PROFILE OF SAMDRUP JONGKHAR

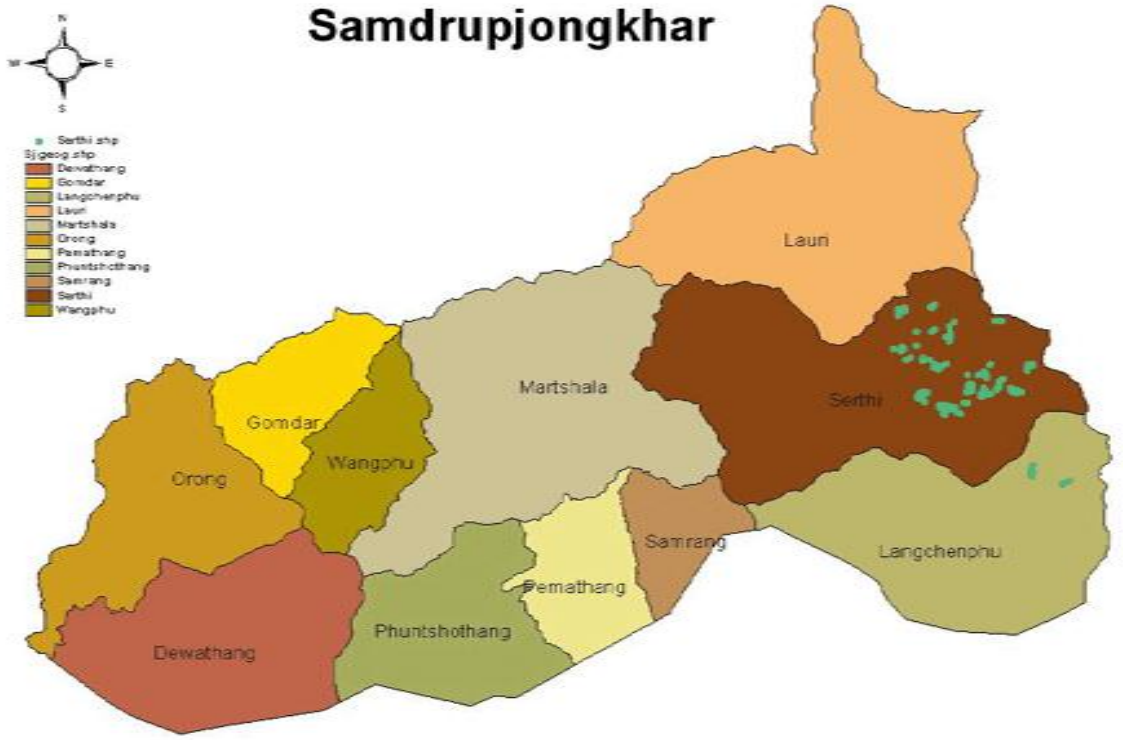
Prepared by Linda Pannozzo, Karen Hayward, Tsering Om, Luke Raftis, Katherine Morales, Dahlia Colman, Kathleen Aikens, Alex Doukas, Michael Oddy, and Ronald Colman

GPI Atlantic

February 2012

Funded by
International Development Research Centre, Canada

The Samdrup Jongkhar Initiative



Samdrup Jongkhar Dzongkhag is situated in the southeastern part of Bhutan, sharing its western border with Pemagatshel Dzongkhag and northern border with Trashigang Dzongkhag. The Indian states of Assam and Arunachal Pradesh are in the south and east respectively. The dzongkhag has eleven gewogs: Martshalla, Pemathang, Phuntsothang, Samrang, Lauri, Serthi, Langchenphu, Gomdar, Wangphu, Orong and Dewathang. The dzongkhag has a population of 35,960 and a total of 7,453 households (2009). It has a total area of 1,878.79 sq. km with elevations ranging from 200 m to 3,600 m above sea level, with the majority of the land ranging from 600 m to 1,200 m. The flattest areas are in the south along the Assam border.

A broad leaf subtropical evergreen forest covers roughly 85% of the land area. The soil type varies from sandy to clay loam, the latter which is suitable for agricultural production. Most of the gewogs are prone to landslides and soil erosion due to loose soil and heavy monsoon rains. Settlements tend to be located in the foothills where the soil is most fertile. Climate is subtropical with a maximum temperature of 35 °C dropping to cooler daytime temperatures of 16 °C from October to March, which is the dry season. The heaviest rainfall occurs between June and September. The average annual rainfall is 5,309.4 mm and the annual average humidity is 7%.
Source: http://www.samdrupjongkhar.gov.bt/

Cover photo: Villagers from Orong Gewog gathered for a field research interview.

TABLE OF CONTENTS

VOLUME 2: APPENDICES

LIST OF TABLES

LIST OF FIGURES

NOTE TO READERS

This Samdrup Jongkhar Profile reflects the best initial efforts of the research team and authors to assemble as much data and information as possible on Samdrup Jongkhar, joined with independent field research. The purpose of this research endeavour is to ensure that any actions undertaken by the Samdrup Jongkhar Initiative are evidence-based, firmly rooted in existing conditions and circumstances, and thereby responsive to actual local needs.

At the same time, the materials and recommendations in this Profile are the sole responsibility of the authors and do not necessarily reflect the views and recommendations of the Samdrup Jongkhar Initiative or of its staff and board.

In any compilation of this magnitude, containing thousands of statistics, including a wealth of previously unpublished data, there are bound to be some inadvertent errors and inaccuracies, despite our best efforts to report and analyse the evidence as accurately as humanly possible. The authors take full responsibility for any such errors and for all misinterpretations of the data.

The Samdrup Jongkhar Initiative whole-heartedly welcomes users' and observers' corrections and improvements to strengthen this report, which should be regarded as an on-going work in progress. Please write to us at samdrupjongkharinitiative@gmail.com.

Our hope and aspiration is that this Profile will be a useful learning tool for the SJI and for the Dzongkhag as a whole, and that the evidence presented herein will bring great benefit to the people of Samdrup Jongkhar and beyond.

ACKNOWLEDGEMENTS

This report is dedicated to the villagers of Samdrup Jongkhar Dzongkhag, who in many cases walked a long way to get to the field research interviews, and then sat, often in the blazing sun, while we asked questions. Without their interest and willingness to participate and share their stories, this study would simply be a collection of disembodied facts and figures. Their voices have given this Samdrup Jongkhar profile real life and meaning, and have provided all of us with profound hope and inspiration.

I want to thank the local researchers and coordinators whose commitment, kindness and footwork got us to where we needed to go in Samdrup Jongkhar villages, steered our way around once there, translated the interviews, painstakingly transcribed the many hours of taped interviews, and organized field visits. Without their dedication, good humour, and assistance, the field research would not have been possible or nearly as enjoyable.

I would also like to thank everyone who contributed to this study: Tsering Om, for preparing the *Background Statistical Research*, which can be found in the Appendix (Volume 2) and provided a foundation from which to build; Hasta Dahlia Colman who also provided background statistical research on Samdrup Jongkhar; Michael Oddy, who provided ongoing support and research material upon request; Kathleen Aikens, Alex Doukas, Kate Morales, and Luke Raftis who all assisted with the field research, especially in some of the more far-flung gewogs. They were also extremely helpful in providing other research required for this study. In particular, credit for the chapter on Models in Part 2 goes to Kate, while Luke provided the section on Waste Management in Chapter 5. All have helped to fill the following pages with photos from the field.

Thanks also go to Sangay Tempa who provided us with unpublished Bhutan Living Standards Survey (BLSS) micro-data files and to Karma Wangdi of the Centre for Bhutan Studies who worked particularly hard to provide the Samdrup Jongkhar data from the 2010 GNH Survey in time for this report. I also want to thank all those who generously provided their time and expertise in reviewing particular sections of this study. These are too numerous to be named here, but I do want to single out Miguel Braganza, of the Organic Farming Association of India, who provided particularly useful information for the agriculture-specific sections of the report.

A special heartfelt thanks goes to former Director of the Jigme Namgyel Polytechnic, Lopen Kezang Choddar, and faculty Sonam Keba for their kindness and support during our stay in Dewathang and their personal dedication to the Samdrup Jongkhar Initiative. We also wish to thank all the local dzongkhag officials, including the Dasho Dzongdag and his staff, gups, tshogpas, agriculture extension officers, and many others, whose kind and helpful ongoing assistance to the researchers in many ways greatly facilitated our wonderful meetings with villagers.

Thanks also to Katherine Riley and to Karen Hayward, who helped to bring this report over the finish line. There are many others who contributed in countless ways to this

study and who helped the researchers personally and cheerfully through their kind and gracious hospitality. I wish they could all be listed here — you know who you are — please know we are deeply grateful.

The SJI is very grateful to the leaders, secretaries, and officials of the Gross National Happiness Commission, Ministry of Agriculture, National Environment Commission (which has kindly provided funding support for launching the SJI zero waste initiative), National Statistics Bureau, Royal University of Bhutan, Jigme Namgyel Polytechnic, and many other key Bhutanese departments, agencies, and institutions, which have provided invaluable support and assistance to the SJI in countless ways.

None of the SJI activities to date would have been possible without the brilliant, kind, and superbly generous assistance of our Indian partners — Dr. Vandana Shiva, Dr. Vinod Bhatt, D.S. Negi, and the expert staff of Navdanya, who are training our Samdrup Jongkhar farmers in the best organic farming methods; Bunker Roy, who has trained six Lauri Gewog women in village-level solar engineering technologies at his Barefoot College in Rajasthan (a training kindly funded by the Government of India); Janak and Jimmy McGilligan, Dr. Tahera Jadhav, and the staff of the Barli Development Institute for Rural Women in Madhya Pradesh, which has provided training in solar drying methods; Kalyan and Anita Paul of Grassroots India, and Miguel Braganza, Ashish Gupta, and Vikram Rawat of the Organic Farming Association of India, who have trained our farmers in agricultural cooperative formation and management. The only real thanks we can give is to implement what they taught.

We have saved the most important acknowledgement and thanks for last:

Very special recognition and deep appreciation go to Dzongsar Jamyang Khyentse Rinpoche for his profound wisdom, vision, compassion, and kindness in launching the Samdrup Jongkhar Initiative. Without his inspiration, insight, and understanding, none of this would be happening. Ultimately, the benefits of the Samdrup Jongkhar Initiative, and any usefulness that this report may have, are entirely due to him.

And on the most practical level, not even the most enlightened vision can be realized or translated into practical action without resources, and without the practical conditions and circumstances that are necessary for any effective action. And so we offer our deep thanks to the International Development Research Centre in Canada for providing the major funding for this initiative, and for the research and preparation of this Samdrup Jongkhar profile.

Interestingly, these last two thanks go hand-in-hand. From the very start, Rinpoche emphasized that the Samdrup Jongkhar Initiative must be based on hard evidence and understanding the human realities on the ground in Samdrup Jongkhar for it to have any success. It cannot, he noted, be a pie-in-the-sky effort based on good intention alone. He therefore stressed the necessity for the Samdrup Jongkhar Initiative to be grounded in solid research as a first step. This report is a modest effort in that direction, and it points to much more extensive research that is still needed. With its mandate particularly geared

to supporting research in a development context, the International Development Research Centre was therefore the perfect match for Rinpoche's direction in this regard. IDRC is much more than a funder here, because it fully shares the vision of the Samdrup Jongkhar Initiative and its holistic philosophy of development.

May any benefit from future initiatives that derive from this research go directly to the villagers and people of Samdrup Jongkhar. And may their wellbeing and the Samdrup Jongkhar Initiative quickly become models for Bhutan and the world. With deep gratitude to all who have made my own time and that of my family in Samdrup Jongkhar both memorable and profound — I am deeply honoured to be part of the SJI team.

Linda Pannozzo,
Senior Researcher, GPI Atlantic

INTRODUCTION

The transition is both immediate and inescapable. As you cross the border from the dusty, chaotic sprawl of Darranga, India, into Bhutan, both the pace and the landscape change abruptly. The flat plains of Assam give rise to the rugged and verdant subtropical evergreen jungles of Samdrup Jongkhar, a district situated at the far southeastern part of the country. More than 85% of the district is covered in forest and the land is as much a home to a vast array of flora and fauna as it is to the 36,000 people who live here. By comparison, the state of Assam teams with a population of more than 27 million—38 times the entire population of Bhutan—340 people per square kilometre compared to Bhutan's average of 17.[1]

Thus, in the span of a very short space and time—passing under the dragon and garuda of the border gate—one defining reality becomes crystal clear: Bhutan is extraordinary and unique, but also incredibly vulnerable. Today it stands at a remarkable crossroads in its history. On the one hand, the country's guiding philosophy for three decades has been the principle of 'Gross National Happiness' (GNH),[2] which seeks to integrate sustainable and equitable economic development with environmental conservation, good governance, and preservation and promotion of the country's ancient culture and profound traditions. On the other hand, rapid modernization and the lure of consumerism have accentuated materialist tendencies and threaten to undermine these values. While conventional development models stress economic growth as the ultimate objective, GNH is based on the premise that true development of human society takes place when the public good is paramount. In other words, if indicators of GNH improve, then this would be reflected in the increased wellbeing both of the public and of the natural environment on which the people ultimately depend for survival.

If successful in Bhutan, this unique development philosophy could become a powerful model for other countries, particularly in the rest of South Asia and other parts of the developing world. It could also have important lessons for industrialized countries that increasingly recognize the necessity for economic advances to be more effectively integrated with environmental conservation and social wellbeing.

At the same time, Samdrup Jongkhar district (dzongkhag) is the locale for a major civil society-based initiative taking place in Bhutan—the Samdrup Jongkhar Inititative (SJI)—which aims to raise living standards in the dzongkhag and establish food security, while fully protecting the natural environment, strengthening communities, promoting Bhutan's

[1] Population figures for Assam state are for 2001. Population estimate for 2011 is 30 million.

[2] GNH has four pillars: sustainable and equitable socio-economic development; environmental preservation; promotion and preservation of culture; and good governance. Within these broad headings are nine domains — standard of living, health, education, ecological literacy, time use, psychological wellbeing, community vitality, cultural diversity, and good governance — each of which has several indicators of progress.

unique culture, stemming the rural-urban tide, and fostering a cooperative, productive, entrepreneurial, and self-reliant spirit.[3]

Needless to say, this is an ambitious task particularly given the global realities facing all countries of the world, Bhutan included. However, relative to the rest of the world, the pressures of modernization are late in coming to Bhutan. Because of this, Bhutan is in the enviable position of being able to learn from the mistakes that have already been made elsewhere.

This is particularly true in the area of agriculture. Small-scale farmer landholdings all over the world are being transformed into larger plantations for export crops—and those who work on these farms have become the "cheap labour" for the industrial economy.[4] Essentially, once independent small-scale farmers adopt the chemical-intensive production of cash crops, producing increasing dependence on unstable world crop prices, rising indebtedness for costly equipment and chemical inputs, extreme vulnerability when crops fail, and, in some places in the world, the forced removal of people from traditional lands that have sustained their communities for generations.[5]

Just across the Bhutan border these trends have had tragic and tangible outcomes: In India countless numbers of farmers have reached the tipping point and amassed unmanageable debt loads, have lost their farms through bankruptcy, and have even lost their lives through suicide.[6] In the last decade alone it's estimated that 200,000 Indian farmers have committed suicide, often by ingesting pesticides.[7] While the stated goal of

[3] The Initiative is a civil society project inspired by Dzongsar Jamyang Khyentse Rinpoche to foster GNH-based development and was publicly launched on December 18–20, 2010 at Rinpoche's Chokyi Gyatso Institute in Dewathang. See Appendix for his speech.

[4] McKibbon, Bill. 2007. Deep Economy. The Wealth of Communities and the Durable Future. Henry Holt and Company. New York.

[5] Ibid, pp. 190–191.

[6] For example, in the Indian state of Andhra Pradesh, with a population of 75 million, rural suicide rates have been recorded in the thousands per year. An avalanche of farmer suicides has also been recorded in Punjab, the epicentre of India's high tech "green revolution." Patel, Raj. 2007. *Stuffed and Starved. The Hidden Battle for the World's Food System*. Harper Perennial. Toronto. (p. 25)

[7] Renton, Alex. "Suicide by Pesticide: India's Hidden Climate Change Catastrophe". *The Independent.* January 2, 2011. http://www.independent.co.uk/environment/climate-change/indias-hidden-climate-change-catastrophe-2173995.html. Figures of suicide deaths are extrapolated from figures provided by Indian authorities, but it is believed the real death toll is much higher. Half of the suicides are believed to have taken place in India's cotton belt where the price of cotton in real terms is one-twelfth of what it was 30 years ago. According to Vandana Shiva, the phenomenon of farmer suicides in the cotton belt began in 1997 when the Indian government removed subsidies from cotton farming and when Monsanto's genetically modified seeds were introduced, which required heavy and mounting inputs of expensive pesticides and inorganic fertilisers. According to Miguel Braganza, Additional Director Organic Farming Association of India (OFAI) Central Secretariat, Goa and Convener-South Asia for the International Federation of Organic Agriculture Movements' (IFOAM) Intercontinental Network of Organic Farmers' Organizations [INOFO], it is not the poorest farmers in India who are killing themselves but the richer educated farmers. He says that if an insect gets into a cotton ball the value of that cotton is gone. "So if a farmer puts Rs. 200,000 to 400,000 into the crop and then another Rs. 100,000 to spray it, in some other countries he may be bankrupt and sit at home, but in India if you are bankrupt and owe money you have lost your honour." From a speech on organic agriculture given by Miguel Briganza, of the Organic Farming Association of India to the business community in Samdrup Jongkhar, February 19, 2011.

the Samdrup Jongkhar Initiative (SJI) is to achieve the opposite of this trend—food security and food sovereignty where the farmers decide the direction they will take—we will discuss in this report how the pressures of conforming to a globally integrated and industrially organized agricultural system are already being felt in Bhutan and how the choices made today will have far reaching impacts on both farmers and food sovereignty well into the future.

It is essential to understand those larger pressures in order to appreciate both the profound significance of the SJI *and* the major challenges it faces. We therefore begin this Samdrup Jongkhar profile with a brief overview of some of those pressures. Our purpose is not to be overly grim or depressing here. In fact, the opposite is the case. A realistic grasp of these global trends highlights the vital importance of the Samdrup Jongkhar Initiative—indeed its pressing *need*—as well as its practical utility and potential relevance not only for Samdrup Jongkhar, but for Bhutan and the wider world.

We begin with a note on true benefits and costs that are invisible in conventional global accounting systems and that are explicitly taken into account in the SJI.

Not counting the cost of farmer suicides or the deleterious long-term impact of chemical inputs on soil and water quality is a key example of how we have externalized the real costs of the way most of the food is now produced in the world. Since GNH at its core is about assigning value to those things that matter to us—health, livehood security, environmental quality, culture, good governance—it is particularly relevant here to discuss how these GNH-based values can be undermined by the profit-driven, consumerist culture to which Bhutanese are now increasingly exposed, and in which the real costs of consumption do not enter into price equations. For example, everyone wants cheap food, but cheap food comes with high invisible costs—the loss of family farms may displace farmers and destroy farm communities, there are health and environmental costs associated with using pesticides, there is cruelty inflicted on animals in factory farms, and chemical farming produces soil loss and erosion, pollution, and greenhouse gases—to name just a few of the hidden costs of so-called "cheap food".

According to one of the world's leading authors in this field:

> Add up the health impacts from losing the ozone layer, the loss of fish stocks and ecosystem services provided by trees, the contamination of water by industrial agriculture and the adjustment to a world with more floods and drought because of climate change, and you end up with quite a tab. If humanity had to pay for the consequences of a degraded ecosystem, the bill would run to about $47 trillion.[8]

Inextricably linked to the hidden costs of industrial agriculture is its dependence on fossil fuels. Based on U.S. data, it has been estimated that it takes half a gallon of oil to produce a bushel of hybrid corn—for making fertiliser, farm machinery, providing irrigation, making pesticides etc. Then there's processing, packaging and distributing, which

[8] Patel, Raj. 2009. The Value of Nothing. Why Everything Costs so Much More than We Think. Harper Collins Publishers Ltd. Toronto. p. 49.

consumes 4 times again more oil.[9] Apart from the production of GHG emissions, the food system's dependency on fossil fuels is disastrous, given the fact that it's running out. Leading scientists are now asking 'how will we eat when oil runs out?'

> Peak oil—the idea that sooner or later world demand for oil will overtake supply—is no longer a mystery, in spite of the fact that many governments around the world avoid discussing it and frequently behave as if it weren't happening… Extreme price volatility is a sign that supplies are becoming more uncertain. Also, oil price volatility and supply uncertainty are extremely dangerous for food production.[10]

Increased oil prices will have direct impacts on farmers everywhere: higher tractor fuel costs, higher costs for pesticides, fertilisers and other chemicals and farm input, and higher costs for transporting food together mean that farmers' costs will skyrocket. The second *indirect* result of higher fuel prices is an increased demand for biofuels "resulting in farmland being turned from food production to fuel production, thus making food more costly."[11] Competition between food producers and fuel producers for the same grains could lead to grain prices doubling due to increased scarcity—a recipe for political unrest particularly in countries that import their grain supply.

Another area of concern globally is the growing gap between rich and poor. A raft of evidence world-wide now indicates now that income *distribution* is one of the most important determinants of population health. According to a comprehensive study published in the *British Medical Journal:* "What matters in determining mortality and health in a society is less the overall wealth of the society and more how evenly wealth is distributed. The more evenly wealth is distributed, the better the health of that society."[12]

In a recent and seminal book on this subject, the authors concluded that while we've known for some time that health and social problems are more common among the less well-off within each society, we also now know that "the overall burden of these problems is much higher in more unequal societies."[13] If growing inequality is bad for health then the trends of the past 30 years are cause for concern—in all countries of the world the gap between the rich and poor is on the rise, including in Bhutan. In this profile of Samdrup Jongkhar, this reality is the backdrop for the discussion on economic security and poverty in Bhutan and in Samdrup Jongkhar in particular.

Although its contribution to the global climate crisis is negligible at best, Bhutan is considered to be highly vulnerable to its effects —both in terms of human health impacts and in terms of weather-related disasters. One recent newspaper article noted that climate

---

[9] McKibbon, p. 73.
[10] Cribb, Julian. 2010. *The Coming Famine. The Global Food Crisis and What We Can do to Avoid it*. University of California Press. Berkeley, p. 120-122.
[11] Cribb, p. 122.
[12] "Editorial: The Big Idea." *British Medical Journal*. April 20, 1998. p. 985, cited in Health Canada. 1999. *Toward a Healthy Future: Second Report on the Health of Canadians,* Ottawa. p. 39.
[13] Wilkinson, Richard and Kate Pickett. 2010. *The Spirit Level. Why Equality is Better for Everyone*. Penguin Books. London, p. 20.

change is already causing extreme rainfall in Bhutan, nearly doubling from an average of 644 mm in 2000 to 1,120 mm in 2010.[14] Further reports indicate that the entire Himalayan region is perhaps the world's most vulnerable to climate change. "As the climate warms, the river flows will at first increase, causing devastating summer floods, and then, as the glaciers that supply them shrink, the rivers will dwindle."[15]

According to Bhutan's National Environment Commission, the Bhutan Himalayas are known to have 677 glaciers and 2,674 glacial lakes—25 of which are potentially dangerous. These glaciers are reportedly retreating at an alarming rate—some by 20-30 metres per year. This could mean increased water flow in the short-term (including outburst floods), but diminished flow in the long term, posing serious implications for hydro-power generation as well as for agriculture and drinking water supply. [16] But the greatest danger from glacial retreat and melting is to the countless millions of people living downstream from Bhutan, who are dependent on the Himalayan glaciers and water sources for their survival.

What does this global evidence have to do with the goals of the SJI? As noted above, the world desperately needs—and indeed is searching for—a viable and functioning alternative model of development that enhances livelihood security and human wellbeing while protecting precious ecosystem services and conserving nature's wealth and resources. But the need for the Samdrup Jongkhar Initiative can also be demonstrated closer to home. The realities of climate chaos and fossil fuel depletion will certainly affect agricultural production in Bhutan—there is even some evidence that it already has—and the ability of the country to be food secure. Food security, in turn, and the capacity of a country to feed itself, according to analysts, is the most vital component of national security at times of international insecurity and crisis. In sum, the path taken in the Samdrup Jongkhar Initiative needs to be based on these current, inescapable realities. Bhutan is no longer isolated from the world, and the SJI—to be relevant and successful even at the local level—simply must, through its own actions and in its own modest way, address those wider global challenges and issues.

In an important report titled *Agriculture at the Crossroads*, over 400 of the world's leading scientists, led by Robert Watson, the World Bank's chief scientist, studied how the world will feed itself in 2050, when the population is estimated to reach 9 billion and the climate will be far more variable than it is now. The report concludes that what's needed is a shift away from the current industrial system of agriculture, which requires vast amounts of water and fertilisers. "When the world's top scientists addressed global hunger, they came up with the same kinds of solutions that the world's poorest had—local, ecologically sensitive solutions that respect local knowledge, democracy and autonomy."[17]

---

[14] Dawa T. Wangchuk. "Extreme rainfall caused by climate change." *Business Bhutan*. March 12, 2011.
[15] Cribb, pp. 142–143.
[16] National Environment Commission. 2008. *Bhutan Environment Outlook*. National Environment Commission Secretariat, Royal Government of Bhutan, pp. 36–42.
[17] This report, *Agriculture at the Crossroads,* will be discussed in greater detail later in this study. The report led by Robert Watson of the International Assessment of Agricultural Knowledge Science and Technology for Development is available at http://agassessment.org. It was cited in Patel, Raj. 2009. *The*

If key goals of the SJI are realized—like food security, self-reliance, and ecological sustainability—then the people of Samdrup Jongkhar may not only be well insulated and protected from some of the hazards that lie ahead, but may become a model for those communities, regions, and nations that are less well protected and more vulnerable to future hazards like severed food and fuel supply lines.

As noted, these global trends are noted here in order to help inform the task at hand in Samdrup Jongkhar and to help clarify some key future directions and priorities of the SJI in the context of wider realities. In order to create a flourishing and self-reliant Samdrup Jongkhar—where the values of health, food and livelihood security, cultural integrity, community vibrancy, ecological intregrity, and good governance are paramount—one needs to know not only what the Initiative's own goals are, but what obstacles and challenges lie on the path, as well as some of the ways the SJI might overcome those obstacles and achieve its objectives. These global trends provide not only cautionary tales but illustrate some of the realities and choices that lie ahead.

The research dimension of the SJI, for which this baseline report attempts to provide a modest initial contribution, is further seen as essential to the success of the initiative itself in order to provide a solid basis and ground for well-founded evidence-based regional development in accord with GNH values and principles, and to ensure the Initiative's success over time. Without such an evidence base, SJI actions might be "pie-in-the-sky" wishful thinking divorced from existing local conditions and circumstances. Dzongsar Khyentse Rinpoche therefore urged that the SJI begin with such research in order to ensure that SJI actions are firmly grounded in and address existing realities.

For example, at the most practical level, it is important to know how each gewog is faring, so that any benefits of the SJI initiative will be equitably distributed throughout the dzongkhag. The different gewogs have different economic, social, and environmental conditions, and one path or one solution for the whole dzongkhag will not fit all needs. As such, Part 1 of this *Profile* report represents a first attempt to develop a comprehensive and thorough picture of the dzongkhag through a) analyzing existing quantitative data and b) conducting field research. Because the economy of the dzongkhag as a whole is based on agriculture, which is the source of livelihood for the vast majority of the region's residents, this study focuses on the agriculture sector, food security, and related markets, but additional statistical data on Samdrup Jongkhar can be found in the *Background Statistical Material* provided in the Appendix at the end of the study.

Part 2 of the study reports on best practices locally, nationally, and globally that could act as potential development models for the SJI. Part 2 also presents a list of recommendations and a set of possible indicators that could be used to monitor the transition to organic agriculture in the dzongkhag.

Value of Nothing. Why Everything Costs so Much More than We Think. Harper Collins Publishers Ltd. Toronto. p. 163.

The field research conducted for this study consisted of (i) direct observation and (ii) in-depth interviews with villagers and farmers, shopkeepers, educators, and elected village leaders and local officials, often in group settings. Typically, field researchers visiting villages in the dzongkhag were greeted by between 20 and 50 villagers, many of whom would have walked from nearby villages to attend the interview. The information gathered during these interviews, combined with the stated goals of the Initiative and available statistical data, has informed both the structure of this report as well as the content.

In each of the following chapters both quantitative and qualitative data have been combined in an attempt to present an accurate and representative profile of Samdrup Jongkhar.[18] However, it should be noted here that the collection of observations and interviews compiled and reported on in this study is neither complete nor representative of all eleven gewogs in the dzongkhag, as the researchers were only able to visit seven gewogs. What we have managed to accomplish in a short time is a good start. But in order for the SJI to claim it is a project of and for the people of the entire Samdrup Jongkhar district, it must continue to gather information—particularly from the far flung, difficult to access, gewogs in the district, which tend to be the poorest—and thus to ensure that the benefits of the project reach these areas and in some cases disadvantaged populations.[19]

It should also be noted that since many of the themes presented in the following pages are cross-cutting, the categorization of chapters is an artificial constuct: in reality none of these issues exist in isolation—all are interconnected. For example, poverty is an important dimension of economic security, but it is also tied to health and food security issues. Therefore, a discussion about poverty is found in both the Food Security chapter as well as in the chapter on Living Standards and Wellbeing. This applies to many other themes covered in the following study.

Note to reader: *All interviews were audio recorded, translated and transcribed. Interviews were often conducted in a language other than English: Sharchop, Nepali, or Dzongkha. In order to maintain the confidentiality of those we interviewed, names are not used in the following study. Some exceptions were made in the cases of elected or appointed officials, heads of organizations, or government employees.*

[18] Please see the Appendix for the Background Statistical Material compiled for this profile of Samdrup Jongkhar based on already existing data that were compiled for the SJI prior to the field research.
[19] For further details on the field research methods and procedures, please refer to the Appendix of this report titled *Methodology and Objectives for Field Research*.

PART ONE

Our dilemma in agriculture now is that the industrial methods that have so spectacularly solved some of the problems of food production have been accompanied by 'side effects' so damaging as to threaten the survival of farming. Perhaps the best clue to the nature and gravity of this dilemma is that it is not limited to agriculture. My immediate concern here is with the irony of agricultural methods that destroy, first, the health of the soil and, finally, the health of human communities… This is the kind of surprise that is characteristic of our time: the cure proves incurable… It is only when it is understood that our agriculture dilemma is characteristic not of our agriculture but our time that we can begin to understand why these surprises happen, and to work out standards of judgment that may prevent them.

- Wendell Berry[20]

[20] Berry, Wendell. 1981. "Solving for Pattern". Chapter 9 in *The Gift of Good Land: Further Essays Cultural and Agricultural.* North Point Press. Originally published in the Rodale Press periodical *The New Farm.*

Chapter 1. Food Security

I think that the weather has drastically changed. Before, it used to be moderate in winter and not too hot in summer but today in winter it's like a summer and in summer we can't bear the heat. Before, maize used to yield a good amount of grains without using manure. But today even if we mix some manure it does not yield like before, which indicates that there has been a change in soil fertility and indirectly a change in weather.

— Woman farmer from Shilingay village, Pemathang Gewog

When is the data going to catch up with the stories? Why don't the scientists come and listen to people who actually work with the rain?[21]

A cluster of makeshift huts—many on stilts with thatched bamboo walls, some with windows cut out of metal siding—cling to the hillside in the village of Rikhey, roughly 6 km from the town of Dewathang.[22] The villagers here tell us that because most of their children are not in the civil service and many are not employed at all, there is little money coming back to their community. In some other communities, they say, the children and relatives send money to their families. What the families in Rikhey earn is for their own personal consumption and there is little extra money to improve their lives and homes.

Villagers here mostly farm—primarily paddy and maize—and some work in the government's public works division making Nu 120-130 day. Forty-five of the villagers are also members of the Dewathang Milk Marketing Cooperative (DMMC), the oldest farmers' group in the country. The women spend their days working in the fields and most of them weave, but only for their families, as there is currently no market here for their fabrics.

Despite the visible level of poverty, particularly in comparison to the relative prosperity in the nearby town of Dewathang, Rikhey residents are actually wealthy in terms of the resources available to them: Below the village sit approximately 200 acres of fertile, flat land—a rarity in these parts where most of the arable land is located on steep and rugged slopes. With all this fertile land available, and with so little disposable income, why do the villagers of Rikhey, like so many other villages visited, depend on imports from India for half their diet when they could be feeding themselves well and have extra produce to sell on the market?

---

[21] Alka Awasthi, of Cecoedecon, a Rajasthani rural poverty organization partly-funded by Oxfam. Quote from: Renton, Alex. "Suicide by Pesticide: India's Hidden Climate Change Catastrophe". *The Independent.* January 2, 2011. http://www.independent.co.uk/environment/climate-change/indias-hidden-climate-change-catastrophe-2173995.html.

[22] With roughly 64 households, Rikhey is one of two villages in Samdrup Jongkhar Dzongkhag that have been identified by the GNH Commission for priority GNH-based development as a potential model for other villages. The other village is Mantsang in Orong Gewog.

Of course the answer to this question is a complex one. Across the region farmers are reporting that their harvest is significantly less than what was harvested a generation ago and even as recently as 5–10 years ago. During field research interviews, lack of water was one of the primary reasons cited by villagers about why they buy vegetables and produce from India. A reliable water source would be a significant step towards food security, they say, and many villagers speculate they could sell a surplus of vegetables as cash crops.

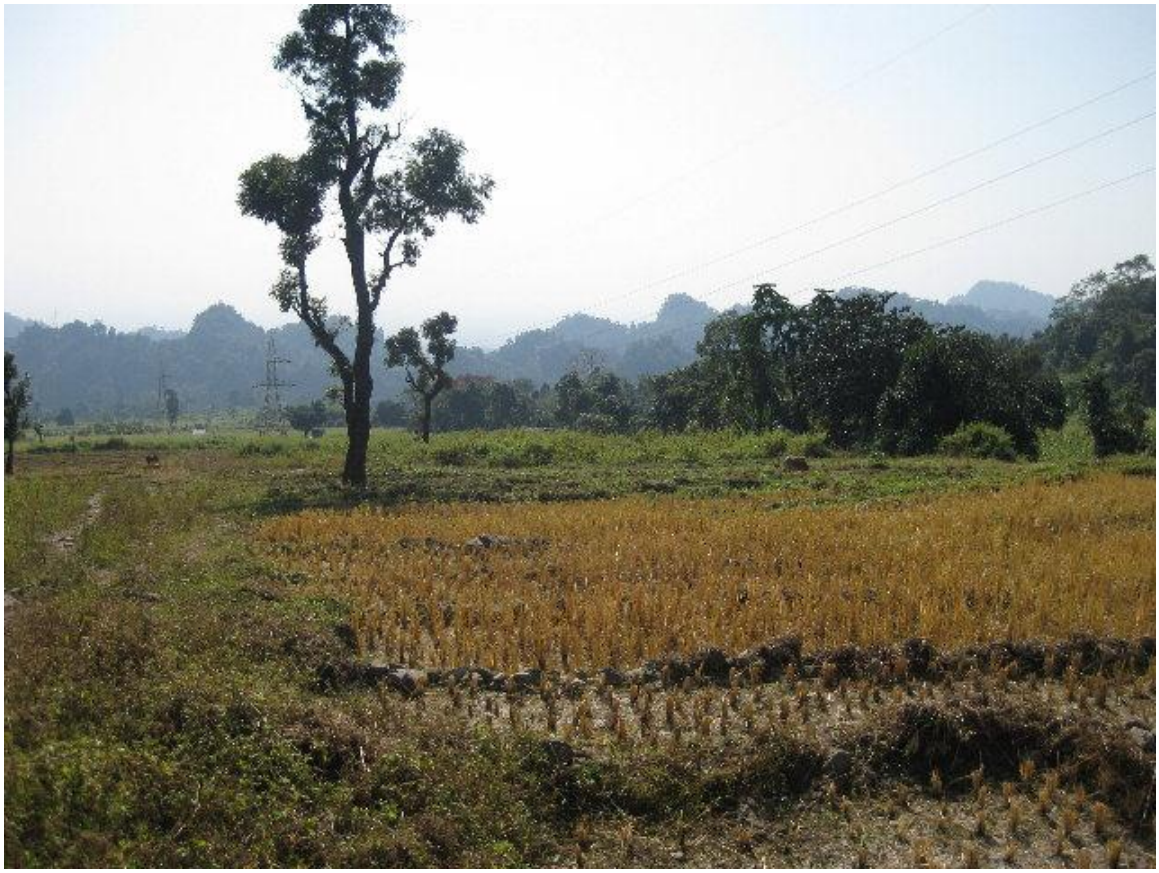
But there seems to be a larger problem at hand. Many villagers cited climate change—characterized by changes in temperature or rainfall—and pollution as major contemporary agricultural problems, resulting in declines in production.
And this is not all. During field research interviews in Rikhey and elsewhere, villagers told us the same story of a number of problems making food security a major challenge. Crop raiding by wild elephants, boars and monkeys, water shortages and lack of irrigation for paddy, difficulties growing and storing food during the monsoon, lack of appropriate technologies to make farming easier, rural-urban migration that was depleting youthful labour, and insufficient landholdings, particularly for large families—were among the reasons given for not being able to grow enough food. [23]

However, while we were not able to visit the most remote areas, interviews with villagers and spokespeople from Langchenphu, Serthi, Samrang, and Lauri—the more remote gewogs—who had come to Dewathang for the SJI project launch and farmer trainings, indicated that farm road access might also have some bearing on dependence on India for food. Lauri villagers (from the dzongkhag's most remote gewog) said they purchased only 5–10% of their food from India, Langchenphu residents reported 20%, and spokespeople for Samrang[24] reported 30%—some of the lowest levels of dependency reported during the field research. Serthi Gewog—remote by comparison with many of the other gewogs in the district—was an exception, reporting 70% dependency.[25] These same gewogs, while reportedly more self-sufficient on the one hand, were also among the poorest in the dzongkhag. Could it be as Kunzang Choden writes in her book, *Chillies and Cheese,* that the "isolation" of some of these far-flung gewogs force the villagers "to develop food security systems that rely on local resources?"[26]

Based on only a handful of interviews with representatives from these remote gewogs, it was not possible to draw any firm conclusions or make any reliable correlations between food self-sufficiency and market access, though the interviews did raise the following questions that bear further investigation as the SJI moves forward:

[23] Many of these and the following viewpoints were gathered at the breakout sessions held during the SJI Launch in December 2010 at the Chokyi Gyatsho Institute (CGI) in Dewathang. Please see the Appendix of this report for a full breakdown of these.
[24] While there are no roads into Samrang through Bhutan, there is a road connecting it to India. It is a 30 minute walk from the only inhabited village in Samrang to India.
[25] Serthi is a 4 hour walk from Gelongkhar. For further detail on distances (both driving km and walking time) from Dzongkhag Headquarters to the various gewogs, please refer to the Appendix titled Objectives and Methodology of Field Research.
[26] Choden, Kunzang. 2008. *Chilli and Cheese. Food and Society in Bhutan*. White Lotus Press. Bangkok.

- What is the relationship between isolation (and by extension poverty) and self-sufficiency?
- Does road access reduce self-sufficiency?
- Furthermore, if the poorest and most remote gewogs are more self-sufficient due to necessity, does this increased self-sufficiency mean they are more food secure or are they simply making do with less?



Paddy and maize fields below the village of Rikhey, in Dewathang Gewog

1.1 Food security versus self-sufficiency

In the section above, we have referenced both food security and food self-sufficiency. But these are not the same. According to a widely accepted definition of food security from the Food and Agriculture Organization (FAO), food security is achieved when "*all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.*" By contrast, food self-sufficiency is defined as being able to meet consumption needs (particularly for staple food crops) from own production rather than by buying or importing.[27]

[27] Food and Agriculture Organization: Available from http://www.ifpri.org/sites/default/files/publications/bhutannote04.pdf

The Principal Component Analysis (PCA) used by Bhutan`s Ministry of Agriculture is a composite index of food insecurity that combines a number of different factors, including household consumption. By this measure, Samdrup Jongkhar has an unacceptably high level of food insecurity. Out of the twenty dzongkhags in Bhutan, Samdrup Jongkhar is ranked as the 8th most vulnerable to food insecurity, with a PCA Index of -0.18. The most vulnerable dzongkhag is Zhemgang, with a Mean PCA Index of -0.32, while Thimphu is the most food secure with an Index of 0.82.[28] A food security index was not available at the gewog level (see Table 1 below).

Table 1. Vulnerability to food insecurity by dzongkhags, 2005

Rank	Zones	Dzongkhags	Mean PCA Index	Level of Vulnerability
1	Central	Zhemgang	-0.32	MOST
2	Eastern	Pemagatshel	-0.32	
3	Western	Wangdue	-0.32	
4	Eastern	Mongar	-0.27	
5	Eastern	Trashiyangtse	-0.27	
6	Western	Gasa	-0.22	
7	Southern	Sarpang	-0.20	
8	**Eastern**	**Samdrup Jonghkar**	**-0.18**	
9	Southern	Samtse	-0.15	
10	Eastern	Lhuentse	-0.14	
11	Western	Dagana	-0.12	
12	Western	Chhukha	-0.02	
13	Central	Trongsa	0.00	
14	Eastern	Trashigang	0.09	
15	Southern	Tsirang	0.11	
16	Western	Ha	0.49	
17	Western	Paro	0.53	
18	Central	Bumthang	0.61	
19	Western	Punakha	0.63	
20	Western	Thimphu	0.82	LEAST

Source: Vulnerability Analysis and Mapping (VAM) Report, 2005, cited in Ministry of Agriculture. Renewable Natural Resource (RNR) Sector Tenth Plan (2008-2013). Enabling Farming Communities to Overcome Poverty. Main Document. p. 6

[28] Vulnerability Assessment and Mapping (VAM) Report, 2005 and RNR, Sector 10th FYP.

According to the Ministry of Agriculture's RNR 10th Five Year Plan, forty nine out of fifty poor people in Bhutan reside in rural areas. Among the extremely poor, practically all reside in the rural areas. According to the report: "Poverty is co-related to food security and cash income. Therefore, poverty reduction involves ensuring food security and enhancing cash income….Food security in turn is the function of availability of food, access to food, and utilization of food."[29]

In Bhutan, and elsewhere, there has been a longstanding debate about whether food self-sufficiency will achieve food security. On the one hand, relying on the market to meet food needs is risky given its volatility, and therefore self-sufficiency in food is a laudable goal. However, according to an FAO report on Bhutan, it is also "costly for a household (or country) to focus on food self-sufficiency rather than producing according to its comparative advantage and purchasing some of its food requirements from the market."[30] Needless to say, the latter argument depends on secure food supply lines and may be less applicable at times of international crisis. The issue is particularly important for the SJI, as one of its stated objectives is improved food self-sufficiency *and* food security for the dzongkhag and its residents.

It is noteworthy that the debate on the relationship between food self-sufficiency and food security is reflected in the evolution of food policy in Bhutan. The Fifth and Sixth Five-Year Plans (1981–86 and 1987–92) called for self-sufficiency in staple foods. The Seventh Five-Year Plan (1992–97) called for self-sufficiency but recognized that it may not be a realistic goal. The Eighth Five-Year Plan (1997–2002) focused on the goal of food security, though it called for the value of agricultural exports to exceed the value of agricultural imports. In 2007, the Bhutan National Food Security Strategy Paper adopted the definition of food security from the 1996 World Food Summit. In spite of this shift in policy emphasis from food self-sufficiency to food security, some continue to favour the concept of food self-sufficiency as key to greater food security.[31]

It is likely that the policy shift noted in the previous paragraph results primarily from actual globalization trends that have increasingly linked Bhutan to international markets, particularly in India. As noted below, Bhutan's Auditor-General, who is originally from Dewathang, remarked at the first presentation of this draft SJI Profile in May 2011, that Samdrup Jongkhar was largely self-sufficient in food production as recently as the 1980s. In other words, the policy shift may have less to do with actual local potential within Bhutan than with global shifts that have drawn Bhutan into an increasingly globalized world and made the country less self-reliant. It is also noteworthy that His Majesty the Fourth King regularly urged his countrymen to become more economically self-reliant and food self-sufficient.

[29] Ministry of Agriculture. RNR Sector Tenth Plan (2008-2013). Enabling Farming Communities to Overcome Poverty. Main Document, pp. 5.
[30] Food and Agriculture Organization: Available from http://www.ifpri.org/sites/default/files/publications/bhutannote04.pdf.
[31] Ibid.

To further illustrate this debate on the relationship between food self-sufficiency and self-reliance, another measure of food security in Bhutan examined the relationship between food self-sufficiency and standard of living. From the Agriculture Census, measures of food self-sufficiency and measures of food shortages[32] were combined with measures of the standard of living obtained from the Population Census.[33] Perhaps surprisingly, the results indicated that gewogs with high per capita rice production were no more likely to have a high rate of food self-sufficiency than gewogs with low per capita rice production. Similarly, high production of cereals did not indicate that those gewogs were better off than those with low per capita production.

The 2007 Bhutan Living Standards Survey (BLSS) also conducted an analysis of food security and found that households that were more self-sufficient in cereals and food in general were less food secure. However, it found a weak correlation between food security and rice self-sufficiency. As well, the BLSS found that per capita expenditure on food, a measure of standard of living, was positively correlated with all four measures of food security. [34]

Thus, the Ministry of Agriculture stated that: "The implication of these findings is that some households may be forced into food self-sufficiency by lack of market opportunities" and that "encouraging household food self-sufficiency is not a useful strategy for achieving food security or reducing poverty."[35]

However, the definition of self-sufficiency and the Ministry`s conclusion here seem to be based solely on cereal production, and perhaps the definition needs to be broadened to include pulses, oilseeds, and vegetables. As well, we noted that the BLSS results on rice self-sufficiency would not support the Ministry`s conclusion. Furthermore, consultations with Dr. Vandana Shiva and Navdanya farmer trainers indicate that — in their own experience and investigations — in order to achieve food security, focus should first be given to families growing food for themselves, to reduce their own dependency on the market and to increase the variety, diversity and nutritional content of crops grown for their own consumption. Once family needs are met, farmers can focus on local markets, and then after that, the region, nation, or further afield.

The measures that tend to be used to assess food security *also* tend to be somewhat simplistic and do not take into account the sources or quality of the dietary energy supply, but rather simply assume that if the daily caloric intake is met, then the diet is a balanced

[32] Measures of food self sufficiency were per capita rice production, per capita maize production, and per capita cereal production, and measures of food shortages were derived from the average number of months a household could meet its food needs from own production and the share of households that could meet all their food needs from own production.
[33] Standard of living measures from the Population Census include type of roof, type of walls, type of water source, type of toilet, and access to electricity.
[34] BLSS measured food security by value of consumption, the share of non-staples, the share of animal products, and the number of months with sufficient food. Ministry of Agriculture and Food. 2010. *Food Security and Food Self-Sufficiency in Bhutan*. Agriculture and Food Policy Research and Capacity Strengthening Project.
[35] Ibid.

one. However, data indicate that the share of meat consumption is higher in urban areas than it is among rural households, and that rice accounts for a higher share of food consumption in rural households. According to the World Food Programme, this indicates a potential risk for protein and micronutrient deficiencies and poor nutrition status in rural households.[36] Food security measures also do not take into account climatic variability as a source of volatility and short-term nutritional stress, and the overall health status of the population. These too will inform whether food security in its fullest sense exists or not.

The 2007 Poverty Analysis Report states that 6% of people in Bhutan suffer from extreme food poverty (also called subsistence poverty)—that is, about 3 in 50 people belong to households where their per capita consumption is not able to meet their food needs. Unfortunately due to differences in survey design and methodologies, PAR 2007 data are not comparable to PAR 2004 data and thus trend lines cannot be constructed.[37]

Rudimentary dwelling on the road to Orong Gewog

According to the Ministry of Agriculture, only 39% of the households in Samdrup Jongkhar had enough food grain production for their own consumption in 2008. The highest percentage of households with enough food grain was in Punakha with 67% and the lowest was in Ha with 8.5%.[38] Within Samdrup Jongkhar, food grain sufficiency varied among the gewogs as well, from a high of 83% in Dewathang to a low of 19.5% in Wangphu, followed by 24% in Samrang.

According to the RNR Census, on average there is a shortage of food grain in Samdrup Jongkhar for 2.8 months of the year, and households cope with this shortage by means of earnings from the following sources: horticulture crops (53.3%), livestock products (15%), forest products (4.2%), off-farm activities (27.4%), remittances (17.9%), and money borrowed from neighbours (17.8%).[39]

[36] Data from World Food Programme. Bhutan: Food Security at a Glance.
[37] National Statistics Bureau. 2007. Poverty Analysis Report, p. 40.
[38] Ministry of Agriculture. 2010. RNR Census 2009. Volume 2. Table 83.
[39] Ibid.

1.2 Poverty rates

"*Poverty in Bhutan is a rural phenomenon."*[40]

2003 was the first year poverty was comprehensively measured in Bhutan, using consumption data from the Bhutan Living Standards Survey (BLSS). According to the Poverty Analysis Report (2007), it remains difficult to monitor progress in the area of improving living standards because poverty data and poverty-related indicators are still relatively scarce in Bhutan. However, initiatives by the Royal Government of Bhutan since 2000 have increased data availability.[41]

According to the Poverty Analysis Report (2007):

> Poverty, which may be thought of as a deprivation of the basics of life, is a multi-dimensional phenomenon. This deprivation includes not just insufficient consumption (and income) but also lack of opportunities and assets, inadequate education, poor health and nutrition, lack of sanitation, insecurity and powerlessness.[42]

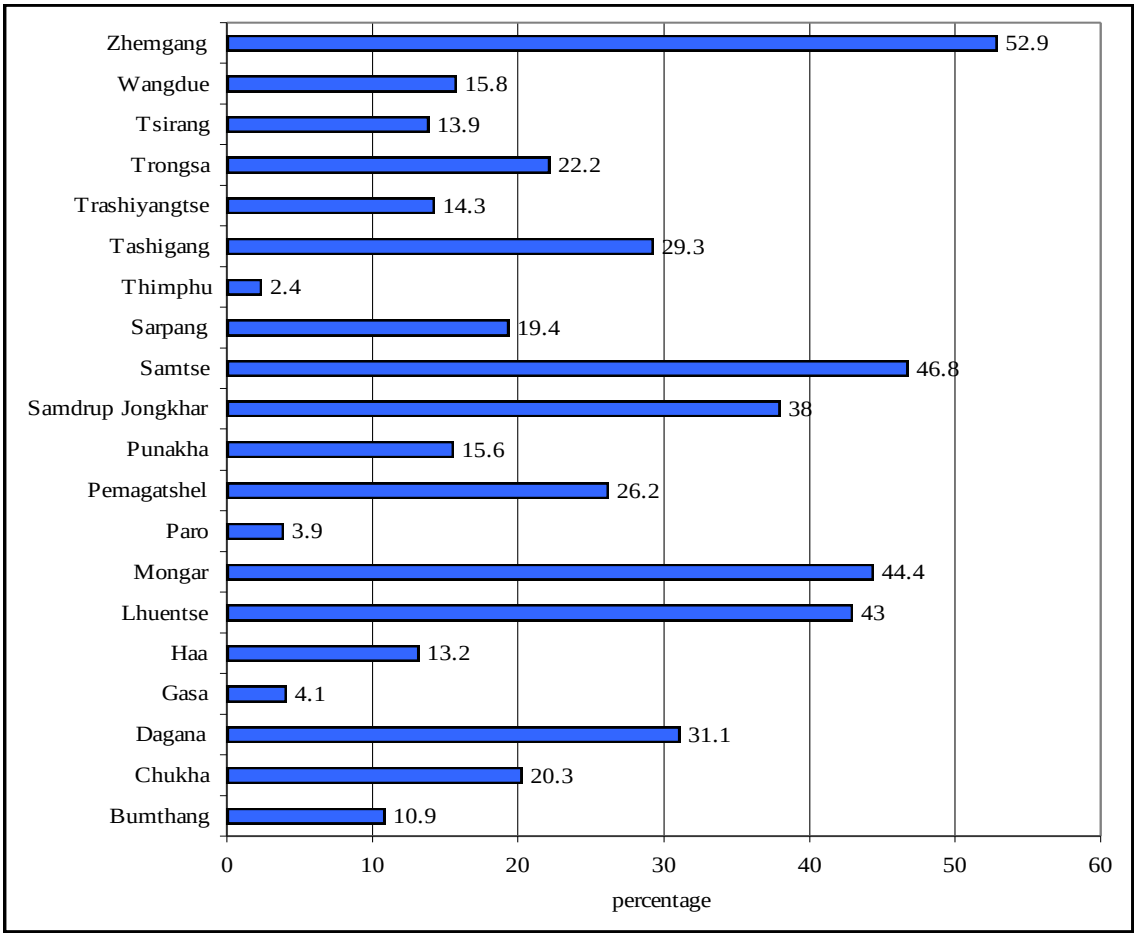
According to the GNH Commission, there are three defining characteristics of poverty in Bhutan: remoteness, size of landholding, and the economic use of the landholding. Remoteness or lack of road connection means farmers cannot generate an income from their farm products. Small landholdings also mean that the poor can only cultivate enough for a few months [and] then rely on purchases for the rest.[43]

Overall, about one quarter of the population of Bhutan is estimated to be poor, and rural poverty is estimated at 31%. Urban poverty is much lower with only 1.7% considered poor. The highest rates of rural poverty are in Zhemgang (53%), Samtse (47%), Mongar (44%), Lhuentse (43%), and Samdrup Jongkhar Dzongkhags, where the overall poverty rate is 38% (see Figure 1 below).[44]

---

[40] National Statistics Bureau. 2007. Poverty Analysis Report (PAR). Royal Government of Bhutan, p. 12.
[41] PAR, 2007, p. 4.
[42] Ibid.
[43] Nirmala Pokhrel. "What it means to be poor". *Kuensel*. November 2, 2010. http://www.kuenselonline.com/2011/?p=15897
[44] According to the 2007 Poverty Analysis Report (PAR) *poverty* is defined as follows: "A household and all its members, are considered poor if the household per capita consumption level is insufficient to acquire a given level of goods and services regarded as essential for a minimum standard of living." The *total poverty line* is calculated by adding the *food poverty line* (derived from the Cost of Basic Needs approach) and the *non-food poverty line*. The PAR used the Nepalese calorie requirement to determine the Bhutanese *food poverty line*. Based on that measure, the Bhutanese food poverty line in 2007 was Nu. 688.96 per person per month. Those citizens consuming less than this amount were considered 'subsistence poor'. The non-food poverty line in Bhutan in 2007 was Nu. 407.98 per person per month. Therefore, the *total poverty line (TPL)* in Bhutan in 2007 was Nu. 1,096.94 per person per month. Those consuming less than the total poverty line were considered poor. From National Statistics Bureau. 2007. Poverty Analysis Report. Royal Government of Bhutan. Thimphu, pp.11-12.

Figure 1. Poverty rates by dzongkhag, 2007



Source: Poverty Analysis Report, 2007.

Note: Poverty incidence rate is the percentage of poor persons who belong to households whose per capita real consumption in 2007 was below the total poverty line of Nu. 1,096.94 per person per month.

It should be noted that during field research interviews, percentages of poor reported by villagers or village spokespeople did not correspond with official rates. For example, when asked about those living in poverty, villagers often replied that the poor in their villages were either the very old or those without land—typically only a handful of people. Thus, at the village level, there seemed to be a subjective acceptance of a certain degree of hardship and financial insecurity, and only the extremely destitute were considered to be poor.

As previously noted, it was not possible during the field research to visit the most remote regions of Samdrup Jongkhar Dzongkhag, but interviews conducted with village spokespeople who attended the SJI Launch held in Dewathang corroborate the findings of

the joint study of the National Statistics Bureau and the World Bank that poor gewogs generally have poor access to markets and road networks, and poor rural electrification.[45]

As Table 2 below indicates, Lauri (61%), Samrang (57%), Wangphu (56%), and Serthi (54%) Gewogs have among the highest rates of poverty in the dzongkhag. They are also not accessible by road: Lauri is a two day journey by foot from the nearest road in Gelongkhar; Serthi is a 4 hour journey from Gelongkhar; Wangphu is a 4 hour journey from Gomdar Gewog; and Samrang is a 4–5 hour walk from Diglai Khola in Pemathang Gewog.

Lack of roads also means lack of electricity for the people in these gewogs. In Lauri, solar power for lighting has been supplied by the government for 160 households in Zhangdey village, but the village spokespeople we interviewed said that roughly 60 of these units were currently not being utilized because of damaged batteries, which the villagers did not know how to fix. Serthi Gewog experienced a similar situation, but there only those who could afford the units owned the solar lighting equipment. We were told that in one village only 10 households out of 35 had solar lighting. The Royal Government of Bhutan's rural electrification plan calls for Lauri and Serthi Gewogs to be connected to the grid by 2013.

Samrang, once the dzongkhag's 3rd most populated gewog, has only 21 households today.[46] The people who still live there have no road access or grid-based electricity, but have been provided recently with solar lighting.[47] Samrang is further disadvantaged because it is the only gewog in the district not to have any health, education, or cultural centres. To access any of these services, the villagers must walk to Pemathang Gewog.

Langchenphu also has a high poverty rate (55%) even though for the most part it does have electricity and road access—both are via India. There is no road access to Langchenphu within Bhutan. In order to get to Lanchenphu Gewog by road, one has to drive 190 km from Samdrup Jongkhar town through Assam. Furthermore, the electricity for the gewog comes from coal burning plants in India, and the villagers we interviewed talked of periods of extreme power outages, on average 10 to 15 times per week and sometimes lasting as long as 2 months in the summer.[48]

---

[45] Sonam Pelden. "Poverty by Headcount". *Bhutan Observer*. October 22-29, 2010, p. 1. The NSB report also noted that while market access and road connection are the "main drivers of poverty reduction" there was one exception to this rule: Gasa has very low poverty incidence but also has very limited market access. Further study is required to ascertain why this is the case. Perhaps it has to do with the high-end tourist treks that pass through the area.

[46] The historical context and challenges facing Samrang are discussed in greater detail in the Obstacles to Food Security section below.

[47] According to one interview, solar lights were provided by GNH Commission.

[48] Due to constraints discussed in detail in the Appendix: Objectives and Methodology of Field Research, field research was not conducted in these most far-flung gewogs. However, where possible, interviews were conducted with villagers and spokespeople from these gewogs who attended the SJI Launch held at the Chokyi Gyatso Institute in Dewathang in December 2010.

In the gewog of Wangphu—roadless and at the time of writing, lacking in grid-based electrification, there was one village called Benoporang that had been solar electrified and had its own solar engineer—a women trained at Bunker Roy's Barefoot College in India who is now paid by the villagers to maintain the solar units.[49] Field research in Wangphu Gewog further revealed that — while the gewog was remote and not accessible by road — it had in fact been wired for electricity and was — within a month or so of our January (2011) visit — to be connected to the grid.

Table 2 below shows that six of Samdrup Jongkhar's eleven gewogs have a poverty rate over 50%, and ten of the eleven have a poverty rate over 42%. Only Dewathang Gewog (which contains the towns of Samdrup Jongkhar and Dewathang) has a lower poverty rate—30%—by far the lowest rate of poverty in the dzongkhag. The poverty rate in Lauri Gewog is twice that of Dewathang. This indicates that dzongkhag-level analysis and actions are insufficient for the SJI to achieve its objectives. Conversely, it also shows how important it is in the longer term for the SJI to undertake intra-dzongkhag analysis and targeted poverty-reduction and livelihood promotion actions in particular regions where needs are greatest. This is where thorough research can help provide a sound basis for the SJI as it moves forward.

Table 2. Poverty rates, Samdrup Jongkhar, by gewog, 2007

Gewog	Number of Households	Poverty rate (%)	Number of Poor
Phuntshothang	599	45.8	1,404
Pemathang	297	55.9	810
Gomdar	621	43.9	1,161
Lauri	697	60.6	1,619
Martshala	475	45.3	986
Orong	639	42.4	1,194
Langchenphu	171	55.0	482
Samrang	22	57.0	60
Serthi	421	53.9	9,52
Wangphu	339	56.1	1,077
Dewathang	653	30.0	899

Source: Bhutan Living Standards Survey, 2007.

Note: The poverty headcount rate is the proportion of the population whose incomes are below the official threshold (or thresholds) set by the national government. National poverty lines are usually set for households of various compositions to allow for different family sizes. Where

[49] A total of 504 houses in 48 villages in Bhutan have been solar electrified by the efforts of Bhutanese women who have been trained at Barefoot College, an institute founded in 1986 by Bunker Roy with the aim to impart traditional knowledge and skills and appropriate technologies at the rural and village level. Bunker Roy addressed the December 2010 SJI Launch and Jigme Namgyel Polytechnic faculty and students, and has since trained 6 Lauri Gewog women at Barefoot College (March–September 2011) with financial assistance from the Government of India.

there are no official poverty lines, they may be defined as the level of income required to have only sufficient food or food plus other basic necessities for survival.

The relatively greater prosperity of Dewathang Gewog, compared to other parts of the dzongkhag, is explained in part by the fact that it contains the administrative centre of Samdrup Jongkhar town with its sizeable civil service populace. Dewathang town is also a relatively prosperous area, even when compared to the other nearby villages in the same gewog, as it has a number of large institutions including the engineering college of the Royal University of Bhutan—the Jigme Namgyel Polytechnic (JNP), a Buddhist monastery—the Chokyi Gyatso Institute for Advanced Buddhist Studies, a military base, and a hospital.

When looking at poverty rates it is also important to assess the "depth and severity" of poverty or what is termed the "poverty gap." The 2007 Poverty Analysis Report (PAR) found that poverty was deeper and more severe in rural areas than in urban areas. According to the PAR, a total of Nu. 502.2 million—the equivalent of 1.2% of the GDP—would be needed annually to eliminate poverty in Bhutan. But the report notes that this figure is provided for statistical purposes only, and that a direct cash transfer to the poor is "neither sensible nor feasible: dole outs would only make the needy dependent. Poverty reduction can only be sustained if the poor are empowered."[50] The topic of "poverty gap" is discussed in further detail in the chapter on Living Standards and Wellbeing.

According to PAR, poor households tend to be rural and large in size (i.e. have a number of children). They also tend to be headed by men, as opposed to women. In fact, the depth and severity of poverty is observed to be higher among male-headed households. Poverty rates are also observed to increase with the age of the head of the household.[51] Poverty rates by ethnicity were not available.

1.3 Obstacles to achieving food security in Samdrup Jongkhar

During field research interviews, as noted above, villagers invariably listed the following as the main reasons for not being able to grow enough food for personal consumption: human-wildlife conflict (i.e. crop raiding), water shortages and lack of irrigation for paddy, difficulties growing and storing food during the monsoon, lack of technologies to make farming easier, rural-urban migration with consequent shortage of youthful farm labour, and insufficient landholdings, particularly for large families.[52]

[50] National Statistics Bureau. 2007. Poverty Analysis Report, p. 19.
[51] Ibid.
[52] Many of these concerns and challenges were echoed during the breakout sessions held with participant villagers at the SJI Launch in December 2010 at the CGI in Dewathang. Please see Appendix of this report for a summary of these findings.

According to the Samdrup Jongkhar District Agricultural Officer (DAO), the main constraints experienced by farmers in the dzongkhag are:

- Crop raiding by wild animals: The DAO notes there is an electrical animal deterrent device (siren) that has been developed on a pilot basis and is being used in two gewogs: Orong and Phuntshothang. Maintenance of the device is high, so the technology has to be improved (see section on *Crop Raiding* below for more details).

- Pests and diseases: The DAO listed a few of the diseases/pests that have been causing particular problems in the dzongkhag, including northern corn blight, tuber weevil, and ginger soft rot.

- Monsoon rainfall: Samdrup Jongkhar receives a very high amount of rainfall in the summer months (an average of 5,300mm annually) causing roads and agricultural land to be washed away, and damaging irrigation structures/canals.

- In general, the DAO says farmers are older – in their 60s – and there are not many young people replacing them.

Many of the concerns raised by villagers and agriculture officials are supported by existing data. According to the Renewable Natural Resources Census (RNR) conducted in 2008, the most important issues affecting farming activities in Samdrup Jongkhar overall, based on percentages of households reporting these problems, are: crop raiding (59%), limited market access (35%), insufficient irrigation (17%), land shortages (12%), unproductive land (12%), and hail storms (9%).[53] It is noteworthy that more than 90% of households in Serthi and Samrang Gewogs and 75% in Wangphu report crop raiding as a major constraint. See Table 3 below.

[53] Contraints not included here (due to smaller percentages of households reporting these problems) are drought (2.7%), excessive rain (2%), landslides and erosion (3%), wildlife predation on livestock (2.4%), livestock diseases (0.95%), and livestock feed shortage (2%). However, when results are analysed by gewog, it is noteworthy that 11.2% of households in Lanchenphu and 8% in Samrang suffer from drought; and 10.2% of households in Serthi suffer from landslides and erosion. RNR census, Table 7, 2009.

Table 3. Constraints encountered in farming activities, Samdrup Jongkhar by gewog, 2008

Dzongkhag /Gewogs	Various constraints encountered in farming activities, 2008 (% of households)						
	Insects and disease	Insufficient irrigation	Unproductive land	Crop raiding	Hail storms	Land shortage	Limited market access
Samdrup Jongkhar	**26.3**	**16.9**	**11.5**	**58.6**	**9.0**	**12.1**	**35.1**
Dewathang	11.4	9.8	20.7	44.6	11.7	16.2	2.9
Gomdar	16.0	10.1	6.3	61.9	16.2	2.9	58.5
Orong	25.0	12.5	3.7	37.0	27.1	3.7	34.7
Langchenphu	8.9	62.7	10.7	62.1	0	10.1	0.6
Martshala	24.6	4.0	11.7	56.4	2.3	13.4	31.9
Pemathang	23.4	33.5	21.0	59.0	2.0	16.9	0.8
Phuntshothang	9.7	48.4	14.1	56.9	0.7	36.1	3.5
Samrang	20.0	64.0	8.0	92.0	4.0	20.0	16.0
Serthi	58.2	1.2	11.3	90.2	4.3	8.2	78.9
Lauri	57.7	2.3	3.9	56.8	3.9	6.5	62.9
Wangphu	43.8	3.0	17.0	75.1	8.8	6.1	63.5

Source: RNR Census, 2009, Table 7.

Notes: Numbers have been rounded. Due to space limitations, only a selection of the most problematic constraints were included above. Contraints not included were drought (2.7%), excessive rain (2%), land slides and erosion (3%), wildlife predation on livestock (2.4%), livestock diseases (0.95%), and livestock feed shortage (2%). However, it is noteworthy that 11.2% of households in Lanchenphu and 8% in Samrang suffer from drought; and 10.2% of households in Serthi suffer from landslides and erosion.

In the following section each of these constraints will be discussed in further detail.

It should also be noted here that at the May 19, 2011 presentation of the Draft SJI profile study, Bhutan's Auditor General, who is originally from Dewathang, noted that as late as 1980s, Samdrup Jongkhar was almost self-sufficient in food production, with almost nothing bought or imported from across the border. He added that this self-sufficiency included the cultivation and seed collection of many foods that are no longer grown to any significant degree today. (See section on *Forgotten Foods* in Agricultural Diversity Chapter).

1.3.1 Insufficient water

As previously stated, one of the primary reasons cited by villagers for why they buy vegetables and produce from India is because they do not have sufficient water to grow them themselves during the winter months, when vegetables grow well. A reliable water source in the winter would be a significant step towards food security, and many villagers speculate they could sell a surplus of vegetables as cash crops if they have adequate water for cultivation.

In Wangphu Gewog the Agriculture Extension Officer points out that vegetables require a lot of water, and this is in very short supply in the winter months: “Only a few people grow vegetables, if they have a good water supply, because vegetables require a lot of water. We have to water them in the morning and evening, and [the people] don't even have sufficient water to drink, so I think they are not able to produce vegetables in the winter.”

Similar comments were made during our visit to Chennari village (Dewathang Gewog). There, all the villagers nodded in agreement when the issue of water was raised — they simply don’t have enough water for their fields in the winter months, or even to wash themselves, let alone their cows (a practice which is encouraged by the agriculture extension office, as many of the farmers sell their milk for consumption). According to the village spokesperson, the people who now live in Chennari migrated from a place called Gopa about 7-8 years ago because the government policy was to provide farm roads and electricity to clustered communities. “Thinking the government would then give them a farm road, the people migrated to this area.” Now they are in a clustered community, but without enough water. Villagers say that when they first arrived they had to carry water on their backs in bamboo containers. Then they asked the government for help and water was provided. A water tank was built and they had lots of water at least for personal use. Sometimes they collect rainwater during the rainy season, using buckets of 9-10 liters – but this is not enough for use as a backup during the dry season or for use in cultivating crops. Now with all the road construction, the water supply is unpredictable and supply lines are often damaged.

According to the rules, if the water line lies within 50 feet of the road-widening project currently underway between Samdrup Jongkhar town and Trashigang, then Dantak, the Indian Border Roads Organization charged with the road-widening undertaking, is not responsible for fixing it. Instead, the villagers are responsible for providing the labour to repair the line, while the district government provides the new materials. Since the road project is ongoing, villagers say they are waiting for the roadwork to be completed before fixing the line lest it gets damaged again, which is highly likely. According to Dewathang’s Gup Dozang:

> During the 10th five year plan the government has funded us with 60 lakhs for drinking water purposes which we have sourced in Lemsorong. This budget was for 117 households in Dewathang Gewog. We were enjoying good water without any problem. The Shedra [Chokyi Gyatso Institute] has a different water source, the Polytechnic also has a different source. Just now we are having a water problem because of the road widening work done by the Dantak Project because they have damaged all our pipes. Again, we managed to repair it ourselves but due to a landslide, 800 meters of our pipe has been washed away. Now again we have gotten 800 meters of pipe from the government and we thought of doing the work again but the road widening work is not finished and if we do it now it will be the same case again, because there is lots of blasting and road widening work done by bulldozer, so we thought of fixing the pipe after the road widening work by the Dantak Project is completed. At present, the water that we are using is

> from the Polytechnic, we are sharing their overflow water, ours is still on pending. Very soon we are going to have a meeting for repairing the damaged pipes. I think we will have water very soon. But still we will have the same problem until the road widening work is completed.

According to a recent article in *Kuensel,* the water problems in Dewathang predate the Dantak project and have existed for two decades.[54] In Dewathang, there are currently 5 separate water lines for the JNP, the Shedra (monastery), the military base, and two separate ones for the town proper. One consolidated line, avoiding or reducing duplication and potential problems with pipe damage, might be a solution to this problem.

According to Bhutan's Auditor General, who is originally from Dewathang, water sources and springs in the area have been drying up. As a result, Dewathang is now completely dry in winter, and experiences drinking water shortages. He says that huge trees have been cut down for shifting cultivation, and "the catchment area is getting drier and drier."[55]

Water options for S/J agriculture

Irrigation

Water management seems to be a primary inhibitor to agricultural development in Samdrup Jongkhar. Issues about water shortages in winter were reported in every gewog the researchers visited: Villagers in Orong Gewog explained that lack of water was the reason why they buy vegetables from India. "We don't have enough water, we have to feed Jersey cows, and we have to drink ourselves, and we have two schools here to share from the same source…. If there is enough water we can grow lots of vegetable for both commercial and self consumption. It is just because there are lots of places like schools and hospital, that divide the water from the same source."

In Phuntshothang Gewog, villagers from the community of Thanchugoenpa said there were many areca nut plantations, some with leaves drying out. One farmer explained that the leaves were drying due to lack of irrigation water and that they were not allowed to use drinking water to water their doma trees.

In addition to water shortages there are also issues regarding water infrastructure. In Bhangtar (Phuntshothang Gewog), for example, terraced paddy fields often lack irrigation. According to one prominent business person in the community, lack of proper irrigation channels is "the most important" factor limiting rice production. "The climate is also almost the same as India's…so the reason why we are not able to do double cropping out here, like they do in India, is because we lack irrigation channels."

[54] Tshering Palden. "Without water for twenty winters". *Kuensel Online.* January 8, 2011.
[55] Information provided by Bhutan's Auditor General at the May 19, 2011 presentation of the Draft SJI Profile held at Deer Park Thimphu.

Currently, only 17% of the Bhutan's arable land is covered by irrigation facilities. The rest depends on rain. When it comes to paddy, irrigation can help double or triple the grain production. In some cases, however, it may not be feasible or sound to expand irrigation channels given some of the climatic changes already experienced. Changes in rainfall patterns and intensity, for example, have prevented some farmers even from planting their crops on time.[56]

System of Rice Intensification (SRI)

In Bhutan, different varieties of rice are grown in a wide range of elevations from subtropical lowlands (150 m) in the south up to as high as 2,600 m in the north. Samdrup Jongkhar produced 4.4 mT of rice (6.7% of Bhutan's total production) in 2009.[57] Agricultural scientists estimate that the productivity of the current system could be greatly improved by adoption of the System of Rice Intensification (SRI), seen as an important step particularly in those regions where rice productivity is a main concern for food security.

SRI has been endorsed by the National Organic Program (NOP) of Bhutan due to the successful results, particularly for small and marginal farmers, in yielding both economic and environmental benefits compared to the conventional method of cultivation. SRI is an organic practice that can be practiced under irrigated or rain-fed conditions. It does not involve chemicals and significantly increases rice yield, while reducing inputs. It reduces grain maturity time, and enables farmers to save seeds (80-90%), water (25-50%), and cost (10-20%). At the same time, grain quality improves, and there is increased pest and disease resistance and more tolerance for lodging and drought. Research has shown positive results in the application of the method to other crops as well.[58]

The *Field Extension Manual* produced by Karma Lhendup at the College of Natural Resources provides a step-by-step guide on the method of SRI. Because of its potential relevance to Samdrup Jongkhar and the SJI, this has been reproduced here in summary:

- Presoak seeds in water for 24 hours and incubate in rags for 24 hours before sowing in a well-drained, garden-like nursery in random or line sowing. This helps seeds to grow faster.
- When seedlings are at 2-3 leaf stage they are ready to be transplanted. Remove carefully along with soils to avoid trauma to root system. Carry seedlings to field and avoid damaging or drying out roots while transporting.

[56] Under the 10th Five-Year Plan (FYP), 101 km of new irrigation channels and renovation of the existing ones will be undertaken. This is supposed to increase wetlands under dry season irrigation from 40% to 70%. (Source: *Bhutan Today* and 10th FYP).
[57] RNR Census, Agriculture Statistics, 2009.
[58] Karma Lhendup. 2008. System of Rice Intensification (SRI) Method of Rice Cultivation: How to Produce More Rice with Less Inputs, Field Extension Manual. Faculty of Agriculture of the Royal University of Bhutan's College of Natural Resources. More information on SRI can be found at: http://ciifad.cornell.edu/sri/countries/bhutan/index.html.

- Transplant seedlings singly into a shallow depth (2-3 cm) in a slightly slanting position, without removing soil attached to root, into a well puddle and levelled field, not flooded. Space 25x25 cm between seedlings: this saves seed required and reduces the competition for nutrients, water and sunlight.
- After transplanting leave field moist but without flooding for at least 12-14 days. This allows seedlings to adapt to their new environment. SRI fields usually appear terrible for about a month, but after this they flourish.
- In a flooded rice field, plant roots die back due to lack of oxygen. SRI recommends a series of wetting and drying cycles until the end of the vegetative stage. This allows roots to grow well, saves water, and results in better root and plant growth.

Rainwater harvesting

In addition to water conservation methods and use of SRI, rainwater harvesting also seems to be an obvious solution to the lack of water, particularly in the winter months. Water could potentially be collected during the monsoon season for later small-scale use for cash crops and vegetable production. Consultations with Bunker Roy of Barefoot College with regard to rainwater harvesting are ongoing and there is a plan under way to build a model of an underground rain harvesting tank, made of concrete, at the Chokyi Gyatso Institute (the monastery) in Dewathang as well as at five community primary schools in Lauri Gewog as pilot projects. Other smaller scale rain harvesting systems can be developed (i.e. trenches and use of bamboo pipes) in order to conserve water and lengthen the growing season. It is intended to develop funding proposals for such rainwater harvesting systems during 2011–12.

In March/ April of this year, under the auspices of the SJI, twenty-two farmers and agriculture extension officers from Samdrup Jongkhar, plus the District Agriculture Officer and two representatives of the National Organic Program, visited a cooperative in Ranikhet, India, which specializes in value-added organic production. Low cost rain harvesting techniques in use there, in which rainwater is collected on hilltop ponds during the monsoon season and then channeled down to fields during the dry season, will be investigated to assess their transferability and adaptability to the conditions present in Samdrup Jongkhar.

1.3.2 Storing and drying food

Two kilometres from the town of Dewathang, women from Chennari sit near their drying shed hung with bright orange maize. Some is eventually ground into meal, some saved for seeds, some bartered for rice, some fed to the cows. Corn and other grains are also used to make alcohol (banchang and ara) and sold. Next to the shed, metal sheets are layered with drying pumpkin slices and piled high with beans—the pods are fed to the cows.

These women, who all agree they work harder than the men, are engaged mostly in growing maize. All the drying takes place during the winter months and the idea is to

store enough to last all year long. However, lack of dry storage facilities and very high levels of humidity in the summer months mean that the dried food must be consumed before it has a chance to spoil. Villagers in many communities say they are competing with the insects and humidity and have to consume the grains before they are lost. Many say this explains the high consumption of alcohol and the social patterns that evolved.

Woman and children from Chennari village next to drying shed, Dewathang Gewog

In the village of Bawani (Phuntshothang Gewog), paddy is stored in wooden boxes and kept inside the houses. Vegetables are cut and dry-stored. Dhal is dried, ground, and stored in a container. In Mantsang village (Orong Gewog) maize is harvested twice a year and the winter maize lasts up to 4 months. But the summer maize won't last longer than a month, say the villagers. They have been asking the government to provide them with "a machine to keep it cool."

In Martshala Gewog, villagers reported that rats were eating their stored products and so people are using zinc phosphate as poison. Weevils also cause storage problems, mainly in the lower altitudes. Villagers from Lauri and Serthi, as well as from other gewogs, reported maize being damaged by a black insect (yagpu).

Villagers from Gomdar village in Gomdar Gewog recognized that grinding the maize or turning it into flour and storing it in air-tight containers was one way to keep it longer:

"If we don't control ourselves and store the maize in a container, there will be a damage of 50%. The damaged maize can only prepare ara and feed cows." But grinding maize poses a challenge as well. Without machines, villagers in Gomdar village grind the maize in the traditional and time-consuming way: "using two stones (Rangthang) with one handle. It is all done manually, not mechanized."

Rice drying on tarps, Bhangtar, Phuntshothang Gewog

According to Kunzang Choden in her book on food in Bhutan, it was the "accumulation of food" in the form of grains, butter, salt and meat that was crucial for the survival and wellbeing of the people.[59] For many of the villagers interviewed during the field research the storage or accumulation of grains was a challenge, especially given the humidity and high rainfall during the summer months.

According to Dr. Vinod Kumar Bhatt and D.S. Negi, two of Navdanya's farmer trainers, it is possible to make storage structures to withstand the humidity and rain. Traditional grain containers can be constructed using local bamboo woven tightly into baskets and then covered with an animal dung/mud plaster. Also, pine cone powder and tumeric and chilli can be used as natural pesticides during storage of grains. Using this method, they said that 5-10 quintals[60] of grain in one drum could be stored inside the home. They also noted that food grains could be protected from insects by adding cedar shavings/powder, and that chili was also a deterrent to insects.

In February of this year, two experts in low-cost solar drying technologies visited Samdrup Jongkhar. These experts, who direct the Barli Development Institute for Rural Women in Indore, Madhya Pradesh, presented their work both to Polytechnic faculty and to villagers and farmers in Bhangtar and Dewathang, and they assessed conditions and potential needs for more extensive training. These technologies can potentially help overcome some major agricultural marketing challenges like poor transport and storage infrastructure, by drying vegetables and fruits for extended shelf life.

[59] Choden, Kunzang. 2008. *Chilli and Cheese. Food and Society in Bhutan*. White Lotus Press. Bangkok, p. 61.
[60] One quintal is equivalent to 100 kilograms.

It is anticipated that the Barli Institute's solar drying technologies will be incorporated into the curriculum of the Jigme Namgyel Polytechnic's new Centre for Appropriate Technology. In September–October 2011, the SJI sent six village women from Lauri Gewog and the JNP focal person for the new Centre for Appropriate Technology, Denten Zangpo, for two weeks training at the Barli Institute in Indore. The SJI Appropriate Technology Coordinator, Tshering Dorji, is presently drawing up a proposal for application of these solar drying methods in Samdrup Jongkhar.

Usually solar technologies are only thought of for lighting, but solar drying avoids the fossil fuels used in refrigeration and freezing systems and also works well in winter (see section 3.4.1 on Solar Drying of Fruits and Vegetables in the Chapter on Markets).

Maize storage in Wangphu Gewog

In Wangphu Gewog, the government provided a silo for storage of seed corn, which manages to keep insects at bay. However farmers are not interested in using it much, as it means mixing all of their corn together. Thus, they feel that if they had good seed, it will get mixed with the seed of poorer quality from others. The silo is currently sitting on the Gup's front porch and his family is using it to store their corn.

1.3.3 Crop raiding by wild animals

Elephant prints in paddy field, Bawani, Phuntshothang Gewog

Samrang, once the district's 3rd most populated gewog, has only 21 households today. The people who still live there—mostly Nepali-speakers—have no road access or electricity and their struggle with crop damage is reportedly the most extreme of all the gewogs in Samdrup Jongkhar Dzongkhag. Field research interviews indicate that the gewog once had roughly 500 households but, due to the exodus of nearly half the Lhotshampa population in the early 1990s, only the few households remain.[61]

Since so many people left the area, much of the land has been "left barren" and—based on news reports and personal communications with spokespeople—much of the area is now overrun by wild elephants, a problem that has become "endemic" according to one source. "Many houses are damaged by elephants and there is 100% damage to maize crops and 50% damage to all crops in general… The people are tortured day and night by elephants. After 5pm they shouldn't move from household to household, they should stay in their own houses." News reports indicate that 7 people from Samrang and one from a neighbouring gewog have been killed by elephants including a family of 4 who were trampled by elephants in their home in the early 1990s and 2 women who were attacked and killed in 2009.[62]

Crop raiding by wild animals has serious implications when it comes to food security in Samrang and elsewhere in the dzongkhag. "Of the 21 households living there [in Samrang], six do not cultivate paddy anymore, because of lack of irrigation water and elephants."[63]

[61] The field research team was not permitted to visit Samrang Gewog. Please see Appendix on Objectives and Methodology of Field Research for further details.
[62] Tshering Palden. "A gewog under siege". *Kuensel Online*. January 4, 2011. The article indicates that elephants can smell salt and often break into homes in search of it.
[63] Ibid.

According to an article that appeared recently in the *Kuensel*, one villager owns two acres of paddy but still needs to buy rice to feed his family: "If I reap all the crop, I can feed my family of four for a whole year and sell a little surplus too," he said. But lack of irrigation (due to a damaged channel) and raiding by elephants mean he cannot grow sufficient rice for his family, and so he grows dhal (lentils), millet, and ginger around his house to earn additional income to buy rice.

"We make a living with what we earn from selling ginger and dhal. There's no other way," he said. Another villager says "The gewog was once a vast spread of paddy fields and houses. Now it is turning back into a jungle."[64]

While Samrang's experience is perhaps extreme, crop raiding by wild animals was high on the list of obstacles facing all the villages visited during field research. Raiding by elephants, boars, monkeys, deer, rabbits, and porcupines was cited as one of the most challenging aspects of producing enough food in Samdrup Jongkhar. An overview of the crop raiding problem experienced by many of the villages visited is summarized below.

In Kopur, a village not too far from the town of Dewathang, the farmers say at one time the people used to use guns to scare away the animals (perhaps even kill them), but this is no longer allowed by the government or by the military, which set up here during the Assam crisis.[65] Wild elephants have been so problematic to farmers that some have abandoned their land.

For example, Rinzin Dorji, the principal of the Garpawoong Middle Secondary School said the 2 year old school—built by the Indian Government—occupies what was an abandoned farm field. Flat land is scarce in Dewathang—and this large, relatively flat field, seemingly ideal for cultivation, was constantly being raided by wild elephants and as a result was abandoned by farmers.

Similarly, in Khatithang village in Phuntshothang Gewog, villagers cited 85% losses due to wild animals—one of the highest reports of loss reported during our field research. In Richang village in Martshala Gewog wild boars and monkeys cause most of the damage, though monkeys were said to be the biggest culprits. Maize and potatoes were often damaged, with losses nearing 30%. Farmers spend their nights guarding the fields there and use traditional techniques such as shouting and making noise to fend off the wild animals. They also build bells with attached ropes and ring these during the times when animals are known to raid the crops. Boars were said to usually attack in the late night-early morning period, and monkeys generally from 9–10am.

---

[64] Ibid.

[65] Although killing was prohibited by the Forest Conservation Act in 1995, pressure from farmers has resulted in a partial reversal of the law. It is now legal to kill the intruder within the field limits. Endangered species (such as elephants) are an exception and remain protected. If a farmer is caught killing a wild animal outside her/his own field, (s)he will be charged with a high fine.

In Gotungma and Tishure villages, both in Martshala Gewog, farmers estimated that nearly 50% of their crops were lost to raiding animals. Wild animals damage every crop with the exception of ginger, villagers report. Deterrent methods include guarding crops at night and shouting to chase away the animals. However, because their fields are scattered and can be several kilometres away from their homes, protecting their crops is difficult. Villagers practice shifting cultivation and report that the human-wildlife conflict (HWC) has been growing worse over the years, which they attribute to changes in land use and possibly loss of the jungle that has reduced traditional wildlife habitat and forced animals into areas of human settlement.[66]

The Bhangtar Gup estimates that about 60% of the crops in that area are lost to wild animals. As far as deterrents, the Gup is aware of the alarm system being experimented with in a few areas, but he says that it works for boars and not elephants. He suggests that the government compensate people for their crops or that there could be crop insurance available, given the prohibitions on killing.

Villagers from Mantsang and other villages in Orong Gewog reported that deer used to be a key problem but that now the wild boar is the main problem. The boars are so destructive and bold that they even enter villager's homes: "Sometimes we just feel it is our pig," says one villager.

In the remote gewog of Serthi raiding by wild animals is also a serious impediment to producing sufficient food even for home consumption. One Serthi farmer, interviewed during the SJI Launch held in Dewathang, reported that 70% of crops in that region are damaged by wild animals: "We the farmers put in lots of effort and hard work but in the end the wild animals destroy the field in a second. The forestry people tell us not to disturb or kill wild animals but we hardly get enough for our own consumption." According to these villagers, wild animals used to damage only 25% of their crops, but since the law prohibiting the killing of wild animals came into effect, the problem has gotten much worse.

Currently, many studies are being done in order to understand the human-wildlife conflict, including the possible origin of the imbalance. For example, one of the natural predators of the wild boar, the wild dog, has been extirpated from some areas in Bhutan.[67] It is well known that predators play an important role in regulating prey species such as herbivours and omnivours, and help to maintain the health and balance of ecosystems.[68] According to one study, which conducted a nation-wide survey of the presence of wild dogs, found that with the exception of Trashigang, Samdrup Jongkhar, and Pemagatshel, all other dzongkhags reported a presence of wild dogs. The study went on to compare the

[66] Loss of habitat as a cause of the increase in human-wildlife conflict was also raised by Sonam Tashi, a Lecturer at CNR at the May 19, 2011, presentation of SJI Profile results at Deer Park, Thimphu.
[67] According to the study, approximately 37% of wild dog diet consists of domestic animals such as cattle and horses, but the other 63% is wildlife—about 58% of which is wild boar. Thus, overall, the wild boar makes up 36% of the wild dog's diet. Tashi Wangchuk. 2004. "Predator-Prey Dynamics: The Role of Predators in the Control of Problem Species". *Journal of Bhutan Studies*. 10, Summer: 68–89. http://www.bhutanstudies.org.bt/pubFiles/v10-7.pdf
[68] Ibid.

wild boar density with the wild dog density and found a negative relationship between increasing wild dog numbers and decreasing wild boar density.

In the early 1980s in Bhutan, wild dogs, implicated in the killing of livestock, were poisoned in a mass predator eradication program, and this resulted in an "explosion of wild boar." According to Tashi Wangchuk, author of the study, "though the wild boar continues to be the main enemy in Bhutan's agrarian societies, little is understood about the dynamics of this predator-prey system."[69] More study needs to be done on this important relationship, and particularly on whether the recolonization of wild dogs to Samdrup Jongkhar might help ameliorate the crop-raiding problem. According to Wangchuk: "The carrying capacity for wild dogs of the community is extremely low since they kill valuable livestock. Yet the positive role of the wild dog in controlling wild boars cannot be ignored. As the results indicate, wild dogs have a significant impact in reducing wild boar numbers."[70]

Pema Dakpa, from the National Post-Harvesting Centre in Paro, is currently working on an animal deterrent device to scare the wild animals. This device is being tested in Samdrup Jongkhar (see section below). The District Agriculture Officer is supervising this pilot experiment. Improvements of the device such as converting it into a wireless system are being studied with a view to covering a whole field area with sensors.

For now, fields are usually guarded in turns by women. Monkeys and porcupines come during the day and wild boars at night. In some cases, the whole family stays in the shafai (guard house) all night watching for wild animals. The scare methods consist in shouting and banging old steel utensils and tins bound on poles in different areas in the fields. Other attempts have consisted in clearing bushes around the fields, erecting numerous scarecrow-like objects, and building fencing using the best material available. However, these haven't had good results, and wildlife crop raiding continues unabated.

A pilot insurance scheme for livestock killed and crops destroyed by predators has been initiated. In response, compensation claims and raiding cases reported to the Wildlife Conservation Division (WCD) increased from 4 cases in 2002 to 113 in 2003 and 609 cases nationwide in 2004. There is some speculation that the sharp increase could be due to the incorporation of compensation programs and awareness, rather than an increase in actual cases.

Between 2003 and 2005, the division compensated farmers approximately Nu 4.3 million nationwide. However, in response to a funding shortage, the division shifted the requirements and compensated only for loss of livestock to tigers and snow leopards. Thus, between 2006 and 2008, a total of only Nu 178,750 was compensated to farmers for livestock losses—just 4% of total compensation to farmers for wildlife-related losses in the prior three years. Today, since the tiger is at the top of the food chain and in danger of global extinction, only animals killed by tigers are compensated.

[69] Ibid.
[70] Ibid.

The compensation amount in Bhutan has ranged from Nu 500 to Nu 9,500. High rates of compensation are not always beneficial. As an example, in Switzerland, farmers stopped looking after their sheep because the compensation for sheep killed by wolves was very high. In order to manage the claims more objectively and avoid abuse, the system in Bhutan is being decentralized, and power to make decisions has been given to the farmer communities.[71]

Crop damage by wild boars, Martshala Gewog

Crop raiding by elephants is a serious issue for farmers in the southern gewogs of the dzongkhag and, because these animals are not as easily scared off as other animals, a different approach is needed. The 2008 *Bhutan National Human-Wildlife Conflicts Management Strategy* announced plans to study the changing migration patterns of elephant herds in the region and develop a broad strategy accordingly.[72] Thus, any actions by SJI on this front will need to be undertaken in collaboration with the government agencies already working on the project.

Fortunately, experience in Assam, India—on the border with Samdrup Jongkhar—demonstrates that effective approaches to human-elephant conflict in the region can be developed if specific deterrent techniques are combined with a coordinated community-based approach to conflict mitigation. For example, in Sonitpur, Assam, the World Wildlife Fund (WWF) is currently working to help mitigate human-elephant conflict by helping to organize and train community-scale anti-depradation squads to reduce conflict with wild elephants by using non-violent means such as use of drums, firecrackers, and searchlights. The key to the program's success to date lies not in the use of particular deterrent techniques, but in the community-level organized approach, which reduces the burden on individual farmers.

[71] Personal communication with Royal Society for the Preservation of Nature (RSPN) by Tsering Om.
[72] Department of Forests. 2008. *Bhutan National Human-Wildlife Conflicts Management Strategy*. Ministry of Agriculture and Forests. Royal Government of Bhutan, Thimphu. Available from http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload5lv1595os.pdf

The SJI could contribute in the area of networking by making contact with such groups, and by assisting to bring in trainers from the WWF in Sonitpur, Assam, and other locations in India, to conduct training workshops on this community-scale approach with both local officials and farmers in affected areas in Samdrup Jongkhar.

When consulted on effective traditional methods to reduce the harm done by wild animals on crops, farmer trainers from Navdanya—Dr. Vinod Kumar Bhatt and D.S. Negi—concurred that coexisting with wild animals certainly did pose a challenge to food security, but that there were some traditional methods that might be effectively employed by Samdrup Jongkhar farmers.[73] They suggested the following:

- Planting cactus fencing at the perimeter of the field
- Planting undesirable crops at the perimeter of fields at a depth of approximately 4 feet to deter wild animals from entering cultivated fields
- Solar electric fencing to deter wild boars
- Spreading animal dung on crops
- Far-flung fields have to be protected by communal effort: They may need to rotate field watchers or hire people to protect those fields that are far away from homes.

Consultations with Navdanya farmer trainers are ongoing and will hopefully reveal additional methods of dealing with human-animal conflict that, over time, will reduce the magnitude of the present problem.

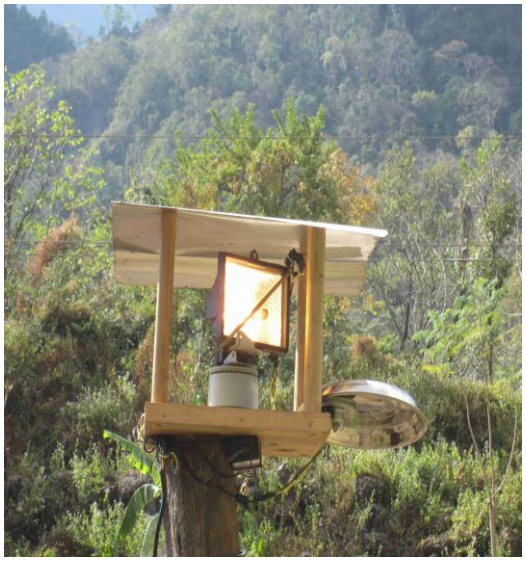
Animal Deterrents Piloted by NPHC[74]

In response to the heavy crop losses incurred by farmers throughout Bhutan as a result of crop-raiding by wild boars, the National Post-Harvest Centre (NPHC) has developed and tested a deterrent device aimed at reducing crop losses. It is comprised of of an electric horn and rotating spotlight which operate at irregular intervals, and they are mounted on poles in fields a short distance from the farmhouses. Farmers turn on the machine from the house for a few hours a day during peak raiding times, typically a few hours a day for a few months per year. The device can be fabricated for roughly Nu. 10,000.[75]

The device has been tested across the country since 2008, including in Samdrup Jonghkar in 2010. Nationwide, the results show a substantial reduction in crop loss, with 67% of respondents reporting no damage, and 33% reporting low damage during the trial period. There were, however, some issues of breakdowns, with 49% of respondents reporting a medium or high incidence of problems.[76] According to SJI field research interviews with

[73] Personal communication with Dr. Vinod Kumar Bhatt and D.S. Negi, by Linda Pannozzo, December 23, 2010.
[74] This section was provided by Luke Raftis.
[75] Pema Dakpa, Ugyen Penjore, Dorji, Thinley. 2009. "Design, Fabrication and Performance Evaluation of Wild Pig Repellent Device." *Journal of Renewable Natural Resources, Bhutan.* 5,1: 116 – 126.
[76] Ibid.

farmers in Phuntshothang and Orong Gewogs, there were 12 devices installed in Phuntshothang Gewog, and one in Orong Gewog. While the results were promising when the device was operating, the incidence of mechanical problems was high, as it was elsewhere, thus confirming the national results reported above. Furthermore, some Phuntshothang and Orong farmers reported a decline in deterrent effectiveness when the boars eventually got used to the device, after which damage increased again.



Animal deterrent device

The NPHC is planning to improve the device, equipping it with a motion sensor so it operates less frequently, thereby hopefully mitigating the problem of the boars becoming accustomed to the noise. Furthermore, there are plans to make a solar-powered model, which could be placed further from houses, as well as in non-electrified villages.[77] While the NPHC developed and tested the prototype devices, there is no long-term plan for broader implementation.

The NPHC plan is that some yet-to-be-determined organization could commercialize production, distribution, and maintenance. It is possible that Samdrup Jongkhar's new Centre for Appropriate Technology at JNP, proposed as part of the SJI, could be a highly suitable candidate to provide such animal deterrent production, testing, maintenance and distribution services, given the high degree of technical expertise available there.

Plans are already under way for the proposed new Centre to fabricate, produce, and test solar dryers for the dzongkhag at JNP, and to provide training in their use and maintenance. Indeed, provision of such production, testing, and training services on a nationwide scale might provide a self-funding mechanism for the new Centre and for the SJI and dzongkhag at large, which in turn would allow investment in new initiatives.

[77] Personal communication between Luke Raftis and Pema Dakpa, Deputy Chief, Post-Production Centre, National Post-Harvest Centre, Bhutan Ministry of Agriculture, February 18, 2010.

1.3.4 Soil fertility and erosion

"Establish a good relation with the soil and all your needs will be taken care of!"[78]

A major Food and Agriculture Organization (FAO) report on irrigation in southern Bhutan notes that much of the topsoil in the three Southern Zone dzongkhags it investigated (Samdrup Jongkhar, Sarpang, and Samtse) varies from light clays to sands.[79] Soil in the region is generally not very deep and often overlays gravel. The most common present method for increasing soil fertility is tying cattle in the fields and incorporating this cattle manure into the soil. In what certainly constitutes a major advantage from a sustainability perspective and transition to full organic production, it is noteworthy that use of chemical fertilisers is almost non-existent in the dzongkhag. This is discussed in further detail below.

During the field research interviews, farmers in many of the communities noted that production had declined over the years and they didn't know why. For example, one villager in Orong Gewog summarized the situation:

> There is a vast difference between the crops that were growing very well before and are not growing well now. Before all 9 seeds were grown here but now they are not. For example you could see our orange trees. Before we never used to do anything with the orange trees, they grew very well by themselves but now we are given lots of training and methods to guide the orange trees, and still they are not growing—oranges started dropping now. With maize, we never used manure before, and still it was growing excellently, but now even after inputting the manure and all, it is not growing well. Now everything is not growing well as it was before. We are wondering if it is the soil fertility that has gone down or if it is because of the varieties of seed that we are using. We really can't understand that. Production today compared to the last few decades, it has decreased 100%.

While it is not possible to state conclusively why production has decreased for so many farmers, it is possible that loss of topsoil due to lack of terracing coupled with cultivation on steep hillsides is a contributing factor. Lack of terracing also reduces the benefits of applying farmyard manure (FYM), as much of this will wash away during the heavy monsoon. For this reason, terracing methods were emphasized by Navdanya farmer trainer, D.S. Negi, during 2010–11 SJI farmer trainings. As well, in early April, following an 11-day training at the Navdanya farm in Dehradun, SJI took farmers from all 11 gewogs, as well as the dzongkhag DAO and three extension officers, to Ranikhet in Uttaranchal to observe effective terracing methods there. It is not yet possible to say whether improved terracing in Samdrup Jongkhar will help counter the production declines presently observed and reported by farmers throughout the dzongkhag.

---

[78] Quote by grandfather of Bhutan's Auditor General, as contributed by the Auditor-General at the May 19, 2011 presentation of the Draft SJI Profile study at Deer Park, Thimphu.

[79] Southern Zone Irrigation Development Reconnaissance Mission Report, United Nations Food and Agriculture Organization (FAO), March 2010. (on paper only) http://www.fao.org/

It is also worth noting here some relevant comments made by Bhutan's Auditor-General, who is originally from Dewathang. He says: "These days everyone thinks of milk as the purpose of raising cows." But the Auditor-General remembers a time when the main purpose of raising cows was actually manure: "Shit was more important than milk." Now, he notes, everyone wants Jersey cows, because they think only milk is important.[80]

According to the Renewable Natural Resources Census (2009), farmyard manure (FYM) or cow dung and chemical fertilisers are the two major sources of soil nutrient for crop production in Bhutan. Gasa Dzongkhag had the highest (91%) and Zhemgang the least (19.7%) proportion of households applying FYM. In 2008, 34.5% of households in Samdrup Jongkhar applied 1,237 MT of organic fertilisers compared to 64% of households in Bhutan overall. This Samdrup Jongkhar quantity corresponds to only 2% of the total FYM applied in the whole country. However, in terms of both total quantity and proportion of households, Samdrup Jongkhar farmers' use of organic FYM fertiliser still far exceeds their use of chemical fertilisers. Thus, 76 MT of chemical fertilisers were applied by a total of 10% of households in the district in 2008 (see Table 4 and Figure 2 below).[81]

When fertiliser use is analyzed by gewog, the are vast differences of which SJI must be cognizant if its farmer trainings are to be relevant and effective in different parts of the dzongkhag. Thus, according to the 2009 RNR Census, it appears that Serthi has the lowest percentage of households using organic fertilisers (0%) followed by Martshala (1.9%), Langchenphu (3%), and Dewathang (4%). In sharp contrast, Orong had the highest percentage of Samdrup Jongkhar households applying organic (farm yard manure) fertilisers to their fields (64%) followed by Phuntshothang (60%) and Gomdar (54%). In terms of chemical fertilisers (i.e. urea), only 10% of households overall in Samdrup Jongkhar apply these to their fields. But the highest using gewogs were Lauri (28%), Orong (15%), and Gomdar (14.7%) (See Table 4 and Figure 2 below).[82]

The fact that Orong and Gomdar farmers are among the highest users of *both* organic *and* chemical fertilisers appears to indicate that the issue has far more to do with use vs non-use of fertilisers altogether than with the organic vs chemical distinction. Again, the reasons for this must be carefully investigated and understood for the SJI farmer trainings to have optimal relevance, utility, and efficacy in different parts of the dzongkhag.

[80] Information provided by Bhutan's Auditor General at the May 19, 2011 presentation of the Draft SJI Profile study held at Deer Park, Thimphu.
[81] RNR Census, 2009.
[82] Ibid.

Table 4. Percent households and quantity of organic and chemical fertilisers used, 2008

Dzongkhags/Gewogs	Organic Fertilisers		Chemical Fertilisers	
	Households (%)	Quantity (MT)	Households (%)	Quantity (MT)
BHUTAN	**64.0**	**76,731.0**	**37.6**	**2,632.4**
SAMDRUP JONGKHAR	**34.5**	**1,236.8**	**10.1**	**76.2**
Dewathang	4.0	49.5	10.6	7.4
Gomdar	54.4	244.3	14.7	23.0
Orong	64.1	574.0	15.1	12.3
Langchenphu	3.0	25.5	0.6	0.1
Martshala	1.9	7.8	3.3	2.1
Pemathang	33.1	15.9	6.5	4.4
Phuntshothang	59.5	33.7	2.3	1.4
Samrang	40.0	11.1	0	0
Serthi	0	0	3.9	5.1
Lauri	34.2	170.7	28.4	16.3
Wangphu	50.5	103.3	9.7	4.2

Source: RNR Census, 2009, Table 5.

Note: Numbers have been rounded. 'Households' refers to % of total households in the dzongkhag, gewog, and country.

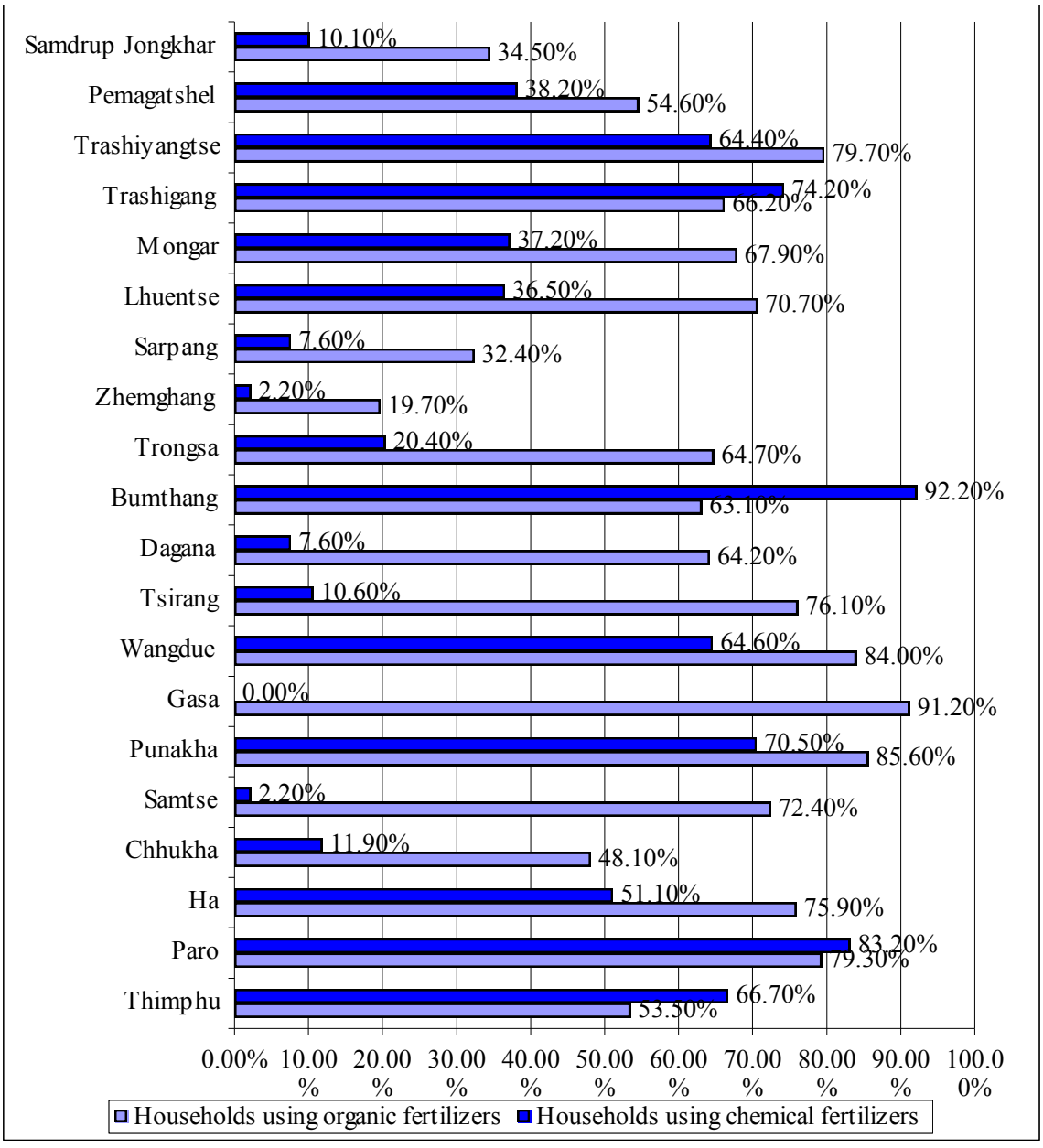
The data below support the field research conducted in Samdrup Jongkhar to date, which in turn helps explain *why* use of chemical fertilisers has been limited in Samdrup Jongkhar. Thus, village after village reported that at one time they did use urea, but observed that it resulted in the deterioration of the soil and therefore stopped its use. For example, village spokespeople from Langchenphu Gewog revealed that urea use had "hardened the soil" and, as a result, they no longer used it and were also advised by their Agriculture Extension Officer to use cow dung instead.

Villages in Gomdar and Wangphu Gewogs reported the same. One villager from Wangphu village reported: "Now we don't use urea—it is 5 years now since we used it. We left it because it makes our soil harder. During our first time when we used urea, production was very good. But coming to the next year, we could see production decrease, so we came to know that it is very harmful to our soil and we left it." In the village of Martang—a one hour walk from the road and within the Dewathang Gewog—villagers reported that they did use urea in the maize fields in the past but the Agriculture Extension Officer advised them to stop. They observed that with the use of urea, soil fertility decreased the following year. Now they say they use only cow dung, both fresh and dried, on their fields.

Given the very widespread and often increasing use of urea in rural India and elsewhere, along with concomitant soil damage and productivity declines, it is noteworthy that these Samdrup Jongkhar farmers were observant enough of soil impacts and intelligent enough to draw conclusions and act accordingly to cease urea use. This bodes well for Samdrup

Jongkhar's intended transition to fully organic production, and indicates that the worst impacts of urea-related soil quality decline may have been averted in the dzongkhag.

Figure 2. Percent households applying organic and chemical fertilisers by dzongkhag, 2008



Source: RNR Census, 2009.

In addition to the negative effects on soil quality, urea inputs also add to the costs of farming. According to Dr. Vandana Shiva, when the farmer buys his seeds, invests in machinery, and purchases inputs of fertilisers and chemicals, the cost of production can be 10 times more than what the farmer could ever earn from the produce itself. Dr. Shiva says that this doesn't happen immediately. Urea is a case in point: In the first year the farmer might use one bag of urea and get higher crop yields that fatten his initial profit margin, but in year two he will require 2 bags and so on to compensate increasingly for the ever more nutrient-depleted soil, and in an effort to maintain yields that the degraded soil itself will no longer support. In this way, farm input costs keep going up, she says, to say nothing of increasing unit prices for fossil fuel-based farm chemicals. Once the cycle of chemical addiction begins, she points out, it becomes increasingly difficult for farmers who have been lured by initial promises of higher yields to wean themselves off those chemicals.

Dr. Shiva notes that urea destroys the natural working of the soil—essentially killing the soil organisms that are the source of real soil fertility. As a result, the essential work of these organisms—to aerate the soil and enhance its moisture carrying capacity—is destroyed, resulting in soil compaction, and making the soil more sand-like. "The soil eventually loses its health, and so the impact of using more chemicals is having less and less benefit," she says.[83]

In some of Bhutan's most remote villages, farmers themselves, through keen observation, had noticed these negative changes to the soil after applying urea just one season—even though these initial impacts were relatively subtle, and in many cases decided to stop urea use even before being advised by the agriculture extension officer (AEO) to do so. This illustrates the value and importance of traditional knowledge and wisdom, and is a testimonial to the local rural insight and intelligence that can manifest in the absence of outside interference. By stark contrast, the Indian agriculture colleges, in which Bhutanese agricultural officials are often trained, are mostly dominated by Green (chemical) Revolution dogma that modern, high-yield farming is not possible without chemical inputs.

Dr. Shiva notes that organic alternatives do not trade off productivity gains. On the contrary, there are proven, effective, non-chemical organic methods that can substantially improve soil health by increasing the amount of organic matter in the soil. That, she says, will not only increase productivity, but in the winter months, when there is little rain, the soil will hold more moisture without any direct water inputs.

Please see Part 2 of this study where conservation and measurement of soil health will be discussed further.

The use of farm chemicals will be discussed further, and in considerably greater detail, in the chapter on Agricultural Diversity.

[83] From Dr. Vandana Shiva's four-hour presentation, meeting, and question and answer session with nearly 300 local Samdrup Jongkhar farmers, held at JNP, Dewathang, 17 December 2010.

Terraced paddy fields in Khoyar, Gomdar Gewog—a relatively rare example of terracing in the region.

Soil erosion was often raised as an issue during field research, and—given the ruggedness of the terrain in Samdrup Jongkhar Dzongkhag combined with the general lack of terracing and heavy rains (more than 5,000 mm/yr)—this is not surprising. The Tshokpa of Nainital village in Pemathang Gewog said that soil erosion and flooding were "the most dangerous natural calamities" in his village during the summer months.

According to the National Environment Commission, among all of Bhutan's 20 dzongkhags, Samdrup Jongkhar has the highest percentage of agricultural land on steep slopes (between 27.5 and 45 degrees and greater than 45 degrees), and that "agriculture on steep slopes is inherently risky" and can lead to "exacerbated land degradation" without proper water and soil management measures.[84]

In an attempt to impart good soil management practices, the AEO in Wangphu Gewog is encouraging farmers to terrace their land: "I told them, but they are so reluctant because you have to work a lot. The areas here are so slopy, it's very difficult to make terraces. So we are planning with the gewog administration to give them training on land management and nutrient management. So at that time, we'll try to train them about how

[84] Bhutan Environment Outlook, 2008, p. 21.

to make a terrace, and if they cannot, then we can say that there is live fencing—the planting of hedges between the fields so that nutrients are maintained in their field and the slope of the area can decrease."

Maize sparsely planted on un-terraced slope, Khoyar Pangthang, Gomdar

Ugyen Taujay is a retired forest ranger who lives in Samdrupgatshel, not far from Dewathang town. He says farmers in the area need to develop farming methods that protect the soil from erosion and increase land stability, and that this will help increase the living standards of the people here. "The rain is very strong and heavy," he says, "often washing away fertile soils." He also says a way to combat this problem is by planting trees and other plants that help to stabilize the soil. The root system of a grass species currently used to make the local brooms is also good for holding soils together, he notes—and he would therefore encourage the planting of these grasses. He also says that terracing the rugged farm fields would be beneficial—a practice not currently seen in the area.

Villagers in Martang (Dewathang Gewog) said they practice crop rotation due to poor soil quality, and they drew attention to the very heavy erosion that occurs in the monsoon season.

1.3.5 Build up of disease-pest pressure

In our field research interviews and observations, it quickly became apparent that, apart from the household kitchen gardens—which tended to grow a variety of foods for household consumption—*the* three dominant crops in the region were maize, paddy, and citrus. Research in the area of monocultures indicates clearly that varietal uniformity often leads to the build up of disease-pest pressure.[85]

> Monocultures are ecologically unstable, and that reason alone should be enough to NOT view them as essential to production. Monocultures invite diseases and pests…. The technology for breeding high yield varieties is therefore technology which breeds uniformity and threatens collapse in yields.[86]

According to Dr. Vandana Shiva, when farmers "stop growing ten things and start growing one thing", the implications for the farm can be serious. First of all, monocultures "become a feast for pests," often forcing farmers to resort to chemical pesticide use—which in turn leads to higher input costs. Shiva describes the "debt trap" that farmers in India have experienced by embracing chemical agriculture, leading eventually to ruin for many of them. She tells of the nearly 200,000 Indian farmer suicides over the past decade that have been directly linked to the unmanageable debt burden caused by purchases of seeds, chemicals, and machinery. She also notes that the only monocultures that get promoted are those of which there are already plenty, and this just brings down the price, which further reduces net farm income.[87]

In Samdrup Jongkhar, it still feels like there is time to make sure farmers don't take this chemical-dependent monoculture path that has proved so destructive elsewhere. However, there are also signs of trouble brewing: The diversity of crops grown in Samdrup Jongkhar is sharply decreasing, residents are increasingly dependent on low-priced chemically produced rice and other food from India, local farmers are complaining of declines in productivity, and the loss of crops due to disease or pest pressure is clearly on their minds.

One Dewathang farmer and shop-keeper has had trouble with his citrus and cardamom crops:[88] "I have a cardamom plantation. And still I have 600-700 orange trees in an orchard plantation. So we have this problem. I have lost almost all my cardamom. I have more than 15 acres of cardamom. I lost all 15 acres of cardamom. And not only me, all of

---

[85] Shiva, Vandana and Pandey, Poonam. 2006. *A New Paradigm for Food Security and Food Safety*. Navdanya. Systems Vision. New Delhi.

[86] Shiva, Vandana. 1995. "Biodiversity, Biothechnology, and Profits". In *Biodiversity. Social and Ecological Perspectives.* Zed Books. London, p. 47.

[87] From Dr. Vandana Shiva's presentation to and meeting with nearly 300 local farmers at JNP, Dewathang, 17 December 2010.

[88] Cardamom plantations across Bhutan have suffered considerable losses in yield due to diseases, both viral and fungal in nature. For more information on sustainable ways to grow cardamom in mountain regions, please see: Sharma G. 2008. "Traditional Knowledge Systems in Large Cardamom Farming: Biophysical and Management Diversity in Indian Mountainous Regions". *Indian Journal of Traditional Knowledge.* 8, 1: 17–22.

my friends. We had here I think, almost 100 acres of cardamom here in Dewathang. So every one of us has lost this cardamom. So now, when the experts visit us, we want to particularly know details about this. How we can re-manage our cardamom? With my oranges, I could not harvest for two consecutive years—last year and this year—because they're all getting dropped."

According to the Agriculture Extension Officer for Martshala Gewog, citrus greening disease afflicted many of the mandarin orchards this year (2010–11), and therefore the harvest was much reduced. To confirm the presence of the disease, officials from the NPPC analysed samples, and training for spraying was provided for the farmers. Like many other crops, citrus is plagued with a host of diseases caused by different etiological agents such as fungi, bacteria, viruses, and phytoplasmas. Of all diseases of citrus described to date, citrus greening disease, also known as Huanglongbing or Likubin in Chinese, is considered probably the most destructive and lethal disease affecting citrus.[89]

Citrus greening disease is easily transmitted and can quickly spread throughout an orchard, either by insect vectors or by propagating infected seedlings, and is both highly infectious and incurable. Once an orchard is infected, it can only be rehabilitated by clearing the infected trees and replanting pathogen-free healthy seedlings.[90] Citrus greening is caused by bacteria that can live in citrus trees and other hosts for up to three years before the first symptoms appear. The common symptoms include mottling on leaves, the fruits often being small, lopsided, and poorly coloured, and the juice being abnormally bitter. Citrus greening was first discovered in Bhutan in 2002 in Punakha, and has since spread widely through the land.

Except for the village of Wooling in Orong Gewog, where it was reported not to be a problem, citrus fruit drop also seems to be afflicting the entire region.[91] Typically farmers in Samdrup Jongkhar are advised to use pesticides such as Dimethoate (to kill the fruit fly) and Cypermethrin (to kill the shield bugs).[92] Cypermethrin is also used to combat case worm on paddy. Farmers are also counselled by the AEOs to collect and destroy fallen fruit, but many farmers do not follow through on this advice. In fact, in virtually all

[89] Tsai, James H. "Citrus Greening and its Psyllid Vector." University of Florida. From: http://ipmworld.umn.edu/chapters/TsaiGreening.htm. According to Tsai, early symptoms on a greening infected citrus produce a leaf yellowing on a single shoot or branch, which is descriptive of the Chinese name for yellow dragon. Infected leaves show a mottled or blotchy appearance at the initial stage of symptom development. The yellowing spreads to other parts of the tree, and dieback and rapid decline follow. At the advanced stage, the leaves are small and often display symptoms similar to zinc or manganese deficiency. Fruits from the infected trees are underdeveloped, unevenly shaped, and remain green—thus the name greening disease.

[90] Conference on Management of Citrus Greening and Virus Diseases for the Rehabilitation of the Citrus Industry in Asian and Pacific (ASPAC) Region. September 8-12, 2008. Sponsored by National Institute of Fruit Tree Sciences, Japan; International Research Centre for Agricultural Sciences, Japan; Plant Protection Research Institute, Vietnam; Southern Fruit Research Institute, Vietnam.

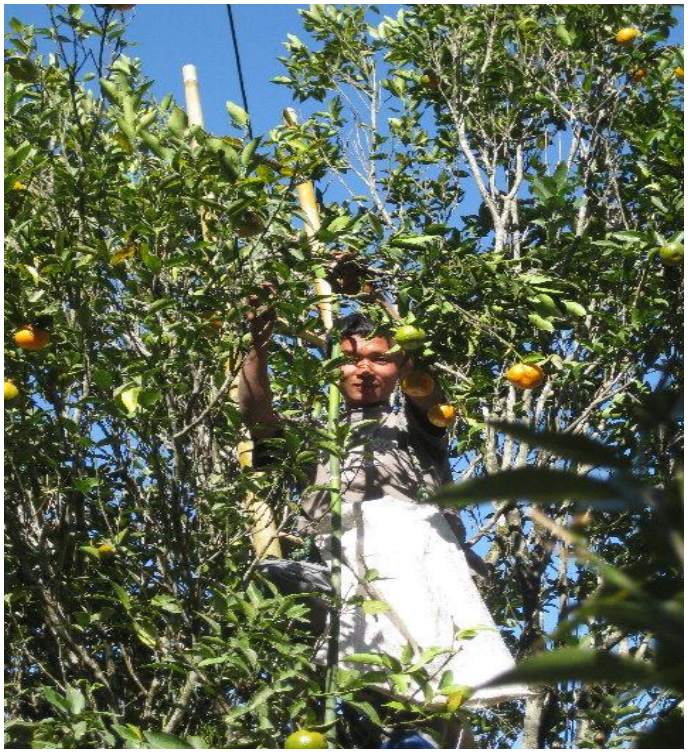
[91] It is unclear as to why citrus fruit drop has not affected the plantations of Wooling. Further investigation would need to be undertaken to ascertain whether the age or condition of the trees there differs from that of other areas.

[92] Based on personal communications with the Agriculture Extension Officer (AEO) stationed in Dewathang.

the villages we visited during our field research, collection of fallen oranges to reduce the fruit fly problem was not practiced, and the primary reason given was shortage of labour. There was also an awareness among those we interviewed that, unless all area farmers engaged in the collection of dropped fruit, the effort would likely yield negligible benefits.

Dewathang's AEO said she advised farmers that orange drop was also symptomatic of trees in poor condition, and that, in order to combat the problem, farmers also had to apply manure to their trees at the rate of 5–10 kg /tree /year for younger trees and 15 kg /tree /year for trees older than ten years.

One large citrus grower in Dewathang describes the decline. On 12 acres of land, he and his family grow two thousand orange trees—all between 20 and 30 years old—planted by his father. Over the years production has fluctuated, but lately, he says, the fruit quality has noticeably declined. The mandarins are smaller every year and the new leaves are smaller as well. He puts cow dung around the trees closest to his house and barn, but those trees that are far away don't receive any fertilisation. He also doesn't prune his trees. "Orange drop" has been a problem for him, as for so many farmers in the area—and it has affected the manured and non-manured trees alike. He says that only on one occasion he applied chemicals to the trees.



Worker picking fruit in large-scale orange orchard, Dewathang

On the day of our visit, in early December, this citrus grower had 12 labourers working for him, picking the ripe fruit. He says the picking will take about a month, give or take, depending on productivity. Finding labour, he says, is one of his biggest challenges. Because he can't find labourers to manure or prune his trees, he acknowledges that this could be leading to the reduced productivity. He points out some of the trees close to his home, laden with so many big oranges—trees that are also manured on a regular basis. Labourers come from villages nearby, but not many are willing to do this kind of work anymore, partly because the young people in the villages

who are physically able to do this work are leaving, and because the farmers who remain are getting old. Also, when he needs farm labourers, they are often engaged in their own farm work, and so are not always available.

These findings and farmer reports from our Samdrup Jongkhar field research are also supported by the Ministry of Agriculture's own data. According to data the Ministry has collected from farmers, citrus production in general is falling every year. Many citrus trees are dying and facing huge loss of fruits due to citrus greening disease, phytophthora rot, citrus fruit fly, and powdery mildew infestations. Other reported limitations to effective citrus cultivation, according to the Ministry, are poor input supply (seedlings, fertiliser, irrigation, agricultural chemicals), inadequate knowledge and skills that result in poor management of orchards, untimely harvesting of the fruits, poor handling and inappropriate packing, poor infrastructure (including inadequate road networks, collection centres/ packing houses/ grading facilities), limited access to credit facilities, and high losses during post-harvest handling (particularly storage shortage).[93]

Table 5 below indicates that the major citrus producing areas in Samdrup Jongkhar, in terms of total production, are Gomdar and Wangphu Gewogs, followed by Martshala. There were no data provided for Samrang, Pemathang, or Phuntshothang Gewogs.

Table 5. Citrus production and market in Samdrup Jongkhar, 2009

Gewog	Total Trees	Bearing Trees	Production (Kg)	Yield (Kg/tree)
Wangphu	39,696	20,964	884,091	42
Serthi	15,123	8,584	449,489	52
Orong	33,688	12,800	430,526	34
Martshala	49,308	18,588	760,245	41
Lauri	892	535	1,070	20
Langchenphu	15,176	1,680	329,280	196
Gomdar	34,791	26,550	1,035,450	39
Dewathang	29,986	11,133	252,093	23
Total Samdrup Jongkhar	**218,660**	**100,834**	**4,142,244**	**56**

Source: Department of Agricultural Marketing and Cooperatives. 2009. Citrus in Bhutan: Value Chain Analysis.

Results from a 2007 survey of 400 citrus farmers in Bhutan conducted by the Australian Centre for International Agricultural Research reveal the following:[94]

[93]Department of Agricultural Marketing and Cooperatives. 2009. Citrus in Bhutan: Value Chain Analysis.
[94] Australian Centre for International Agriculture Research. 2008. *Results of a Survey of Citrus Farmers in Bhutan 2007.* Australian Government. In 2007 a total of 401 surveys were administered in 11 of the 17 citrus growing districts in Bhutan, including Samdrup Jonghkar, where 20 citrus growers were selected by the District Agricultural Office to be surveyed. The study notes that "limited information was collected from several large production districts including Trongsa, Chhukha and Samdrup Jongkhar" and thus the

- A high proportion of citrus trees (32%) were considered to be past peak productivity (> than 20 years of age), with only 22% of trees younger than 10 years of age. In Samdrup Jongkhar, a similar pattern was observed, but with an even higher proportion of older trees: 47% of trees were >20 years of age; 30% were between 10-20 years; and 23% were less than 10 years of age.[95]

- Respondents with medium to larger plantations tended to grow their own seedlings for planting.

- Chinese citrus fruit fly was identified as the most important pest causing crop loss in citrus orchards, with 92% of respondents nationwide reporting fruit drop problems. Forty-eight percent of those respondents reported losses of between 10-30%, and an additional 31% reported losses of more than 30%. Additionally, a high percentage of respondents (66%) either did not spray their trees, with backyard farmers least likely to spray.

- Collection and disposal of fallen fruit (66% and 64% of respondents respectively) to help manage the Chinese citrus fruit fly is a common practice overall in Bhutan, but there were still high crop losses reported in some districts where respondents reported that fruit were disposed of by "being fed" to livestock. In Samdrup Jongkhar, however, less than 10% of respondents reported that they collect fallen fruit—confirming our SJI field research noted above, which also found that few Samdrup Jongkhar farmers collect and dispose of fallen fruit.

- Citrus greening disease (Huanglongbing) and the psyllid insect vector that helps to transmit the disease are present in some districts in Bhutan. The survey revealed that 42% of citrus farmers nationwide had little knowledge of this potentially devastating disease, and 68% knew nothing about the insect vector, which spreads the disease from tree to tree. The study revealed that in Samdrup Jongkhar Dzongkhag, knowledge about citrus greening disease appeared to be considerably lower than the national average.

- Nationwide, the survey respondents rated powdery mildew as the most important disease affecting citrus in Bhutan.

- Most respondents (78%) fertilised their citrus trees with organic fertilisers such as farm yard manure (FYM) and compost, with these fertilisers being most commonly applied in winter. Application rates in most cases (72%) were meeting recommended rates for FYM. The study notes that it would be beneficial to investigate the nutrient status of commercial citrus trees to assess the adequacy of these rates of FYM for the health and productivity of the trees and for the fruit quality.

---

report summaries for those districts may not represent the reality in these districts very well. This important caveat must be borne in mind when reading the Samdrup Jongkhar specific results that follow.

[95] Age data were based on a total of 5,165 trees in Samdrup Jongkhar. Ibid, Figure 4d.

- While the regular supply of water to citrus trees is important to ensure good tree growth, fruit set, fruit growth, and quality, fully two-thirds (67%) of respondents did not water their trees. For large farmers to water large plantations, they would require access to appropriate irrigation infrastructure and a supply of good water. Irrigation is critical to the production of citrus and is especially important in regions where the timing and amount of rainfall does not match crop water requirements.

It is hoped that ongoing consultations with Dr. Vandana Shiva's organic farmer organization *Navdanya* and the three farmer trainers from the Organic Farming Association of India (OFAI) who visited Samdrup Jongkhar for two weeks in February 2011,[96] will provide guidance on natural and organic methods that can be used to combat the citrus greening and orange drop problems currently plaguing citrus growers in Samdrup Jongkhar. Preliminary field observations by the OFAI visitors in Samdrup Jongkhar citrus orchards indicate that poor tree quality and lack of knowledge of simple protective methods, such as building small soil basins around the base of trees to retain water and nutrients, may be making many orange trees more vulnerable and less resilient to disease than need be the case.

1.3.6 Rural – urban migration and labour shortages

At 6% annually—amounting to 37,300 Bhutanese in 2009—Bhutan has the highest internal migration rate in all of South Asia with an increasing number of people moving from the rural areas into towns in search of what they believe to be a better life.[97] In 2005, 41% of the rural migrants to urban centres were women, and by 2007, almost a third of Bhutan's population was living in urban areas—a very dramatic internal demographic shift in a very short period of time. The main drivers of this movement are education and employment. The rapid growth of urban areas (i.e. Thimphu) has already created severe pressures on city services resulting in water shortages, lack of sanitation and waste disposal facilities, as well as a myriad of environmental and socio-economic concerns.

In his 2000 National Day Address to the Nation from Trashigang, His Majesty the Fourth King expressed his serious concern about the rural-urban migration trend:

> One of the serious problems we are facing today as a result of the rapid socio-economic development taking place in our country is the increasing trend in rural-urban migration. If all the people migrating to urban areas are able to get good jobs and earn a good livelihood we should all be happy. However, people migrating to urban areas are not able to find suitable employment and even then they refuse to return to their villages. If we do not make any effort to change this trend of large numbers of our villagers leaving to seek employment in urban centres, there is every

[96] These are Miguel Braganza, Ashish Gupta, and Vikram Rawat.
[97] In 2009, 37,300 people were migrants or 6% of the population. United Nations Development Programme. 2009. *Human Development Report*. Available from http://www.undp.org/hdr2009.shtml.

possibility that, within the next twenty years, most of our villages will become empty and even our ancestral homes and farms will be abandoned.

In line with the Fourth King's subsequent exhortation that steps *"must be taken to encourage our people to remain in their villages",* one of the key stated goals of the Samdrup Jongkhar Initiative is precisely to help reverse this rural-urban migration trend—particularly by creating good economic opportunities for young people in the region. Indeed, in launching the Samdrup Jongkhar Initiative and addressing the Samdrup Jongkhar community, Dzongsar Jamyang Khyentse's Rinpoche sounded themes almost identical to those expressed by the Fourth King:

> In our villages, even though we have enough to feed our children, the trend has set in where our youth want to go to Thimphu and to the urban areas. These days you can no longer say things like "you cannot go" and "you should not go." Why are our young ones wanting to go to the urban areas? Once they reach the urban areas, if they have no problems living a decent life, it is not a problem at all. But often they end up having no jobs, or if they get jobs, those jobs are not up to their expectations, and then they get exasperated and land up in a situation where they feel ashamed to go back to their homes and end up abusing drugs or drinking alcohol.
>
> How can we stem this flow of our youth to the urban areas? We cannot use force and threat. Within Samdrup Jongkhar and Dewathang, what are the things that we can do to create the enabling environment and conditions that will keep our young men and women here?

In addressing such major challenges, Rinpoche counseled Samdrup Jongkhar residents "to think long term." In fact, he said:

> We *have* to think long term. If we start now, if we begin our activities now and start now, then even if we are not able to accomplish our aims during our lifetimes, it is not a problem. If we start this plan and establish it now, then it *will* bear fruit in our children's lifetime. **If we don't do this now, it will be too late later.**[98]

Indeed, many of Rinpoche's initiatives and intended SJI actions are fully in line with His Majesty's specific recommendations to improve the economic viability of farming, to improve rural services, and "to boost economic activities in the rural areas."[99] Some specific SJI actions to date, such as the creation of the new Centre for Appropriate Technology at JNP and the organic farming and solar drying trainings, as well as future planned SJI actions like the Youth in Media project, the exploration of cultural tourism potential, and the creation of a Centre for Performing Arts are all designed to contribute to this effort.

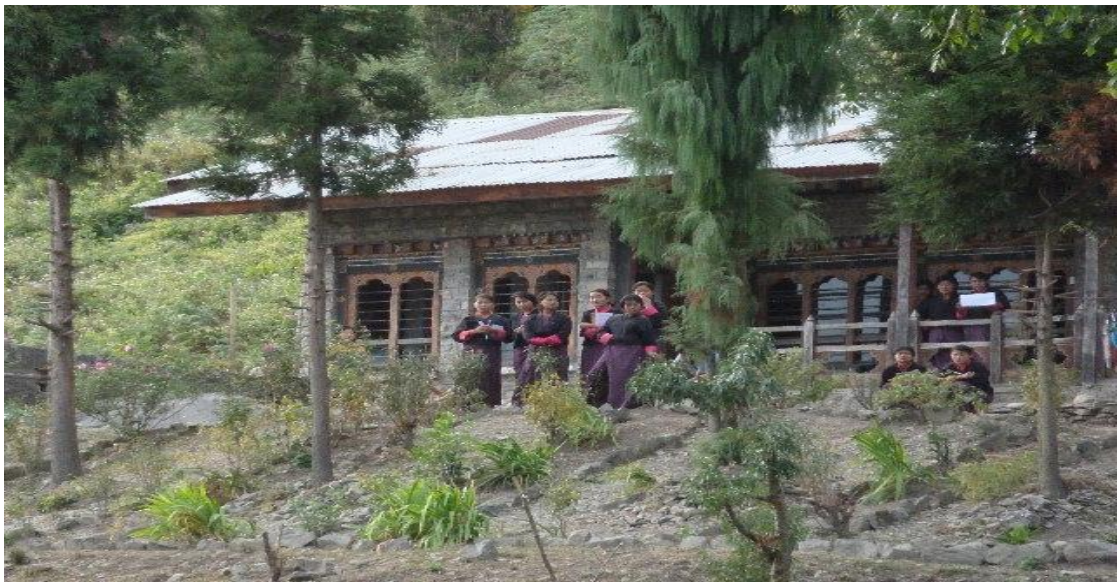
[98] Dzongsar Jamyang Khyentse Rinpoche, video-recorded address to the Samdrup Jongkhar Initiative Launch, 18 December, 2010, Dewathang, Samdrup Jongkhar

[99] His Majesty the Fourth King. 2000 National Day Address to the Nation. Trashigang.

In order for these and other SJI actions to succeed in stemming the current rural-migration tide, it is essential to begin with good baseline data on current rural-urban migration trends, and a comprehensive understanding of their causes. In this section, we are also especially concerned to note their impact on rural farming viability, about which the Fourth King had expressed particular concern.

Existing data show that 45% of migrants in Bhutan are between the ages of 16–30 years old, and 63% have at least a primary education. Migrants from rural areas make up 72% of urban dwellers.[100] As previously discussed, and aside from more general causes, there are also a number of agriculture-specific factors motivating people to leave the rural areas in search of what they think will be something better. For example, crop raiding by wild animals can be so devastating and disheartening that farmers abandon their fields and possibly even farming altogether in search of non-farming work in urban areas. According to Dr. Vandana Shiva, the increasing costs of production in farming—rising far more rapidly than farm gate prices and thus driving net farm income down—also add to the pressure to abandon fields and migrate.

During our field research, Samdrup Jongkhar villagers often expressed concerns about the loss of young people from their villages. Young people leave to further their education or go in search of jobs and, if they don't eventually find work, they may in some cases return to their villages of origin and help in the fields. But, according to the villagers, many of their young folk stay in the city even in the absence of satisfactory employment, and struggle to make ends meet, often getting into bad company. In fact, families who don't have employed children sending money back home tend to be worse off than in the old days, say villagers, because they have no replacement for their lost, youthful, and strong farm labour.



[100] Ibid. and 2005 Ministry of Agriclture "Rural Urban Survey" cited in *Kuensel Online*: http://www.kuenselonline.com/modules.php?name=News&file=article&sid=13779

Martshala M.S.S. School Students

According the World Food Programme, rural to urban migration has negatively impacted farm productivity in Bhutan:

> The emigration of younger portions of the populations from rural areas has left village homes to aging sections of the population. Total land holdings per household, which are already low, are expected to decline further because of land fragmentation…. Farm mechanization has the potential to enhance the economic efficiency of farms, alleviate farm labor shortages, reduce the drudgery associated with farming, and improve the image of farming, thereby reducing rural to urban migration. However, farm mechanization is limited by the rugged topography, small landholdings and lack of funds.[101]

According to the District Agricultural Officer for Samdrup Jongkhar: "Educated youth don't want village life." He says farmers are now averaging 60 years of age and very few young people are interested in carrying on the legacy of their parents.

In village after village the farmers were worried: "Our children never stay here after their studies. I think in the future when we get old, there will be no one left in the village." According to the Bhangtar Gup:

> Young people leave to go in search of jobs in the city, but many do not find the work they seek and end up as bag-carriers and waiters in hotels. Many high school drop-outs who have not finished school past Class 10, are not able to get a job, and this a major challenge…. The older people do not change with the changing times, but the younger generations have modern ways of thinking. They have a different attitude, preferring not to work in the fields.

Rural—urban migration, particularly of educated young people, presents an immense obstacle for farmers and agricultural development in Samdrup Jongkhar. The shortage of farm labour is one of the main reasons for leaving fields fallow. Indeed, as noted, one of the key objectives of the Samdrup Jongkhar Initiative is to stem the rural-urban tide by creating improved opportunities for the youth in the region.

During field research, questions were often asked to villagers about how they themselves thought young people might be attracted to remain in the villages, or at least to return once they've completed their education. Villagers from a number of communities raised ideas about creating vocational training in their communities or training centres where young people could learn skills, such as weaving or tailoring.

[101] World Food Programme. http://foodsecurityatlas.org/btn/country/access/livelihoods

For example, in the village of Thanchugoenpa, in Phuntshothang Gewog, villagers noted there were several excellent painters—as many as four—in the community. One of these painters had studied at a professional painting school in Thimphu for five years. One idea for training young people suggested by villagers might therefore be to sponsor a salary for these painters to teach area youth traditional painting. The newly trained young painters could then be hired to work on the new construction planned in the area and in other regional projects like the traditional paintings that will soon be required for the new temple at Chokyi Gyatso Institute in Dewathang.

The Gup of Dewathang suggested a weaving centre, an idea which was supported by villagers in many of the villages visited during field research. The Gup says this would help to retain youth while also supporting the traditional Bhutanese culture. His thought was that a weaving centre could also employ and train many of the women in the area to weave school uniforms for Bhutan's schools, and men could be employed as tailors. According to the Gup:

> So far most of the school uniforms are bought from India. We are just making them rich there. Why can't we talk with the government and make all the schools buy uniforms from here? We can supply them from here, and in this way there won't be any unemployment problem for the women. Regarding the boys, those who are school dropouts can work as tailors, and this way there will be lots of income for us.

Obviously, a feasibility study would need to be conducted to see if such a weaving and tailoring centre could be economically viable, particularly given the current low cost of school uniforms bought from India. However, this idea, along with others suggested by villagers and local officials, does merit serious study.

The Samdrup Jongkhar District Agricultural Officer said that the way to help remedy the rural-urban migration issue was to provide school agriculture programs to encourage young people who are educated to want to be farmers. "We now have five of these programs in schools: in Orong, Martshala, and Serthi," he said. Orong has the dzongkhag's only higher secondary school, and our own field research in Orong revealed that the villagers felt the school agricultural program there was very valuable, and that many of the students practiced what they learned at school in their own kitchen gardens when they returned home.

One business person in Bhangtar noticed in his community that there were a few young people who, after reaching Class 10, were not able to go further, either because of financial difficulties or because they didn't have the grades to qualify:"With them I was trying to do something creative, because there is one mill out here—it is an oil mill. So I thought of re-opening it. Things are quite damaged and I have to repair it, but at least I might be able to engage some of the younger villagers who are just roaming here and there without any work."

Young people in the village of Pangthang in Wangphu Gewog reported that what they want above all else is to find work. But staying in the villages was also desirable for some: If they were to stay back, these young folk said, they would be very beneficial to this area and to their villages. They would bring new agricultural practices. Some people are moving to urban areas, they acknowledged, but one young man said he sees remaining in rural areas as more beneficial. He remarked that he is watching all of his peers struggling to find jobs and places to live in the cities to which they have moved, whereas he has already settled down, established a home and an orange grove, and is happy with the security of living in the village. He says that eventually most of his peers will return to the village, and when they do, he will already be ahead of the game. For many young people interviewed, however, staying in the village and doing farm work isn't very appealing, as it's very hard work.

According to Bunker Roy, founder of Barefoot College in India, the way to reverse rural-urban migration is to never give a certificate. "As soon as you give someone a certificate, they leave the village," he says. When students graduate from Barefoot College they only become "certified" once they return and work in their village. In essence, certification happens when the newly acquired skills are put to actual use in the village. Roy also says that once men are trained, "they are ambitious and restless and compulsively mobile" and leave the village. For this reason, he said, he trains only women and particularly grandmothers. Roy argues that once you increase the living standard in the village, young people want to stay.[102]

In an attempt to deal with rural-urban migration and the consequent agricultural labour shortages, Bhutan recently asked for a new grant from the Japanese government. Last year Bhutan had received farm machinery from Japan—152 power tillers, 35 tractors, 77 paddy transplanting machines, 25 water pumps, 165 sets of plastic for greenhouses, and 85,000 seedlings worth 200 million Yen. Such machinery is intended to ease the burden of agricultural labour, cope with labour shortages, and improve farm productivity and economic viability.

According to a newspaper article, Bhutan's Secretary of the Ministry of Agriculture and Forests was quoted as saying: "In order to attract young and educated youth towards commercial farming and to address the concern over the dwindling farming community in Bhutan, farm mechanization is a key measure which has been made possible by such grants." The new 2KR aid grant (Second Kennedy Round—now known as the Japan Grant Assistance for Underprivileged Farmers) requested by Bhutan from Japan would be used for purchasing machinery and fertilisers as part of Japan's pledge "to help increase food crop production in developing countries where there are food shortages."[103]

---

[102] From presentation given by Bunker Roy, founder of the Barefoot College in Rajasthan, India.17 December 2010, JNP, Dewathang.

[103] Pushkar Chhetri. *Japan Considers another 2KR Grant to Bhutan*. Bhutan Observer. December 10–17, 2010. "The 2KR grant assistance for food security project for underprivileged farmers is an aid provided for purchasing agricultural machinery and fertilizers to help increase food crop production in developing countries where there are food shortages."

According to Dr. Vandana Shiva, mechanization has to be handled very carefully. She tells the tragic story of the Punjab, where farmers have taken their lives because they are still paying the debt for a tractor they purchased years ago. "Mechanization can be a curse if the farmer doesn't have the capital to buy it in the first place," she says.[104]

As previously noted, the use of fertilisers may increase productivity in the short term but will increase farm input costs, destroy soil quality and the natural functioning of soil ecology, and increase the requirement for such inputs in subsequent years. In light of this, the perceived benefits of such grants have to be weighed against the reality of higher farm input costs for subsistence farmers (e.g. for fuel and maintenance of the machinery and for future purchases of fertilisers) and of reduced soil quality.

According to Bhutan's Auditor-General, another reason why people moved away from Samdrup Jongkhar in the past is because of the Assamese insurgents who were in the district for 10–15 years until they were forcibly ejected by the Fourth King and the Bhutanese Army at the end of 2003. "People were scared to stay there and moved," he says. He also notes that because of the insurgents' presence, development activities that happened elsewhere in the country didn't happen in Samdrup Jongkhar, which therefore lagged in key dimensions of progress.[105]

1.3.7 Lack of labour-saving technologies

In Pangthang village in remote Wangphu Gewog, six villagers have formed a group whose name speaks for itself—the "Drudgery Reduction Group." At the moment the group is not functioning, but is eagerly awaiting the arrival of some labour-saving equipment. A mustard oil expeller, a maize grinder and rice huller are all being provided by the government, along with a technician, who will train the six villagers to use the diesel-run machinery. It's part of a pilot project aimed at reducing the drudgery of manual farm labour and improving farming efficiency. Once up and running, the group of six will provide services to the whole village of 75 households, and collect a small fee to run and maintain the equipment.

The use of machinery in Samdrup Jongkhar Dzongkhag as labour-saving technology is very rare. Data indicate that in 2008 fewer than 1% of the rural households in the dzongkhag used power tillers and other machinery as a means of cultivation, compared to 7.5% in Bhutan overall. The same low usage of machinery is true for Chhukha, Samste, Dagana, Mongar, and Trashiyangtse Dzongkhags. Nearly all farming households in Samdrup Jongkhar (99%) use bullocks to cultivate and till their land, compared with 88% in Bhutan overall, and 0.3% dig manually, compared to 1% in Bhutan.[106]

During field research, villagers often noted that labour saving technologies (i.e. tillers, harvesters, threshers, mustard oil extractors, grinders etc.) would make their lives much

[104] From presentation given by Dr. Vandana Shiva, JNP, Dewathang, December 17, 2010.
[105] Information provided by Bhutan's Auditor General, who is from Dewathang, at the May 19, 2011 presentation of the Draft SJI Profile study held at Deer Park Thimphu.
[106] RNR Census, 2009, Table 4, p. 16.

easier and help to keep the young people interested in farming. For example, in the village of Domphu (Dewathang Gewog), villagers grow 10 acres of mustard (local name is memba), used for both food and for extracting oil. "We don't have a machine, so we have to go to India to extract oil from memba, and it's a long distance," says one Domphu villager.

In the village of Rikhey (Dewathang Gewog) farmers complained of the fields being full of stones. According to one villager: "We think of doing more but we have lots of rocks and stones in this land. In Paro they have a machine to separate rocks. If the government could provide us with this machine, it would be beneficial for all of us. We want to grow betel nut also, but due to stones we are not able to grow it."

As part of the Samdrup Jongkhar Initiative, the Jigme Namgyel Polytechnic (the engineering school of the Royal University of Bhutan), in Dewathang, will become a regionally renowned Centre for Appropriate Technology, and a knowledge base for ecologically-friendly development in the region. The proposed new JNP Centre for Appropriate Technology, once established, will hopefully help to build simple machinery for villages—to process maize or extract mustard oil, and villagers could then be trained, under JNP expert supervision, to maintain and fix these machines /equipment.

Through working partnerships already established with India's Barefoot College in Rajasthan and its founder, Bunker Roy, and with the Barli Development Institute for Rural Women in Madhya Pradesh, the Polytechnic will also specialize in other low-cost village-level green technologies appropriate to rural areas. Other partnerships will also be established over time. These technologies, which will hopefully attract local youth interest in both the development and implementation stages, include solar energy, drying, and cooking; rainwater harvesting; sustainable building design; zero waste strategies including compost toilets; and organic farming methods.

JNP student projects that are part of the proposed new Centre for Appropriate Technology are intended to work with and directly benefit local villagers, and the new Centre will create direct and indirect employment opportunities for educated youth. It is hoped that this Centre will then function on an ongoing basis to assist villages with appropriate technological solutions as well as to provide training for villagers so they can maintain the technology themselves.

Bunker Roy noted three stipulations about introducing new technologies:

- Technology should not deny people jobs.
- Technology should not lead to dependency (i.e. people should be able to repair it themselves).
- Technology should lead to local control.[107]

[107] Presentation given by Bunker Roy, Founder of Barefoot College in India. Talk held at Jigme Namgyel Polytechnic, December 17, 2010, Dewathang.

For example, in Lauri Gewog, villagers reported that in 1999 the first solar drying unit for Chirata was provided for Zangthi village by a small UNDP-funded project. The drying unit was handed over to the community, but no one was given clear responsibility or training for its maintenance, and today the unit no longer functions. This example, all too common in Bhutan and in developing nations altogether, illustrates the challenges faced by the SJI and by the proposed new JNP Centre for Appropriate Technology. It is for the purpose of going into the field with eyes wide open, and to anticipate and avoid such pitfalls, that this initial research project and subsequent monitoring and documentation work, funded by IDRC, is intended.

1.3.8 Insufficient landholdings and barren landholdings[108]

In the village of Martang, about an hour walk from the road in Dewathang Gewog, land fragmentation is a problem. When the villagers first arrived there about 40 years ago it wasn't a problem, but at that time there were only seven households and now there are 25. As a result, the average landholding today is less than 1 acre.

According to the World Food Programme, the majority of farmers in Bhutan own a limited amount of land. About two in five households are landless and, not surprisingly, the proportion of landless households (82%) in urban areas is twice the national average. In rural areas, only one out of five households is landless. Although owning land is more common in rural areas, the area of land owned by rural households is usually not very large: seven out of every ten rural households own less than 5.0 acres of land, and only one out of ten rural households own more than 5 acres, with the remaining households being landless.[109] (Please see Figure 5 in Chapter 2 for more information on land holdings in Samdrup Jongkhar).

Interestingly, land ownership in Bhutan is observed to be inversely related with per capita expenditures. Less than half of the richest households own land, with only about one in twenty rich households owning more than five acres of land. By contrast, a very large proportion (85.5%) of the poorest 20% of households households own land, although nearly three-quarters (74.2%) of these poor households own less than 5 acres of land.[110] Further research is required to assess the reasons for this inverse relationship between land ownership and expenditures, but it is likely related to the higher proportion of wealthy Bhutanese who live in cities, and whose revenues may come from civil service or business income rather than from the land.

---

[108] Please see section on Crop Raiding by Wild Animals for further information on causes behind barren landholdings.

[109] At the SJI Profile presentation held May 19, 2011, at Deer Park, Thimphu, Sonam Tashi from the Royal University of Bhutan's College of Natural Resources (CNR) noted that the average landholding in Bhutan is only 3.3 acres and that some rural-urban migration is due to inadequate land availability. He says we need to ask "How many people can one acre of land support?"

[110] World Food Programme. http://foodsecurityatlas.org/btn/country/access/livelihoods Original data from the Bhutan Living Standards Survey, 2007.

In addition to insufficient landholdings, there is a problem of land being left barren. A nationwide study by the Ministry of Agriculture (MoA) found that 6,311 acres of agricultural land are owned by absentee landlords—a situation that is undermining the country's food security.[111] According to a 2009 *Kuensel* article, Sarpang, Dagana, Pemagatshel, and Samdrup Jongkhar have the highest proportions of absentee landlords. A MoA spokesperson said that absentee landlords are "being created" because of rural–urban migration, a shortage of farm labour, lack of sharecroppers, and human-wildlife conflict, as well as drinking water and irrigation problems.[112]

These issues were echoed in all the villages we visited in our field research. As previously mentioned, a number of problems plagued the farmers: crop raiding by elephants, boars and monkeys; water shortages and lack of irrigation for paddy; difficulties growing and storing food during the monsoon; lack of technologies to make farming easier; rural-urban migration; and insufficient landholdings, particularly for large families.

According to the Dasho Dzongdag of Samdrup Jongkhar, Phub Tshering, there are not enough statistics available about food security in the district. "Everything is imported from India," he says. He notes that one of the biggest problems in Samdrup Jongkhar and other eastern dzongkhags is that farmers are not able to cultivate all of their land because of wild animals and rough terrain "In the west [of Bhutan] land utilization is 100%," he says, "but in the east it is 50%—people have a lot of land, but on the ground they do not cultivate much."

In Bhangtar, where good quality rice is grown, the Gup noted that people often do not have enough land for paddy cultivation: "As part of the King's kidu process of giving land to the landless, each family was granted three acres to cultivate," he said. "However, this grant does not take into account the size of the family, and some large families with many children do not have enough land."

[111] Tenzing Lamsang. "Undermining Food Security". *Kuensel Online*. September 2009. http://www.kuenselonline.com/2010/modules.php?name=News&file=article&sid=13429
[112] Ibid.

Corn drying near Martang, Dewathang Gewog

Chapter 2. Agricultural Diversity

Good farmers know … that nature can be an economic ally.

— Wendell Berry[113]

A bad solution is bad because it acts destructively upon the larger patterns in which it is contained. It acts destructively upon those patterns, most likely, because it is formed in ignorance or disregard of them. A bad solution solves for a single purpose or goal… at exorbitant biological and social costs.

— Wendell Berry[114]

A monoculture chemical system is wrong any place in the world, but doubly wrong for Bhutan in year 2010.

—Dr. Vandana Shiva[115]

2.1 Benefits of biodiversity[116]

Agricultural production depends on a healthy, fully-functioning ecosystem. In other words, the production of food depends on the services nature provides for free, such as pest control, nutrient cycling, pollination, waste decomposition, soil formation, nitrogen fixation, bioremediation of toxins, and many others.

Biodiversity is defined as both the diversity of living organisms, and the interactions between those organisms. In order to understand biodiversity and its importance for maintaining ecosystems – including agricultural ecosystems – we need to study those organisms, and ascertain their numbers, their diversity, and their preferred habitats. We also need to understand and value the productive work they do, and how to encourage this work on farms. Biodiversity is the foundation upon which the earth's productive capacity is based. Humankind might be able to produce food with diminished biodiversity, but it would become a progressively more expensive enterprise – both financially and ecologically. Thus, when we evaluate progress in agriculture, we must also include evaluations of the state of biodiversity on farms.

---

[113] Berry, Wendell. "For Love of the Land A farmer and conservationist is tired of being on two losing sides." http://www.ruf.rice.edu/~cses/csessite/restricted/EreadDocs/for%20love%20of%20land.pdf.

[114] Berry, Wendell. 1981. *The Gift of Good Land: Further Essays Cultural and Agricultural.* North Point Press. p 137.

[115] From Dr. Vandana Shiva's four-hour presentation, meeting, and question and answer session with nearly 300 local Samdrup Jongkhar farmers, held at JNP, Dewathang, 17 December 2010.

[116] This section draws on materials from Scott, Jennifer, The GPI Soils and Agriculture Accounts, GPI Atlantic; available at www.gpiatlantic.org

To a limited extent and for short periods, ecosystem services provided freely by earth's biodiversity can be replaced by using purchased inputs of energy, built structures, synthetic fertilisers, pesticides, irrigation systems, and pharmaceuticals. On the one hand, these purchased inputs help to make agriculture more predictable, and may increase short-term yields. On the other hand, some inputs used to replace ecosystem services may be harmful both to biodiversity and to soil quality, thus reducing the capacity to generate further ecosystem services. This can create a spiral of increasing needs for inputs, and reduced capacity of agriculture to tap into 'free' services. That cycle, in turn, generally increases farm input costs, making farming less economically viable, and frequently spiraling farmers into debt. Depletion of ecosystem services, like any other critical resource, therefore, can be self-defeating, expensive, and ultimately reduce long-term net productivity and farm viability—even (or perhaps especially) when apparently temporarily compensated for by purchased inputs.

There are a number of ways to measure the biodiversity on farms, including counting the domestic and wild species that grow on a farm, the genetic diversity, and the quantity and quality of habitat. Habitat is an important indicator because it is relatively easy to measure, compared to listing and counting all of the organisms that live within the habitat. Thus, one way to assess the health of agricultural biodiversity is to monitor the homes or habitats of organisms we know are beneficial. In return, these organisms can be harnessed to provide ecosystem services for the farm – a remarkable symbiotic relationship.

Dewathang butterfly

Rather than looking at agriculture as an infringement upon wild, natural spaces, farms could be seen as reservoirs of habitat potential when efficiently and sustainably managed. Farmers, when they are effective stewards of the land, are providing habitat for thousands of organisms. Because farms are generally collections of crops, livestock, buildings, fields, ponds, streams, patches of trees, and woodland, they are ideal homes for many creatures. Agriculture can even *increase* the diversity of habitat types relative to other land uses, while still producing abundant food for human consumption.

Ecosystem services are the services, such as pollination, which organisms provide as they go about their regular business of living. For example, the bee obtains nectar from the flower, and the flower gets pollinated so it can produce fruit. There is usually some element of mutual benefit in these processes. For example, plants carry out a process of photosynthesis in order to grow, but at the same time produce oxygen that human beings can breathe. There is a *diversity of functional ecological roles*, and *beneficial ecological interactions* between species. The vast variety of ecosystem interactions between plants, animals, and micro-organisms maintains the *quality, relative stability,* and *habitability* of the environment by purifying and regulating air, water, and land resources – as well as by controlling climate. Ecosystem interactions play a role in the protection of water resources; the formation and protection of soil; the storage and cycling of nutrients; the breakdown and absorption of pollution; the maintenance of ecosystems' equilibrium (including controlling pests); and the recovery of ecosystems from unpredictable events. In addition, ecosystems provide *biological resources*, such as wild food, medicines, and wood products.

One way to assess the *value* of biodiversity is to place an economic value on the ecosystem services it provides to agriculture. If society does not explicitly value biodiversity, its services tend to go unnoticed in conventional systems of accounting. In fact, if we rely almost exclusively on economic growth statistics to measure our progress and prosperity, as we currently do, we could irreparably damage our own life-support systems without noticing the damage until it is too late. If, on the other hand, we value ecosystem services explicitly, then we know we are making progress when their value rises over time. If their value diminishes, then society and farmers have an early warning system in place that allows them to take remedial action before it is too late, and before irreversible damage occurs. If ecosystem services are not functioning properly, we know that we are losing our ability to sustain food production in the long run.

Farmers can choose to foster farm environments that allow them to take advantage of ecosystem services. Or alternatively, they can choose to purchase chemical and fossil fuel-based inputs that seek to replace the work done by beneficial organisms. Such input-based methods may produce higher yields in the short term, as manufacturers promise. However, the extra energy and costs required to implement these input-based solutions, as well as their negative impact on soil quality, may negate any temporary yield gains that result.

According to Vandana Shiva's *New Paradigm for Food Security*, sustainability in agriculture has two key dimensions (a) the sustainability of natural resources and (b)

socio-economic sustainability. Shiva writes: "Nature's economy includes biodiversity, soil fertility and soil and water conservation that provides the ecological capital for agriculture."[117]

According to Shiva, socio-economic sustainability relates to the "social ecology of agriculture, including the relationship of society to the environment, the relationship between different social groups engaged in agricultural production and the relationship between producers and consumers, which is invariably mediated by traders, government agencies and corporations."[118]

Shiva notes that while the true meaning of sustainability recognizes that "nature supports our lives and livelihoods," there is another understanding of 'sustainability' that relates to the market. That approach "involves maintaining supplies of raw materials for industrial production and long-distance global consumption." She says that when this meaning of 'sustainability' is used, markets grow at the expense of soils and rural communities.

Shiva and others have concluded that agricultural production that ignores costs to ecosystems and society measures growth in the market economy only—while "nature's economy" and the "people's economy" shrink. For example, the dominant conventional paradigm of production in agriculture pits diversity against productivity, and as a result "modern plant improvement has been based on the destruction of the biodiversity, which it uses as raw material…. Agricultural modernization schemes introduce new and uniform crops into farmers' fields and destroy the diversity of local varieties."[119]

Shiva also points out that monocultures become feasts for pests, and that farmers are then stuck with even more expenditures as they try to control and eliminate those pests. She notes that at times like these, with growing climate chaos and unpredictability in weather patterns, healthy biodiversity in agriculture means that a farmer might still have something to eat and sell even when extreme weather threatens one or more crops — while reliance on one crop would spell disaster.[120]

Table 6 below summarizes the types of land use and farm practices most relevant to biodiversity, and to the maintenance of habitats suitable for a wide variety of beneficial organisms. This Table provides a list of potential indicators of healthy biodiversity in agriculture. Table 7 below provides a sample of ecological services provided by such beneficial organisms. These tables are from the GPI Atlantic Soils and Agriculture Accounts, authored by Jennifer Scott.

---

[117] Shiva, Vandana and Pandey, Poonam. 2006. *A New Paradigm for Food Security and Food Safety. Navdanya. Systems Vision. New Delhi, p. 1.*
[118] Ibid.
[119] Ibid., p. 4.
[120]Vandana Shiva. Speech given at the SJI Launch, 19 December, 2010, Dewathang.

Table 6. Land use and farm practices that affect habitat

Land use that affects habitat	Habitat effect on beneficial organisms
Area of land in annual crops	Beneficial organisms are generally less prevalent and less active in annually cropped vs. perennial areas of the farm.
Area of land in perennial crops or pasture (uncultivated)	While pasture land is generally favoured by many beneficial organisms, high levels of nitrogen (N) fertilisation, herbicides, land drainage, and high-intensity grazing are all variables that tend to reduce species diversity on pastures.
Area of land that is not cropped or grazed	Hedgerows, forest groves, wetlands and riparian zones on farms are important habitat for predators of farm pests. Such predators include birds as well as a host of other species.

Farm practices that affect habitat	Habitat effect on beneficial organisms
Adding fertility to the land	Increases the activity of soil micro-organisms up to an optimal level of fertility. However, further increases in fertility past that optimal level may decrease the activity of these organisms.
Raising the pH of acid soils	Increases the activity of soil micro-organisms up to an optimal site-dependent pH level, but then decreases their activity when pH levels get too high.
Use of synthetic pesticides	Reduces abundance of soil micro-organisms.
	Faunal diversity (e.g. arthropods and birds) is negatively affected by organophosphate-based pesticides (used sometimes on livestock and arable crops), and anthelmintics (dewormers used in livestock). The anthelmintics leave residues in livestock dung that adversely affect dung-dwelling invertebrates.
Organic or biological farming	Density, abundance, and species diversity of beneficial birds and arthropods are significantly higher in organic or biological systems compared with conventional or integrated systems.
Crop rotation	Monoculture reduces the numbers of different species of soil organisms (richness), and may actually increase the organism count (abundance) of the fewer remaining species.
	Diverse crop mix improves bird species diversity.
Conservation tillage	Improves habitat for many soil invertebrates.

Table 7. A sample of ecological services provided by diverse beneficial organisms

Soil fertility & nutrient supply	
Service	**Detail**
Nutrient transform-ations	Proteins and related compounds are transformed by soil life to plant-useable nitrates and ammonium compounds. Similarly, sulfate is produced and mineral elements such as iron and manganese are kept relatively insoluble to prevent toxic accumulations.
	Soil micro-organisms mineralize soil organic phosphorous (P) for plants to use. The rate of P mineralization depends on microbial and free phosphatase (enzyme) activity. Phosphatases are produced by micro-organisms, plants, and earthworms. It appears that synthetic P fertiliser may reduce this living soil activity, while organic management enhances it.
Yield improvement	Introduction of earthworms will produce improvement in dry matter yield in pastures that previously had no earthworms. Earthworms also increase pasture production.
	Micro-organisms in soils produce numerous root-stimulating substances that behave as plant hormones and stimulate plant growth. Humus also can stimulate roots to grow longer and have more branches, resulting in larger and healthier plants.
Vesicular arbuscular mycorrhizae help crop productivity	Arbuscular mycorrhizal (VAM) symbiosis is widespread in roots of agricultural plants. It is believed to ameliorate plant mineral nutrition, to enhance water stress tolerance, and to contribute to a better soil aggregate formation, which is important for soil structure and stability and helps prevent erosion. It appears that synthetic pesticides may reduce AM activity, while organic management enhances it. Organic systems have measured increases in AM activity of 30-900% relative to conventionally farmed systems. Preliminary evidence shows positive yield effects of AM fungi.
	Roots that have lots of mycorrhizae are better able to resist fungal diseases, parasitic nematodes, and drought.
Nitrogen fixation	Nitrogen gas in the atmosphere cannot be used directly by crops without the help of rhizobium bacteria and free-fixing bacteria present in the soil.
Organic matter decomposition	Significant contribution of soil fauna and flora. Organic matter decomposition prevents unwanted accumulation of residues; releases nutrients for use by plants; and improves soil structural stability. (Without this vital process, food would have to be grown hydroponically – an expensive proposition.)
Soil formation and soil mixing	Earthworms and other invertebrate species bring between 10 and 500 tonnes per ha per year of subsurface soil to the surface, contributing an estimated 1 tonne per ha per year to the fertile topsoil layer. Under agricultural conditions, it takes approximately 500 years to form 25 mm of soil, whereas under forest conditions it takes approximately 1000 years to form the same amount of soil.
Composting – stabilizes nutrients, and reduces volume of material applied to fields	The major groups of organisms that help convert raw materials to compost are bacteria (excellent decomposers), fungi (highly effective in tackling woody substances), and actinomycetes (technically bacteria – they thrive in aerobic, low moisture conditions).

Regulation of pests and pathogens	
Service	**Detail**
Healthy crops	A diverse biological community in soils is essential to maintaining a healthy environment for plants. There may be over 100,000 different types of organisms living in soils. Of those, only a small number of bacteria, fungi, insects, and nematodes might harm plants in any given year. Diverse populations of soil organisms maintain a system of checks and balances that can keep disease organisms or parasites from becoming major plant problems. Some fungi kill nematodes and others kill insects. Others produce antibiotics that kill bacteria. Protozoa feed on bacteria. Some bacteria feed on harmful insects. Many protozoa, springtails, and mites feed on disease-causing fungi and bacteria. Beneficial organisms, such as the fungus Trichoderma and the bacteria Pseudomonas fluorescens, colonize plant roots and protect them from attack by harmful organisms. Some of these organisms, isolated from soils, are now sold commercially as biological control agents.
Pathogen control	In the process of decomposition, soils render harmless many potential human pathogens in waste and in the remains of dead organisms. Soil organisms produce potent antibiotic compounds, such as penicillin and streptomycin, manufactured by a soil fungus and a soil bacterium, respectively.
	Soils managed organically host a higher occurrence of fungi potentially antagonistic to plant pathogens than do conventionally managed soils.
	Earthworms remove plant litter from the soil surface (this can have pest/disease control effects particularly in orchards).
	Earthworms also quickly break down manure in pastures, recycling nutrients, and reducing fly reproduction sites and internal parasite larvae levels in grazing livestock.
Aerial insect pest control	A single bat catches an estimated 3,000 insects per night. Swallows catch insects in open areas. Yellow warblers catch all types of insects including those considered to be pests. Dragonflies and damselflies are major predators of mosquitoes, which prey on farmers. Downy woodpeckers consume large numbers of insects including corn borers. Flickers eat insects of all types and feast on grasshoppers in late summer. Habitats that harbour such diverse beneficial predators include forest groves and hedgerows.
Rodent pest control	Owls and hawks and other birds of prey that also depend on proximate forest habitat are valuable for controlling rodents
Biocontrol of crop pests	Approximately 99% of pests are controlled by natural enemy species and host plant resistance. Each insect pest has an average of 10-15 natural enemies that help to control it.
	A full-grown ladybird beetle larva can consume about 50 aphids daily. An average female will eat at least 2,400 aphids before she dies.

Maintenance of water quality and quantity	
Service	**Detail**
Improved water infiltration in soil and erosion prevention	Erosion-prevention effects of the soil biota include improvements in soil aggregation, prevention of surface crust formation, and increase in water infiltration capacity. • Introduction of earthworms has produced a 100% improvement in the rate of water infiltration in pastures that previously had no earthworms. • By contrast, chemical elimination of earthworms has doubled the amount of annual runoff from a 13^0 slope.
Hydrological cycle maintenance	This function of maintaining the water table, slowing percolation of precipitation, filtering wastes before they get to water bodies, water purification, and transpiration is provided by a host of plants and organisms.
Resistance to drought stress	Studies found that species-rich pasture production dropped by 50% during a drought, compared with a 92% drop in production in species-poor pastures.
Species indicate health of the environment	In many places, the numbers of amphibians have undergone dramatic reductions during the 1990s. Practices such as draining marshes and meadows, and cutting forests often result in a loss of amphibian habitat. Acid rain and other types of pollution also reduce breeding success. Amphibians live both on land and in water. They have a moist, permeable skin and quickly respond to changes in the quality of air and water. Amphibian populations are excellent indicators of environmental stress and should be monitored with care. Examples of amphibians include frogs, toads, and salamanders. Maintenance of wetlands and riparian zones on farms provides habit for such amphibians.
Degradation of chemical pollutants	Biological treatments, which use microbes and plants to degrade chemical materials, can both decontaminate polluted sites (bioremediation) and purify hazardous wastes in water (biotreatment). Biological methods are often more effective than physical, chemical, and thermal methods, because they convert the toxin to a less toxic or inert substance—rather than transferring the pollutant to a different medium.

Other Ecological Services Associated with Biodiversity	
Service	**Detail**
Pollination	Pollination by a host of different organisms is very valuable. Although many major crops are self- or wind pollinated, others require and benefit from insect pollination to increase quality or increase yields.
Wild food	Food gathered from non-cultivated species such as berries, fiddleheads, forest tubers, ferns, seaweed, maple syrup, and various non-wood forest products can contribute significantly to our diets, and to national income.
Pharmaceuticals from plants	In the U.S. pharmaceuticals from plants have an estimated value of $20 billion (1997 US dollars) (equivalent to $27.4 billion in Canadian dollars). Bhutan is known for its rich variety of medicinal plants, which are key components of the country`s biodiverse plant life.
Medicinal benefits to livestock	A diversity of vegetation in pastures can be helpful to livestock that selectively graze certain plants for their medicinal benefits and/or mineral concentration.
Maintenance of soil structure	Soil organisms produce sticky substances that help bind soil particles together, stabilizing soil aggregates, and thus contributing to good soil structure. A good soil structure increases water filtration into the soil and decreases erosion.
Carbon sequestration	Conversion of cultivated land to productive permanent pastures results in ~ 176 tons of $C0_2$ being removed from the atmosphere and stored in soil per ha—a significant contribution in an era of climate change, and one that has direct economic value as a carbon credit under the Kyoto Accords.

Sources for Tables 6 and 7: Scott, Jennifer. Soils and Agriculture Accounts. GPI Atlantic.

2.2 Crop diversity in Samdrup Jongkhar

2.2.1 Overview

Bhutan is largely an agrarian country and agriculture remains the main source of livelihood for its citizens despite the fact that only 8% of the total land area is used for cultivation. According to the National Statistics Bureau, in 2008 agriculture contributed 9% to the national GDP, down from 11% in 2004. In Bhutan, agriculture also provides employment for 65% of the labour force.[121] The economy of Samdrup Jongkhar is based overwhelmingly on subsistence agriculture, with agriculture accounting for 83% of the cash income of rural households in 2008.[122]

Samdrup Jongkhar is classified as part of Bhutan's Wet Subtropical Zone, which has the lowest altitude, warmest weather, and most rainfall in the country, averaging between 3,900-4,600 mm per year (though Samdrup Jongkhar itself averages 5,300 mm/year).[123]

[121] Statistical Yearbook 2009. National Statistics Bureau. Table 14.1. This does not include livestock.
[122] RNR Census, 2009.
[123] Statistical Yearbook 2009. National Statistics Bureau. Table 5.6. Range is based on rainfall amounts measured at existing stations in Airong, Dechenling, and Dewathang in 2008. According to http://www.samdrupjongkhar.gov.bt/ the average annual rainfall is in Samdrup Jongkhar is 5,309.4 mm.

Shifting cultivation (Tseri, or 'slash and burn') and pastureland (Tsamdrog) are the primary agricultural land uses in the Wet Subtropical Zone.[124]

Typical hillside farm, Mantsang, Orong Gewog

Of the roughly 36,000[125] people who live in the dzongkhag, 71% live in the rural areas and 29% live in the urban areas. Samdrup Jongkhar has 12,531 ha of arable agricultural land, of which the vast majority (80%) is classified as dry land, and about 16% as wet land and 3.4% as orchards.[126]

Cereals and horticultural crops predominate—cereals are cultivated on both wet land (irrigated) and dry land, while horticulture (i.e. vegetables, pulses, spices, oilseeds and fruits) is produced exclusively on dry land (i.e. land that is only rain fed).

Wet lands are terraced fields traditionally irrigated and used mainly for paddy cultivation. Dry lands are characterized by steeper slopes and mostly occur where the scope for irrigation is poor. This category of land is primarily used for growing food crops such as maize, wheat, buckwheat, millet, and horticulture crops. Another important category of

[124] RNR Sector Tenth Plan (2008-2013).

[125] According to Bhutan's Auditor General, this population figure is based on where people are registered as living for Census purposes. He says that in reality the number of people who actually live in Samdrup Jongkhar is much lower. Information provided at the May 19, 2011 presentation of the Draft SJI Profile study held at Deer Park Thimphu.

[126] At the national level, data from the RNR Census revealed that, in 2008, wet lands accounted for 21% (or 19,521 ha) of the total agricultural land holdings of 94,903 ha, and were owned by 52% of the rural households; dry land accounted for 69% (65,665 ha) owned by 86% of the rural households, and orchards accounted for 10% (9,714 ha) owned by 17% of the rural households.

land is “orchard” (or “cash crop land”) and is exclusively used for fruit production. Agricultural production is generally limited by the landscape—much of which is both steep and rugged.[127]

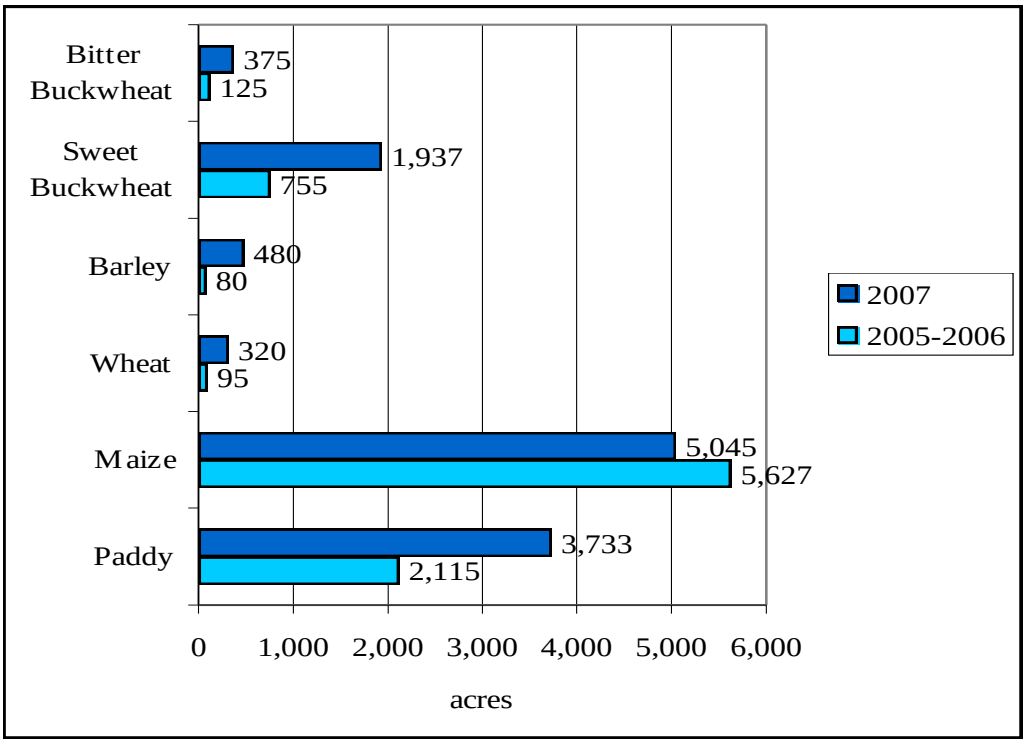
The most commonly grown crop in Samdrup Jongkhar is maize, followed closely by rice paddy (See Figure 3 below). As double-cropping is possible due to the warm climate, many farmers do double-crop maize.[128] Wet lands are primarily utilized for rice paddy production. Other agricultural land uses in the region include nut and citrus orchards, livestock (cattle and poultry), and dry land farming including pastures, crops such as cardamom and ginger, and tree crops.[129]

Figures 3 and 4 below illustrate the dominance of the maize and paddy crops both in terms of the area dedicated to growing them and the yield (kg/acre) of these cereals, when compared to the other crops. It is noteworthy that Figure 3 indicates a sharp increase in the area of rice paddy and other cereals, and a contraction in maize area (though maize still remains the dominant crop). This may reflect changing consumption preferences for rice over maize. Note that in 2005-2006 there were data for foxtail millet (170 acres grown), finger millet (465 acres grown), and mustard (230 acres grown). However, 2007 data for these crops were not readily available, so it was not possible to make any comparisons or to assess trend lines for these crops.

As can be seen in Figure 4 below, in 2007 paddy and maize have the highest yields compared to other cereal crops grown in the district. Data from 2005-2006 indicated that there was also some foxtail millet (260 kg/acre), finger millet (31 kg/acre), and mustard (341 kg/acre) being grown. However, as previously stated, 2007 data for these crops was not readily available.

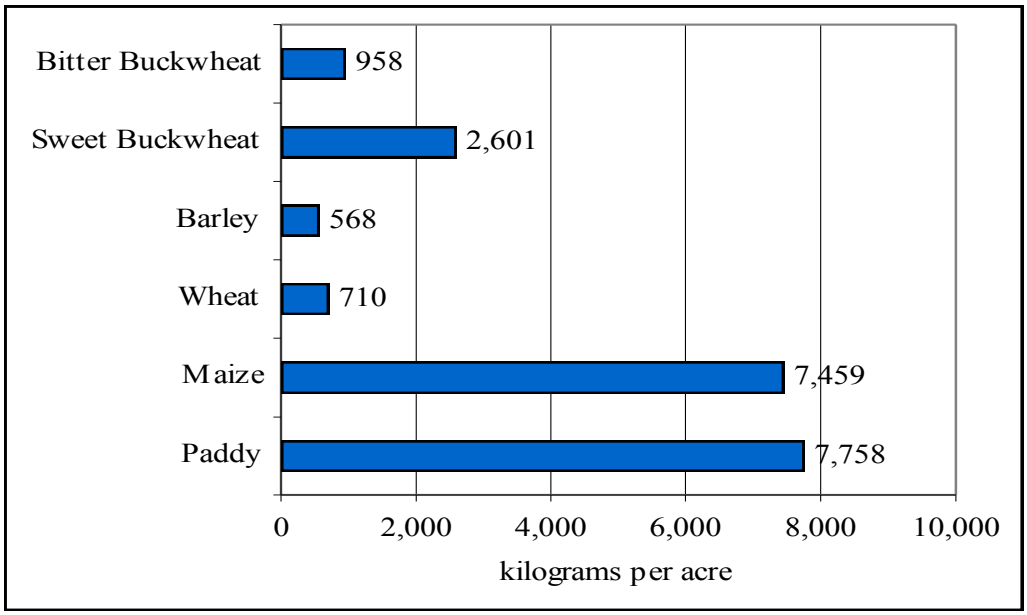
[127] RNR Census, 2009.
[128] According to Bhutan’s Auditor General, it is possible to double crop many types of crops, but this is no longer done. He says this practice should be re-introduced, and that crop rotation can be very beneficial in contributing to soil fertility.
[129] Statistical Yearbook of Bhutan. 2009. Agriculture section. National Statistics Bureau.

Figure 3. Area of cereal crops grown, Samdrup Jonghkhar, 2005–2006 and 2007



Source: Dzongkhag Agriculture Sector, 2009; Dzongkhag Agriculture Sector, 2006.

Figure 4. Yield of cereal crops (kg/acre), Samdrup Jongkhar, 2007



Source: Dzongkhag Agriculture Sector, 2009

According to RNR 2009 Census agriculture statistics for 2008, the most important vegetable production in Samdrup Jongkhar was potato (1,443 mT) followed by spinach (365 mT), radish (356 mT), chilis (265 mT), pumpkin (154 mT) and onion (70 mT). Other vegetables grown in the district are tomato, cabbage, broccoli, squash, carrot, cauliflower, turnip, and asparagus.[130] However, their production is very minimal.

In terms of spices, in 2008, Samdrup Jongkhar produced 11% of Bhutan's ginger (332 mT), 5% of the garlic (102 mT), and 2% of the cardamom (17 mT).

In 2008, Samdrup Jongkhar produced 9% (372 mT) of the nation's areca nut (bettlenut), 10% of the peaches (100 mT), 6% of walnuts (20 mT), 7% of bananas (162 mT), 11% of mandarins (4,048 mT), 2% of pears (21 mT), 4% of mangos (27 mT), and 4% of plums (16 mT). Other fruits present in the region are apple, passion fruit and persimmon. However, their production is very low.

Table 8 below presents the 2009 crop data for each gewog in Samdrup Jongkhar. It illustrates which cereals, vegetables, pulses, and oilseed crops are grown in each gewog as well as the types of fruit-bearing trees that are present. It should be noted that Samrang has the least number of crops or fruit-bearing trees. While the reason for this has not been investigated for this study, it is likely related both to the very small population remaining there (21 households) as well as the severity of crop raiding that these households experience.[131]

According to the RNR 2009 Census, in the dzongkhag as a whole, 98% of Samdrup Jongkhar households own land, although this percentage is much higher than that from the 2005 Population and Housing Census of Bhutan and the 2007 BLSS.[132] The RNR 2009 Census also reports that in Samdrup Jongkhar: 33% of households own wet land, 87% own dry land, and 24% have orchards. Approximately 27% of the rural households own between 3 and 5 acres of land, 24% between 1 and 3 acres, 24% between 5 and 10 acres, 18% less than one acre, and 8% own more than 10 acres (see Figure 5 below).

[130] Renewal Natural Resources (RNR) 2009 Census, Ministry of Agriculture & Forests, 2010. http://www.rnrstat.bt/csbhutan/index.asp?cont=ShowItems.asp&catid=8&type=doc

[131] The issue of crop-raiding by elephants in Samrang is discussed in more detail in Chapter 1 (Food Security) under the sub-heading of *Obstacles to Achieving Food Security.*

[132] RNR 2009 Census. *Op cit.* Table 15. However, data from 2007 BLSS, as reported in Section 1.3.8 above, show that about 63% of households in Bhutan own land, including 82% of rural households, and data from the 2005 Population and Housing Census of Bhutan (PHCB) show that about 65% of households in Bhutan own land. In Samdrup Jongkhar, the PHCB shows that 68% of households own land. Reasons why the RNR Census data are so much higher than data from the other two surveys are not known.

Table 8. Crops and fruit-bearing trees grown in Samdrup Jongkhar by gewog, 2009

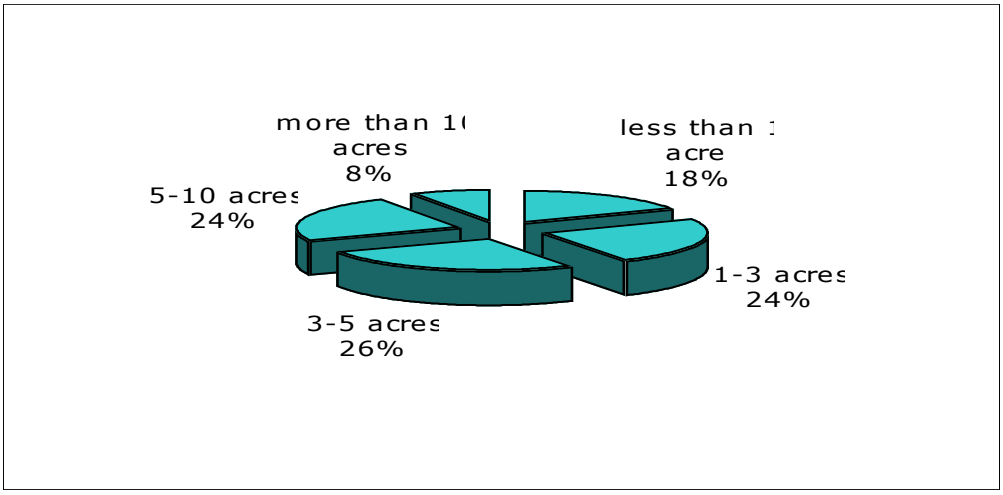
CROPS GROWN Cereals Pulses Oilseeds Vegetables	Gewogs in Samdrup Jongkhar										
	Dewathang	Orong	Wangphu	Phutshothang	Pemathang	Martshala	Samrang	Gomdar	Langchenphu	Serthi	Lauri
PADDY	√	√	√	√	√	√	√	√	√	√	√
MAIZE	√	√	√	√	√	√	√	√	√	√	√
WHEAT					√	√					√
BARLEY			√			√		√			√
FINGER MILLET	√			√	√	√		√	√	√	√
FOXTAIL MILLET		√	√		√			√		√	√
SWEET BUCKWHEAT	√	√	√	√		√		√	√	√	√
BITTER BUCKWHEAT		√	√						√	√	√
RAJMA BEAN	√	√	√	√				√		√	√
MUNG BEAN			√	√	√	√		√	√	√	√
SOYA BEAN		√	√	√				√	√	√	√
OTHER BEAN	√	√	√	√	√			√	√	√	√
MUSTARD	√	√	√			√		√	√	√	√
GARLIC	√	√	√	√	√	√		√	√	√	√
ONION BULB	√	√	√	√	√	√		√	√	√	√
GINGER	√	√	√	√	√	√	√	√	√	√	√
ASPARAGUS	√			√					√		
CARDAMOM			√			√		√	√		
CHILI	√	√	√	√	√	√		√	√	√	√
CHILI DOLAY		√	√		√	√					√
CABBAGE	√	√	√	√	√	√		√	√	√	√
CAULIFLOWER	√	√	√	√	√	√		√		√	√
CARROT		√	√	√	√	√		√	√		
RADISH	√	√	√	√	√	√	√	√	√	√	√
TURNIP	√	√	√	√	√	√		√			√
BEANS	√	√	√	√	√	√	√	√	√	√	√
PEAS	√	√	√	√	√	√		√	√		√
TOMATO	√	√	√	√	√	√		√	√	√	√
POTATO	√	√	√	√	√	√		√	√	√	√
EGGPLANT	√	√	√	√	√	√		√	√	√	√
GREEN LEAVES	√	√	√	√	√	√	√	√	√	√	√
BROCCOLI	√	√	√	√				√		√	√
CUCUMBER	√	√	√	√	√	√	√	√	√	√	√
PUMPKIN	√	√	√	√	√	√	√	√		√	√
SQUASH	√	√	√	√	√	√		√	√	√	√
OKRA				√							
GOURDS		√	√	√	√			√		√	√
WATERMELON				√	√						

Table 8 continued:

FRUIT-BEARING TREES	Dewathang	Orong	Wangphu	Phutshothang	Pemathang	Martshala	Samrang	Gomdar	Langchenphu	Serthi	Lauri
MANDARIN	√	√	√	√	√	√		√	√	√	√
MANGO	√	√	√	√	√	√		√	√		
PEACH	√	√	√	√		√		√	√		√
PEAR		√	√	√	√	√		√	√		√
PLUM	√	√						√	√		√
GUAVA	√	√	√	√	√	√		√	√	√	√
BANANA	√	√	√	√	√	√		√	√	√	√
ARECA NUT				√	√	√	√		√		
PASSION FRUIT								√		√	
WALNUT			√			√		√	√		√
PERSIMMON		√									√
TREE TOMATO		√	√			√		√	√	√	√

Source: RNR Statistics and Agriculture Statistics Database, 2009.

Figure 5. Land ownership by size categories in Samdrup Jongkhar, 2008



Source: RNR Census 2009. Table 19.

In 2008, at least 58% of the households had cultivated their own land, 6% of the households had leased out land, nearly 10% had leased in, and 27% of the households had left their land fallow.

Land is being left fallow for two main reasons: it is situated too far away from the house (as reported by 36% of households that had left land fallow) or crop raiding by wild

animals has made it too difficult to cultivate successfully (35%). Other reasons given were lack of productivity of the land (12%), lack of irrigation (7%), or slope being too steep for cultivation (6%).[133]

As previously noted, both existing data for Samdrup Jongkhar and subsequent field research indicated that essentially two cereal crops—maize and paddy—are being grown in sizable quantities throughout the district.[134] Thus, Figures 3 and 4 above illustrate the dominance of the maize and paddy crops both in terms of the area dedicated to growing them and the yield (kg/acre) of these cereals when compared to other crops. In addition, citrus was the main cash crop /export followed by ginger, potato, and cardamom.

Vegetable production is very limited and, while a wide variety of vegetables is grown in kitchen gardens, they are mainly for personal consumption and rarely sent to market. Thus almost all vegetables bought in stores are from India.

Despite the fact that there is great deal of room to increase *crop diversity* in the district, it should be noted that the *natural floral biodiversity* of the region is enormous. The biodiversity present in the dzongkhag has both regional and global importance, and the agricultural diversity, which includes the cultivated crops and their varieties, must be seen as a sub-set of this overall biodiversity.[135]

According to the National Biodiversity Centre's *Plant Genetic Resources of Bhutan,* the people of Bhutan depend on agro-biodiversity for a number of social, religious, cultural, and economic activities, as well as for ecological conservation. The main uses are food, animal feed, income generation, timber/fuel, traditional medicine, religious offerings, exchange/barter/gifts, handicrafts, fencing, traditional social-cultural use, soil and water conservation, and ornamental value.[136]

In terms of crop diversity, cultivated varieties can be classified in terms of "modern varieties" and "traditional/farmers'" varieties. The modern varieties are the outcome of scientific breeding and are often characterized by high yield and a high degree of genetic uniformity. Farmers' varieties (also referred to as landraces) are the product of breeding or selection carried out by farmers. A number of benefits deriving from the use of landraces have been documented, including:

- They help to provide stability to the farming systems at local, regional, and national levels by levelling yield variability, through the cultivation of a wide range of crops and intra-crop diversity. This is because a temporarily lower yield of a particular variety or crop, due to pests, disease, weather, or other causes, is

[133] RNR Census, 2008.
[134] It should be noted that it was beyond the scope of the field research to determine which varieties of maize or paddy were being grown. According to the National Biodiversity Centre, in Samdrup Jongkhar there are 21 traditional varieties (landraces) of rice and 15 of maize. This does not include high yield varieties (HYV) provided by the agriculture extension offices.
[135] National Biodiversity Centre. 2008. Plant Genetic Resources of Bhutan. Volume 1: Field Crops, 2008. Ministry of Agriculture, Thimphu, p. xi.
[136] Ibid., p. 3.

compensated for by maintaining a steady or higher yield of other varieties or crops that are more resilient and resistant to the particular disturbance.

- Cultivation of a wide range of landraces also provides general insurance against unpredictable environmental changes—a particular concern in an era of rapid global warming and climate change that is already affecting rainfall, temperature, and weather patterns.

- Overall, agricultural biodiversity has been demonstrated to be the surest insurance against natural disasters.[137]

Despite all of these benefits, crop biodiversity in Bhutan is being depleted at an ever-increasing rate due both to increasing population and to economic and technological changes. According to Bhutan's National Biodiversity Centre (NBC), the following are the main driving forces behind genetic erosion in crops in Bhutan:

- Displacement of indigenous landraces by new, genetically uniform cultivars
- Switch from diverse traditional systems to few market oriented cash crops
- Environmental degradation and destruction of habitats due to urbanization
- Wild animal damage
- Droughts/ untimely rain/ shortage of irrigation facilities
- Banning of shifting cultivation
- Low yields
- Land clearing/ landslides and habitat loss/ soil erosion
- Shortage of labour
- Change of food habits

These findings are supported by our field research in Samdrup Jongkhar. In many of the villages visited, farmers noted that the crops grown by their grandparents were no longer grown because they required more labour and produced less in terms of yield. Farmers also noted that their tastes had changed, and now they preferred to eat rice as opposed to maize and some of the other traditional grains that would have been grown in the past. Many farmers also noted that they were provided with seeds by the agriculture extension offices and that these high yield varieties replaced some of what was grown previously. However, as the NBC study notes, the replacement of landraces with these high yield varieties could pose a greater risk of crop failure in the future.

According to the NBC's *Plant Genetic Resources of Bhutan,* there are 21 traditional varieties of rice in Samdrup Jongkhar. A great deal more study needs to be done in Samdrup Jongkhar, in cooperation with the National Biodiversity Centre, to ascertain which traditional varieties (landraces) are increasing and declining in quality and quantity, and which to target in the future in terms of increasing biodiversity in crop production in the district.

[137] Ibid., pp. 3–4.

2.2.2 Forgotten foods

During field research, the most commonly cited *forgotten foods* were yangra (foxtail millet), brayma (bitter buckwheat), chira (little or common millet), kongpu (finger millet), memba (mustard oil) and mo (amaranthus). However, it should be noted here that a limited amount of information on this important subject was collected in field research, and further investigation—especially to assess the feasibility of re-introducing traditional grains that are no longer or only rarely grown—is very much needed as part of the Samdrup Jongkhar Initiative agriculture work.[138]

Women harvesting finger millet (kongpu) in Dungkarling, Phuntshothang

[138] For an extensive study on the subject of crop biodiversity and landraces in Bhutan, please refer to the National Biodiversity Centre's study on Plant Genetic Resources.

Buckwheat (brayma) growing in Orong Gewog

According to the NBC, foxtail millet has the longest history of cultivation among the different traditional varieties of millet. It is cultivated as a rain-fed spring and summer crop on dry land, and can be intercropped with maize.[139] Little or common millet is cultivated on a very small scale and is similar to foxtail millet. Both millets were a common crop in shifting cultivation and were most commonly consumed as porridge, and together with rice and maize. It is also used for making ara, bangchang, and changkay (alcoholic preparations). Finger millet is widely adaptable to a variety of elevations. It too was cultivated on dry land and was common with shifting cultivation as either a sole crop

[139] According to Bhutan's Auditor General, a farmer told him that because of banning of tseri / slash and burn, fox millet no longer grows. Information provided at May 19, 2011 presentation of the Draft SJI Profile study held at Deer Park Thimphu.

or intercropped with maize, amaranth, or legumes. According to NBC, it is consumed in the form of *keptang/roti* (traditional pancakes) and *dengo (*cooked flour). Most commonly it is used to make ara and used as animal feed. It is also considered one of the nine components of *Drunagu (*nine different types of crops) for religious performances.[140]

Bitter buckwheat (brayma) is an important staple crop in higher altitudes where maize and paddy don't grow. But it is also widely adapted to growing at varying altitudes, including in Samdrup Jongkhar Dzongkhag. It is a dry land crop. Where it is grown as a staple crop (particularly in Bumthang), it is used in the form of *khuli (*pancakes), *dengo (*cooked flour), and *puta,* (noodles). Based on NBC information, it appears that sweet buckwheat (*Bremo)* is also one of the 'forgotten foods' in Samdrup Jongkhar, though it was not mentioned in any of the field visits.

Mustard is cultivated for its seeds for extraction of edible oil, and also grown for livestock as grains and oil cakes. Oil seeds are also one of the nine components of *Drunagu* for religious performances and can also be used for lighting. According to Kunzang Choden, there are two types of mustard—white and black—and black is used mainly for consumption while white mustard is often used for ritual or healing purposes. Traditional methods to extract mustard oil are very labour intensive. Seeds are first pounded and then steamed. Grain is then put into a tightly woven bamboo basket and pressed with weights to expel the oil, which according to Choden "trickles out." At one time mustard oil was the most common medium for cooking and lighting.[141]

Amaranthus (mo) grains are also known as a food crop in Bhutan, though the plant is often grown as an ornamental. It is used in eastern Bhutan to make ara and it is also cooked with rice. According to the NBC, "amaranths can be explored to contribute to food security as it is easily harvested, produces lots of seeds to be used as grains, is highly tolerant of dry areas and contains large amounts of protein and essential amino acids."[142]

In Orong Gewog, when villagers were asked what their grandparents would have eaten or grown before access to the Indian food market, they said their grandparents relied more on wild plants such as forest tubers and ferns, and also more on drying of vegetables to last during the periods when the climate was not amenable to the growing of food. They said that today, fewer villagers engage in collection of forest products for food because access to the forests is restricted by the government. In Brongshing village in Gomdar Gewog, villagers also reported use of vegetables from the forest: Nakae, Damroo, wild mushrooms, as well as wild bananas.

[140] National Biodiversity Centre, op. cit., pp. 42-43.
[141] Kunzang Choden. 2008. *Chilli and Cheese. Food and Society in Bhutan*. White Lotus Press. Bangkok, p. 144.
[142] National Biodiversity Centre, *Op. cit*., p. 65.

According to Kunzang Choden:

> There is an inevitable trend that as we adopt and adapt new foods and food habits we are inclined to forget our traditional and indigenous foods. This trend is accelerated by the high rate of urbanization and the growing cash economy empowering consumers to choose and buy rather than depend on local products…. Many people associate eating wild plants and herbs with backwardness and poverty. Consequently we have forgotten many of the plants eaten by our parents and ancestors.[143]

For further information on traditional landraces and crop biodiversity in Bhutan, please consult the work of the National Biodiversity Centre, which has done extensive work in this field. That work includes an inventory of plant genetic resources in the country, documenting where they exist and to what extent, and setting up a base line for genetic erosion assessment in order to monitor these trends at the community level. It will be advisable for the SJI also to monitor those trends in Samdrup Jongkhar.

2.2.3 Non-wood forest products (NWFP) as food and medicinals

On one of our visits to the Chokyi Gyatso Institute in Dewathang there were several monks preparing a "blessed medicine peal" for general health called "mendrup." The manager of the monastery, Ugyen Wangchuk, told us that at one time the more than 30 ingredients for this medicine were collected manually in the forests. Now the monks buy all the ingredients and dry them, and then place them in a folded blanket to roll and mix the herbs.

Monks at Chokyi Gyatso Institute, Dewathang, preparing a "blessed medicine peal" for general health called "mendrup."

Based on information gathered during a number of village visits, when people become ill, they tend to delay visiting the hospital. Instead, they perform rituals and consult healers, and then only go to the hospital if it is still necessary. The healers often use plants from the jungle nearby. In Samdrupgatshel one villager said: "In the past we didn't have hospitals so we used to collect 30 to 40

[143] Kunzang Choden, p. 139.

varieties of herbs in the 9th month and we used them. But because now we have hospitals we don't use as much."

According to the Samdrup Jongkhar District Agriculture Officer, in Samdup Jongkhar there is emphasis on the following NWFP:

- Chirata – a medicinal herb used for cough/colds. Lauri Gewog residents are engaged in collecting Chirata from local forests. They use a "trader" as middle-man to sell the product to India (Calcutta, Delhi, Mumbai). Many people in Lauri Gewog, who have no road or electricity, depend purely on this NWFP.
- Cane (used for basket weaving)
- Rubia cordifolia (red /orange dye)
- Other NWFP in Samdrup Jongkhar include star anise, wild ginger, pipla (black pepper), wild potato, wild ferns, wild mushrooms, daphne (paper). At present the main market for these NWFP is India, but residents also supply to Bio Bhutan and the domestic market.

In Bhutan, a number of medicinal plant species have a considerable international market value. Among these are Agarwood (Aquilaria agallocha), Rauvolfia Serpentina, Tshe (Ephedra gerardina), Himalayan Yew (Taxus Baccata), Chutsa (Rheum Nobile), Chumtsa (Rheum Accuminita), Kutki/Putishing (Picorrhiza Kurroa), Pangpoi (Nardostachys Jtamansi), Tsenduk Rig (Aconitum spp.), and Yartsa-Gunbu (Cordyceps Sinensis). All are in high demand for pharmaceuticals. A renewed interest in traditional medicine in Asia, and the introduction of health foods in Europe and North America, have provided new outlets for many botanical products. Over 400 such botanicals are used commercially in Western Europe, with Hamburg as the centre for the trade. Of the Western nations, the United States is the major importer of medicinal plants. Japan is the major importer among Asian countries.[144]

In India's Uttaranchal State—where topography and climate are similar to some parts of Samdrup Jongkhar—the indigenous knowledge of *Vaidyas* (traditional healers) was studied. A survey interviewed 60 *Vaidyas* and compiled descriptions of 135 herbal drugs, which were used by them for curing 55 types of ailments. This study might provide a relevant point of reference for further SJI investigation, and a potential model for a Samdrup Jongkhar study on medicinal herb potential in the dzongkhag.[145]

A full discussion about NWFP is beyond the scope of this report, but here we will touch on the one NWFP that is of immense importance in Lauri—the poorest and most remote gewog of the district—Chirata. More information on NWFP can be found in the chapter on Marketing below, as well as in the *Background Statistical Material* located at the end of this study.

---

[144] Raling Nawang, Project Manager Integrated Forest Management Project, Bumthang, The Royal Government of Bhutan

[145] Chandra Prakash Kala, Nehal A. Farooquee, and B.S. Majila. 2005. *Indigenous Knowledge and Medicinal Plants used by Vaidyas in Uttaranchal, India.* G.B. Pant Institute of Himalayan Environment and Development.

According to the *Flora of Bhutan*, 19 different species of Swertia are found in the country.[146] The most commercially valued species with high demand in the international market is Swertia Chirayita or Chirata. In Bhutan, it grows most abundantly in Lauri Gewog, Samdrup Jongkhar. The plant is well known for its very bitter taste and its medicinal value. All parts of the plant including leaves, flowers, roots, and stems are used. Chirata is used for numerous purposes, including reducing fever, burning of the body, and pain in the joints. It helps to get rid of intestinal worms and skin diseases, and is used to ease constipation, urinary discharges, ulcers, stomach aches, asthma, bronchitis, and leucorrhoea. It is also used as a breath refresher and to reduce vomiting during pregnancy. Traditional Bhutanese medicine also uses Chirata for blood purification and to cure common colds, gout disease, and even diabetes and malaria.

The plant grows at an altitude of between 1,900 and 3,000 metres and it can be found adjacent to different villages, especially in areas where shifting cultivation was formerly practiced. Farmers collect the entire plant during the months of December-January. The existing populations of Chirata are reported to be diminishing. In 2006, farmers in Lauri claimed that 6 years previously it was possible to collect 20 metric tonnes. The harvest is now less than 5 metric tonnes.

These official data are supported by our own interviews. The villagers of Lauri, where Chirata is grown and collected, say that the production has been steadily decreasing. “In the past we used to fetch about 2 to 3 trucks, but now it’s hard to get even 1 truck.”

Villagers say the decline in production is because of government regulations banning the practice of tseri (slash and burn agriculture). “It is because the government is protecting the environment and the forestry department tells us not to burn the field. But the Chirata, the production of Chirata, is good when the field is set on fire. The seed of this Chirata is like the soil, very small. And when we set fire, the leaves of Chirata are burned, which turns to seed and that is taken by the wind and grows more.” Further study needs to be done in this area, perhaps by the MoA. There is an argument that if practiced correctly, in a limited way, Tseri could be a net benefit to the region.

The sale of Chirata is crucial for the villagers of Lauri: “It increases the livelihood of the people here and we have children studying…. so for their studies, even to buy salt, oil, rice, we need it.” The price of the Chirata is considered high by village standards: Nu. 260/kg.

However, during SJI farmer trainings in Dewathang in February, 2011, to which several Lauri farmers came, one Lauri villager remarked that middlemen take most of the profit from the Chirata sales while Lauri villagers receive only a fraction of the plant’s true market value. This is another key area for investigation—whether some form of Chirata marketing cooperative in Lauri might help increase villagers’ income from Chirata sales

[146] *Flora of Bhutan.*1987. Royal Botanic Garden, Edinburgh, Scotland.

by reducing reliance on middlemen and external traders. Increasing the value of sales per kilogram sold would at least partially compensate for the overall decline in quantity collected.

2.2.4 Chemical use in Samdrup Jongkhar

(Note that some of the following materials also appear in Section 1.3.4 above, but they are repeated here because they are relevant to this section of the Profile and because we assume this report will be used in encyclopedic fashion to look up information section by section rather than read cover to cover.)

Artificial fertiliser use

According to the Renewable Natural Resources Census (2009), farmyard manure (FYM) or cow dung and chemical fertilisers are the two major sources of soil nutrient for crop production in Bhutan. Gasa Dzongkhag has the highest (91%) and Zhemgang Dzongkhag the least (19.7%) proportion of households applying FYM. In 2008, as noted earlier, 34.5% of households in Samdrup Jongkhar applied 1,237 MT of organic fertilisers, compared to 64% of households in Bhutan overall. This quantity in Samdrup Jongkhar corresponds to only 2% of the total FYM applied in the whole country. In terms of chemical fertilisers, 76 MT were applied by a total of 10% of households in Samdrup Jongkhar (see Figure 2 in Section 1.3.4).[147]

When fertiliser use is analysed by gewog, it appears that Serthi has the lowest percentage of households using organic fertilisers (0%) followed by Martshala (1.9%), Langchenphu (3%), and Dewathang (4%). Orong has the highest percentage of households applying organic (farm yard manure) fertilisers to their fields (64%) followed by Phuntshothang (60%) and Gomdar (54%). In terms of chemical fertilisers (i.e. urea), as noted, only 10% of households overall in Samdrup Jongkhar apply these to their fields. But the highest using chemical fertiliser gewogs are Lauri (28%), Orong (15%), and Gomdar (14.7%) (See Table 4 in Section 1.3.4). As noted earlier, it is noteworthy that Orong and Gomdar Gewogs have among the dzongkhag's highest usage of both organic and chemical fertilisers, so this gewog comparison may have more to do with fertiliser use altogether than with gewog-based proclivities for organic vs chemical products.[148]

Our field research to date supports the official data on fertiliser use. Village after village reported that at one time the farmers did use urea, but observed that it resulted in the deterioration of the soil and therefore stopped using it. For example, village spokespeople from Langchenphu Gewog remarked that urea use had "hardened the soil" and as a result they no longer used it. They were also advised by their Agriculture Extension Officer to use cow dung instead.

Villages in Gomdar and Wangphu Gewogs reported the same. One villager from Wangphu village reported: "Now we don't use urea. It is 5 years now since we used it.

[147] RNR Census, 2009.
[148] Ibid.

We left it because it makes our soil harder. During our first time when we used urea, production was very good. But coming to the next year, we could see production decrease, so we came to know it is very much harmful to our soil and we left it."

In the village of Martang—a one-hour walk from the road and within the Dewathang Gewog—villagers reported that they did use urea in the maize fields in the past, but the Agriculture Extension Officer advised them to stop. They observed that with the use of urea, soil fertility decreased the following year. Now they say they use only cow dung, both fresh and dried, on their fields.

In addition to the negative effects on soil quality, and as noted above in Section 1.3.4, urea inputs also add to the costs of farming. According to Dr. Vandana Shiva, when the farmer buys his seeds, invests in machinery, and purchases inputs of fertilisers and chemicals the cost of production can be 10 times more than what the farmer could ever earn from the produce itself. Dr. Shiva says that this doesn't happen immediately. Urea is a case in point: In the first year the farmer might use 1 bag of urea and get higher crop yields that fatten his initial profit margin, but in year two he will require 2 bags and so on to compensate increasingly for the ever more nutrient-depleted soil, and in an effort to maintain yields that the degraded soil itself will no longer support. In this way, farm input costs keep going up, she says, to say nothing of increasing unit prices for fossil fuel-based farm chemicals. Once the cycle of chemical addiction begins, she points out, it becomes increasingly difficult for farmers who have been lured by initial promises of higher yields to wean themselves off those chemicals.

Dr. Shiva notes that urea destroys the natural working of the soil—essentially killing the soil organisms that are the source of real soil fertility. As a result, the essential work of these organisms—to aerate the soil and enhance its moisture carrying capacity—is destroyed, resulting in soil compaction, and making the soil more sand-like. "The soil eventually loses its health and so the impact of using more chemicals is having less and less benefit," she says.[149]

In some of Bhutan's most remote villages, farmers themselves, through keen observation, had noticed these negative changes to the soil after applying urea just one season—even though these initial impacts were relatively subtle, and in many cases decided to stop urea use even before being advised by the agriculture extension officer (AEO) to do so. This illustrates the value and importance of traditional knowledge and wisdom, and is a testimonial to the local rural insight and intelligence that can manifest in the absence of outside interference. By stark contrast, the Indian agriculture colleges, in which Bhutanese agricultural officials are often trained, are mostly dominated by Green (chemical) Revolution dogma that modern, high-yield farming is not possible without chemical inputs.

Dr. Shiva notes that organic alternatives do not trade off productivity gains. On the contrary, there are proven, effective, non-chemical organic methods that can substantially improve soil health by increasing the amount of organic matter in the soil. That, she says,

[149] From speech given by Dr. Vandana Shiva, JNP, Dewathang, December 17, 2010.

will not only increase productivity, but in the winter months, when there is little rain, the soil will hold more moisture without any direct water inputs.

Pesticide use

In Bhutan government documents, pesticides are euphemistically termed "plant protection chemicals," a terminology which according to Dr. Vandana Shiva equates poisons with medicines. She argues that such terms should never be used by governments or agricultural agencies, even though they might be used by the manufacturers of the chemicals.[150]

In 2008, only 5.6% of rural households in Samdrup Jongkhar used pesticides—applying a total of 6.3 mT. Paro had the highest percentage (68%) of rural households applying pesticides totalling nearly 450 mT—by far the highest total quantity of any dzongkhag, followed by Punakha (48.5%), Thimphu (48.1%) and Wangdue (46.1%). In Gasa Dzongkhag, which is the most remote and least populated dzongkhag in Bhutan (population less than 4,000), and which has been fully organic since 2004, there were no pesticides applied in 2008 (see Table 9 below).

In Samdrup Jongkhar Dzongkhag, RNR Census data indicate that pesticide use is highest in Orong (12.7% of rural households) followed by Gomdar (11.9%)—both large citrus-growing gewogs (see Table 10 below).

[150] Personal Communication with Dr. Vandana Shiva. December 17, 2010.

Table 9. Pesticide use, by dzongkhag, 2008

Dzongkhags	Pesticide Use	
	Households (%)	Quantity (mT)
Thimphu	48.1	18.7
Paro	67.7	449.4
Ha	31.0	15.2
Chhukha	15.8	21.0
Samste	4.2	10.9
Punakha	48.5	28.5
Gasa	0	0
Wangdue	46.1	40.3
Tsirang	18.3	12.1
Dagana	16.1	12.0
Bumthang	15.5	6.5
Trongsa	13.9	4.2
Zhemghang	6.9	5.9
Sarpang	8.5	21.8
Lhuentse	9.9	5.3
Mongar	7.0	14.1
Trashigang	5.8	6.9
Trashiyangtse	6.2	4.2
Pemagatshel	6.4	6.7
Samdrup Jongkhar	**5.6**	**6.3**

Source: RNR Census, 2008. Table 5. Note: Numbers have been rounded.

Table 10. Pesticide use, Samdrup Jongkhar, by gewog, 2008

Gewogs	Pesticide Use	
	Households (%)	Quantity (mT)
SAMDRUP JONGKHAR	**5.6**	**6.3**
Dewathang	4.8	0.3
Gomdar	11.9	2.0
Orong	12.7	2.1
Langchenphu	3.0	0.3
Martshala	3.8	0.3
Pemathang	2.4	0.2
Phuntshothang	4.9	1.2
Samrang	0	0
Serthi	0.4	0
Lauri	0.7	0
Wangphu	2.4	0

Source: RNR Census, 2008. Table 3. Note: Numbers have been rounded.

Based on the Census data collected by RNR, Samdup Jongkhar appears to fare relatively well in comparison to other dzongkhags in minimizing the amount and incidence of poison-spraying or use. According to the data for the amount of "plant protection" chemicals supplied to dzongkhags in 2008-2009, a grand total of only 95 kg/Litres were supplied to Samdrup Jongkhar (see Figure 6 below). This includes: 77 kg/L of insecticides; 7 kg/L of fungicides; 1.7 kg/L of rodencides; and 9 kg/L of substances that are termed "non-toxic." No herbicides, acaricides, or bio-pesticides were distributed.[151]

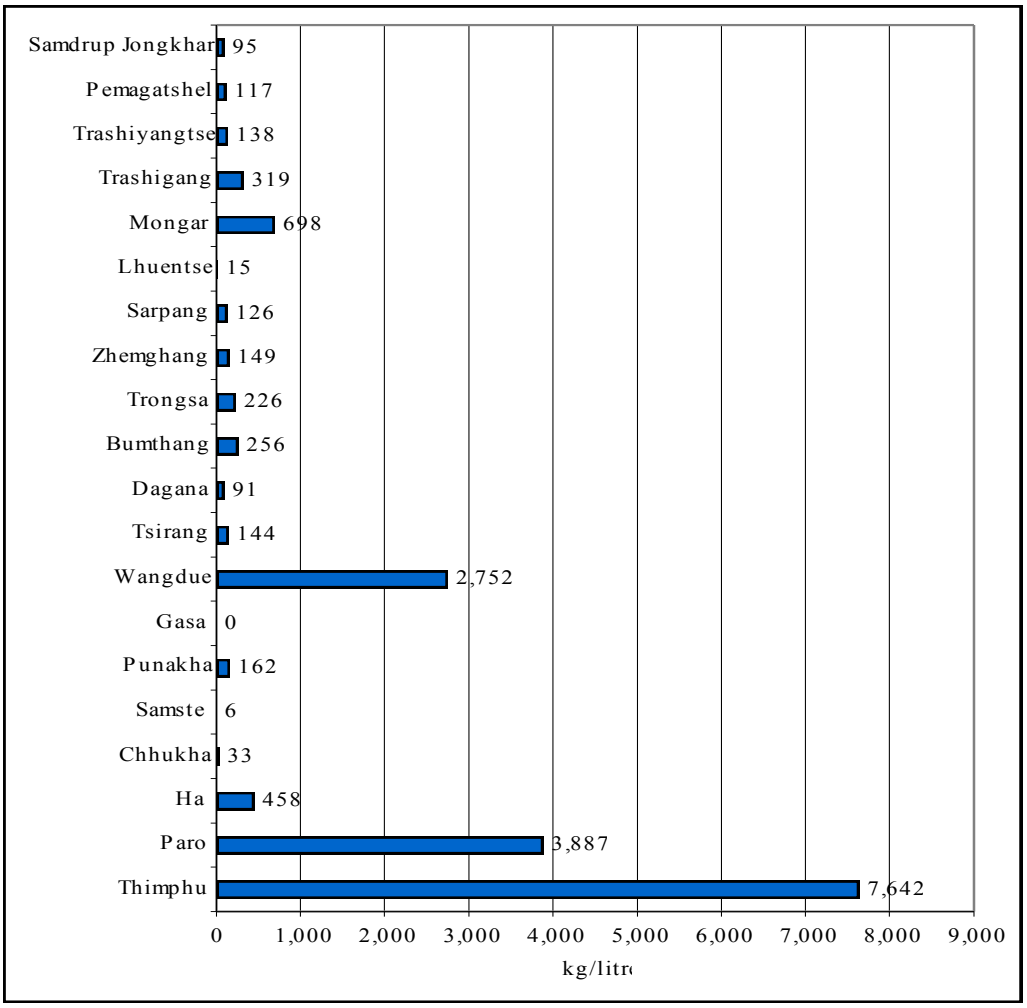
Since the units cited in Tables 9 and 10 above (mT) are not the same as those used in Figure 6 below (kg/L), it was not possible at the time of writing to reconcile the 6.3 mT of pesticides used in Samdrup Jongkhar with the 95 kg/L supplied to the dzongkhag.

According to the RNR data, Thimphu, Paro, Wangdue, and Mongar had the highest amounts of chemicals supplied—7,642; 3,887; 2,752; and 698 kg/L respectively—very much more than Samdrup Jongkhar (95 kg/litre). In fact, Samdrup Jongkhar had one of the lowest amounts of these chemicals supplied: Not including Gasa (which has been fully organic since 2004 and which received no such chemicals), Samdrup Jongkhar had the 5th lowest amount of chemicals supplied compared to all the dzongkhags.[152]

[151] Ministry of Agriculture. 2009 Statistics. Volume 1. Table 49.1. Plant Protection Chemicals Supplied to Dzongkhags in Kg/Litres (2008–2009). Source of data is National Plant Protection Centre (NPPC), March 2010.

[152] At the time of writing there were contradictory stories about the quantity of chemicals used in S/J:—One article (http://www.kuenselonline.com/2010/modules.php?name=News&file=article&sid=16696) noted that Samdrup Jongkhar had the 5th highest use, based on data from the NPPC. It is not clear where these data came from and why they do not correspond with the NPPC data provided in Table 49.1 in the official Ministry of Agriculture document noted above.

Figure 6. Total chemicals supplied to dzongkhags, kg/L, 2008–2009



Source: Ministry of Agriculture. 2009 Statistics. Volume 1. Table 49.1. *Plant Protection Chemicals Supplied to Dzongkhags in Kg/Litres (2008-2009).* Source of data is National Plant Protection Centre (NPPC), March 2010.

Note: This includes insecticides, fungicides, rodencides, herbicides, acaricides, bio-pesticides, and substances termed "non-toxic."

These data correspond with the findings from our field research, which found very little reported chemical use in almost all of the villages visited. In fact, it was observed that most Samdrup Jongkhar farmers interviewed practiced organic agriculture by tradition. Villagers reported that they might have used an insecticide once or twice on the advice of the agriculture extension officer, but that overall their fields were chemical-free. This bodes well for Samdrup Jongkhar's intended transition to fully organic farming.

These findings are also confirmed by the Samdrup Jongkhar District Agriculture Officer, who remarked that a relatively small percentage of Samdrup Jongkhar farmers use chemicals, and that the majority of chemicals that are used are for citrus crops. He says

that while there is no clear-cut policy on organic agriculture/farming yet in Bhutan, presently most farms in the district are in fact organic. He says there are 50–60 requests a year for chemicals and these are mainly for large farms. Smaller farms handle pests by traditional methods such as clean cultivation and hand picking of bugs. The largest farms in Samdrup Jongkhar are about 2 hectares (i.e. 5 acres).

In conventional or industrial agriculture, unwanted plants are often referred to as "weeds."In organic agriculture, however, these unwanted plants are often highly useful in the creation of natural pest control agents and insect repellants. There are many plants that can be used in this way, including Lantana camara, Parthenium cinererifolia, Eupatorium sp, and Flame Nettle. According to Miguel Braganza of the Organic Farming Association of India, who came to Samdrup Jongkhar in March, 2011, to conduct organic farm cooperative trainings for the SJI: "The leaves of these plants can be cut and soaked for ten days in diluted Panchagavya, Sanjivak, or even cow's urine, filtered through cloth, and the extract diluted ten times in water for spraying on plants as an insect repellant." Please refer to Appendix 6 for more information on natural insect repellents.

2.3 Agroecology: A holistic system of food production

2.3.1 The myths of conventional agriculture

Agroecology is a recent term used to describe a kind of agriculture that combines indigenous knowledge with modern scientific knowledge to produce a holistic system of growing food based on the science behind how all of the interconnections work. In other words, how do biodiversity, soil fertility, and the human community all work together to produce healthy and nutritious food in a way that enhances ecosystem functions and services?

Agricultural productivity is conventionally defined in terms of the yield from a single crop. Thus, companies like Monsanto and their agriculture "experts" typically tout the short-term gains from particular "high-yield varieties" of corn, maize, rice, or other single crops—the uniform, genetically engineered seeds of which have largely replaced the diverse farmer-saved seeds of previous generations. Based on this narrow definition of agricultural productivity based on single crop yield, a myth has arisen that industrial, chemical-based monoculture systems are more productive than small organic diverse systems.

However, even the 'experts' are beginning to doubt the wisdom of that conventional approach, which has come to dominate the world's food supply system. In an important report titled *Agriculture at the Crossroads*, over 400 of the world's leading scientists, led by Robert Watson, the World Bank's chief scientist, studied how the world will feed itself in 2050, when the population is estimated at 9 billion and the climate will be far more variable than it is now. The report concludes that what's needed is a shift away from the current industrial system of agriculture—which requires vast amounts of water and fertilisers. Raj Patel comments: "When the world's top scientists addressed global

hunger, they came up with the same kinds of solutions that the world's poorest had—local, ecologically sensitive solutions that respect local knowledge, democracy and autonomy."[153]

Similarly, Dr. Vandana Shiva cites scientific evidence to demonstrate that biodiverse organic farms produce more food than conventional ones, and are the path to food and economic security. They are also the best way to adapt to a changing global climate. Shiva observes that unlike most monocultures, which only produce a single crop, mixed farms actually produce more ***food*** in total. "You will be told your farms are unproductive because productivity is defined as a monoculture yield of a single crop," she told nearly 500 assembled farmers at the launch of the Samdrup Jongkhar Initiative in December, 2010. But biodiverse mixed farms have more food production per acre, more nutrition per acre, and more health per acre, she says. Monoculture farms might have more maize, or whatever particular crop is being grown, but much less food per acre in total than diverse farms growing a wide range of crops.[154] But that is not all:

> While these reductionist categories of yield and productivity allow a higher measurement of yields, they [also] exclude the measurement of the ecological destruction that affects future yields. They also exclude the perception of how the two systems differ dramatically in terms of inputs.[155]

For example, with *indigenous* cropping systems (mixed, biodiverse, organic) all the inputs come from the farm itself and are therefore cost-free to the farmer: seeds are saved from the previous season, soil fertility comes from compost and farm-yard manure, and pest control is natural and built into the cropping mixtures, says Shiva. By contrast, monoculture systems yields are tied to the purchase of inputs: high yield variety seeds, chemical fertilisers and pesticides, petroleum, machinery, and irrigation systems. "High yields are not intrinsic to the seeds," she writes, "but are a function of the availability of required inputs, which in turn have ecologically destructive impacts" and are expensive to farmers.[156]

These destructive ecological impacts, which are for the most part externalized, and which are witnessed with devastating impact in places like India's Punjab state, which was a hub of the Green (chemical) Revolution, include:

- Greenhouse gas effect with atmospheric pollution
- Destruction of soil fertility
- Micronutrient deficiency

---

[153] The report led by Robert Watson, the International Assessment of Agricultural Knowledge Science and Technology for Development is available at http://agassessment.org. It was cited in Patel, Raj. 2009. *The Value of Nothing. Why Everything Costs so Much More than We Think*. Harper Collins Publishers Ltd. Toronto. p. 163.

[154] From presentation given by Dr. Vandana Shiva, December 19, 2010, CGI, Dewathang.

[155] Shiva, Vandana and Pandey, Poonam. 2006. *A New Paradigm for Food Security and Food Safety*. Navdanya. Systems Vision. New Delhi, pp. 3–4.

[156] Ibid.

- Soil toxicity
- Water logging and salinization
- Desertification and water scarcity
- Genetic erosion
- Biomass reduction for fodder and organic manure
- Nutritional imbalances with the reduction of pulses, oilseeds, and millets
- Pesticide contamination of food, soil, water, human, and animal life

Therefore, narrow conventional economic calculations of agricultural productivity have been found seriously to distort the true picture. First, they only account for the short-term yield of a particular crop per unit of land rather than for the total output of food from that same unit of land. Second, they leave out the benefits that would have been derived from internal inputs which are naturally produced by a biodiverse system; and third, they ignore both the financial and ecological (externalized but real) costs of having to purchase the external inputs to substitute for internal inputs.[157]

One of the biggest threats to diversity in agriculture is the myth of high yielding varieties (HYV) of particular seeds. According to Shiva, it is this central myth that has resulted in the "displacement of diverse farmers' varieties." In reality, she notes, the actual evidence shows that "indigenous varieties often outperform HYVs in total system yield and in the realistic conditions of the fields of small farmers."[158]

So why has there been a shift to chemical-fed monocultures all over the world in recent decades? According to Shiva and Pandey (2006), it is because the companies that sell the high-yield seeds, along with the chemical fertilisers, pesticides, and other inputs on which such cultivation depends, are making substantial financial gains from the shift and are not paying its costs:

> Diversity produces more than monocultures. But monocultures are profitable to industry both for markets and for political control. The shift from high yielding diversity to low yielding monocultures is possible because the resources destroyed are taken from the poor, while the higher commodity production brings benefits to those with economic power. The polluter does not pay in industrial agriculture both of the chemical era or the biotechnological era. Ironically, while the poor go hungry, it is the hunger of the poor which is used to justify the agricultural strategies which deepen their hunger.[159]

Studies conducted by Bhutan's National Biodiversity Centre comparing the performance of HYV with Traditional Varieties (TV) over a number of years reveal that the performance of HYV "fluctuates hugely over a number of years under adverse conditions whereas performance of numerous TV may resist adverse conditions and have less fluctuation on the over all production and food security." The study also notes that "it is

[157] Ibid., p. 5.
[158] Ibid., p. 9.
[159] Ibid., p. 14.

an established fact that the narrowness of genetic base is responsible for greater risk of crop failures."[160]

As well there is substantial evidence from all over the world showing that small farms are more productive overall and in the longer term than large industrial farms. Some of the issue lies in how the term productivity is defined. Yield, as previously stated, is conventionally defined as a measure of the crop produced—grain or vegetable. However, what is actually important to measure is *output* or *total biomass,* which includes all the parts of all the crops produced on a given unit of land—including even the parts that will go to feed the livestock (fodder) and the parts that will be returned to the earth (compost). These parts have economic significance in avoided purchased inputs. In traditional crops the yield is about equal to the straw/ fodder, but modern seeds (i.e. HYV) are mostly grain and there is very little left as fodder or compost.[161]

> Plant improvement in agriculture has been based on the 'enhancement' of the yield of desired product at the expense of unwanted plant parts. The 'desired' product is however not the same for agribusiness and Third World peasants…. What is unwanted by agribusiness may be wanted by the poor, and by squeezing out those aspects of biodiversity, agriculture 'development' fosters poverty and ecological decline.[162]

During our field research, it was also clear that many parts of the plant were considered valuable to the villagers, confirming the findings of Shiva and Pandey cited above. Bean pods, for example, were dried as fodder for cows, and parts of the harvested maize plant were cut up and dried for the same purpose. Altogether, there was little wasted on the Samdrup Jongkhar farms we visited, with correspondingly minimal need for purchased inputs of fodder and compost.

In her book on Bhutanese food, Kunzang Choden describes how the maize plant became the staple food in eastern Bhutan (replacing millets in all likelihood) and that practically every part is utilized:

> After the grains are removed from the cobs they are spread out in the sun and cleaned. The film of fine translucent layers that covers the kernels are separated and put aside for pig feed. Grinding the maize makes two different products available. The coarse particles are used for Kharang, and the fine flour is collected separately and used to make a dough known as Bokpi…. The stems and cobs are used as fuel, and the leaves are used as animal feed.[163]

Again, according to Shiva, the argument that you can increase food availability through industrial agriculture is therefore false on four counts:

---

[160] National Biodiversity Centre. Plant Genetic Resources of Bhutan. Chart 1, p. 5.
[161] Personal communications with Dr. Vinod Kumar Bhatt and D.S. Negi, farmer trainers from Navdanya, December 23, 2010.
[162] Shiva and Pandey (2006). *Op. cit.* p. 5.
[163] Kunzang Choden, *Op. cit.* p. 197.

- Industrial breeding focuses on partial aspects of single crops rather than on total system yields of multiple crops and integrated systems.
- It only focuses on yields of particular global commodities, not on the diverse crops that people actually eat.
- It focuses on quantity per acre, not on nutrition per acre.
- It uses natural resources intensively and wastefully.

Overall, therefore, Shiva argues that industrial breeding actually undermines food security by using up resources that could be used to produce more food. Ecological alternatives can increase food supply through biodiversity intensification instead of through chemical intensification and genetic engineering.

2.3.2 And the organic alternative

In order to increase food security and provide foods high in nutrition, the evidence indicates that farmers must grow food for themselves that is low cost but high value. According to Shiva and others, the only low cost system is organic because it doesn't require any purchased inputs. It therefore has "higher net income and higher productivity built into it."

In his book *The Coming Famine,* Julian Cribb echoes Shiva's call. He writes: "The best solution is nearly always for local people to be able to grow as much of their own food as possible—and to have the right to choose their own ways of doing so, in conformity with their climate, soil, water, culture, and beliefs."[164]

There are many techniques associated with organic farming and a discussion of these is beyond the scope of this study. The National Organic Programme in Bhutan's Ministry of Agriculture has produced a number of highly informative brochures and guidebooks on how to farm organically. For example, farmers can now obtain brochures from their Agriculture Extension Officers about composting and vermi-composting, pest and disease management, soil fertility (mulching, applying farm yard manure), and other related topics.[165]

In the spring of 2011, Bhutan's Prime Minister made an ambitious and visionary commitment:

> Our goal is that Bhutan will be the first sovereign nation in the world to be fully, 100% organic in its food production, with the 'grown in Bhutan' label synonymous with 'organically grown.' That will create significant economic opportunities for our farmers and for the country, establish Bhutan as a global

[164] Cribb, Julian. 2010. *The Coming Famine. The Global Food Crisis and What We Can do to Avoid it*. University of California Press. Berkeley. p. 117.
[165] These were provided to the author by the Agriculture Extension Officer in Dewathang. They are titled: RNR Extension Material 2007. The guidebook is titled: *A Guide to Organic Agriculture in Bhutan.* 2007. National Organic Programme, Department of Agriculture.

training centre for organic agriculture, and provide a major spur to organic growing worldwide.[166]

Beans and mustard for personal consumption grown in Rikhey kitchen garden

While these are still early days, and while many will say that remote parts of Bhutan are already "organic by default," interviews with the District Agriculture Officer indicated "there is no clear cut policy on organic farms in Bhutan as of yet." As well, Dewathang's Agriculture Extension Officer noted that while local officials are planning to do organic farming, they don't have a budget allocated for it.

The SJI has therefore taken a leading role in educating Samdrup Jongkhar farmers about organic methods / techniques, by consulting with farmer-trainers from Navdanya and other grassroots farmers organizations in neighbouring India, and conducting organic farmer trainings in Samdrup Jongkhar. As well, the SJI took 20 Samdrup Jongkhar farmers from all 11 gewogs, plus the District Agriculture Officer and the Agriculture Extension Officers from Dewathang, Langchenphu, and Phuntshothang/Samrang on a 3-

[166] Part of statement made about Bhutan's organic policy by Prime Minister of Bhutan, Jigmi Y.Thinley on 12 March, 2011. For the full text of the 2-page statement, please see the SJI website at http://www.sji.bt/assets/PDFs/HPM.17.Mar.organic.pdf.

week organic farming study tour to India, which included 11 days of intensive training at the Navdanya organic training farm in Dehradun, Uttaranchal.

A cooperative and collaborative relationship between SJI and the local and regional agriculture officers will build on this momentum to strengthen the movement towards biodiverse organic farming in the dzongkhag. The SJI has declared its intent that Samdrup Jongkhar will become Bhutan's first populous dzongkhag to be 100% organic. To support that objective, the Ministry of Agriculture's National Organic Programme has recently included the SJI in its own three-year plan.

A few other aspects of organic agriculture will be discussed in the sections below.

2.3.3 Case study: The high yield Jersey cow

During one field interview with villagers held in the town of Dewathang, there was concern raised about what they called a "shortage of fodder" for the Jersey cows.[167] Farmers said that the demand for milk was very high and that expansion was possible, but that lack of fodder was holding them back. According to one member of the Dewathang Milk Marketing Cooperative (DMMC), "The main constraint for the milk society at the moment is fodder. What kind of plants can we grow that could give fodder? Because with the Jersey cows, the more you feed them, the more milk they produce; the less feed, the less milk."

But according to Tashi Tobgyel, the Chair of the DMMC, lack of fodder isn't the issue. He says it's more about the costs. In the early 1990s local cows were gradually replaced by Jersey cows, which are known for their high milk production.[168] But in order to achieve high milk yields, the cows require more fodder and grain. Similar to the *high yield variety* of seeds described above, the high-milk producing Jerseys are creating demands for purchased inputs that may not be sustainable or affordable in the long run. According to Tashi Tobgyel:

> Before, our farmers were depending on the local cows. Local cows have less production, less milk. Jerseys produce a minimum of 7-8 litres of milk a day and our cows, local cows, produce, one and a half litres of milk a day. So they thought that, to benefit the farmers, they would have good production of milk with the Jerseys…. So now our farmers are within only Dewathang and we are producing 380-400 litres per day. That is within a 14km range. Within this 14km range, we are collecting 380-400 litres of milk daily. And we are taking this amount to Samdrup Jongkhar and we have a market down there. Even Indian people come and consume from us….
>
> But to buy the feed needed for Jerseys is expensive. Because the cost is very high and because [Jerseys] don't only depend on pasture, when [farmers] don't feed

[167] "Fodder" here refers particularly to food given to the animals (including plants cut and carried to them), rather than that which they forage for themselves. It also does not include grain.
[168] He says good quality semen is now obtained from the U.S.

them this feed, then the condition of the Jersey becomes worse. So if you see Jerseys in our village around here, you'll see many Jerseys not in a good condition, you know, weak. They are skinny because they are not fed the grain, and we have been telling farmers that. In a day the Jersey should produce at least 6 litres of milk. For that we have to give them maximum feed of 6 kg/day of feed. Compulsory, you know. Per day because 3 kg is for their health, and the other 3 kg is for producing the milk. This was informed to us by the feed experts.[169]

Feed grain sold for Jersey cows at DMMC office

According to Tobgyel, Jersey cows are also expensive to purchase—one cow could cost between Nu. 30,000 to 50,000 (more than double the price of a local cow), plus the cost to feed them compared to the local cows is also higher. He says a 50kg bag of grain costs Nu. 670 and, with the recommended feeding regimen, that would last a little over a week for each cow. Local cows need very little grain, he says, and rely far more on forage from local plants. So, many farmers can't afford the feed and their Jerseys are in poor condition.

He also says that many of the farmers are "very poor" and the cost of the Jerseys and their upkeep is steep, so they have to take out loans. He says they get loans from the Bhutan Development Finance Corporation (BDFC) to purchase the cows at a rate of 10%

[169] Personal communication with Tashi Tobgyel, Chair of DMMC, November 23, 2010.

interest/year and that currently the loans are quite manageable for the farmers. Thus far, the farmers don't have any problems with defaulting, and their payments are managed by the milk society. Currently about 40 farmers (out of the 80 or so active members) have loans.[170]

Tobgyel points out that by comparison with Jerseys, the local cows were much easier to take care of: "A farmer can take it to the jungle and it can climb a high mountain and come down. A Jersey cow cannot climb up a hill—they are very delicate—and once they get injured, it takes a long time for them to heal. Local cows are stronger and more suited to these mountains," he says.[171]

The issues around the manageability of grain input costs (in an emerging fossil-fuel depleted world) need to be explored further. While there is no doubt that Jersey cows, given certain conditions, produce more milk than the local cows, it would be interesting to undertake a full cost/benefit analysis of the Jersey cow versus the local cow, particularly given the higher purchase cost per cow, higher feed requirements (i.e. higher input costs of grain) of Jerseys, higher injury rates, lower milk yields when Jerseys are in poor condition, and the increased indebtedness of the farmers who own them. The use of agricultural land to grow feed, suggested by some of the farmers interviewed, rather than human food, can also be controversial.

Another consideration in such a cost-benefit analysis is the comment by Bhutan's Auditor-General (who is from Dewathang) that local cows in Samdrup Jongkhar used to be valued more for their manure than for their milk, and that the focus on milk production is a very recent phenomenon. Thus a proper cost-benefit comparison of Jerseys and local cows should also account for the quantity and quality of manure produced. None of these remarks pre-judge the outcome of such a cost-benefit analysis, and it may well be that the benefits of Jerseys still outweigh the combined costs referenced above. The costs are only mentioned here explicitly because they are often not considered in decisions to shift from local cows to Jerseys. Such a cost-benefit analysis is currently under way as part of the research to document the transition to organic farming in Samdrup Jongkhar.

According to Dr. Vandana Shiva, when farmers calculate their income, they often only look at what they are selling and earning, rather than factoring in what they are spending. In other words, they are often not assessing their *net* income (revenues minus expenses). For example, she says, if farmers have to buy feed instead of relying on pasture only, then dairy farming is now more expensive. If farmers are using a HYV seed that is producing more, but which also relies on purchase and application of pesticides or fertilisers, then those costs also have to be factored in (and not only the crop yield alone).

[170] According to Phub Tshering, the Dasho Dzongdag for Samdrup Jongkhar, the Bhutan Development Finance Corporation has been active for 10–15 years and it gives loans ranging from Nu. 10,000 to 50,000, with an interest rate of around 12%. He says he receives 5–10 loan applications a day and that applicants need a security clearance. He says there is a repayment problem among the rural population, but that the Gup is now responsible to help BDFC collect due payments. Rural people also tend to borrow smaller sums of money than those living in urban areas like Samdrup Jongkhar town. Personal communication, November 15, 2010.

[171] Personal communication with Tashi Tobgyel, January 18, 2011.

In short, she urges farmers to take stock of all their costs and benefits: what they sell *and* what they have to buy, to get a better picture of their net income generation.[172]

As noted above, undertaking such cost-benefit analysis by no means pre-judges the outcomes or assumes that Samdrup Jongkhar farmers will get rid of Jerseys and go back to local cows. However, it will enable farmers to undertake their work with eyes wide open, and with full information and awareness of the advantages and risks of the major shift in dairy farming that is taking place in the dzongkhag. The DMMC, which is at the centre of this issue and which imports and sells the Jersey feed grain to local farmers, will be discussed further in the chapter on *Markets that Work for Farmers* below.

2.3.4 Saving seeds

According to Julian Cribb:

> Seeds are, in fact, little packages of knowledge, specially designed to perform in particular environments and conditions. They are highly portable and easy to deliver both to smallholders and to advanced farmers. Often, however, they require specialist skills and expensive inputs such as chemicals or fertilisers to get the best out of them—and this applies to all high-intensity farming techniques.[173]

Field research in seven out of eleven Samdrup Jongkhar gewogs revealed that most farmers in this region still do save seeds. Dewathang's Agriculture Extension Officer estimated that 80% of farmers save their seeds while others get seeds supplied by the government or from other farmers. It was not possible reliably to assess an actual percentage through this field research.

However, data obtained from the National Biodiversity Centre (NBC) indicate that in Bhutan overall, approximately 2% of farmers' seed supply is obtained through the formal system of purchasing seeds (i.e. from Druk Seed Corporation), and the remaining 98% of farmers' seed supply is obtained through an informal local/ community system. According to the NBC:

> Farmers manage their plant genetic resources in an integrated and adaptive fashion. Plants are planted and harvested with multiple purposes such as to produce for household consumption and other on-farm uses, for marketing and to produce seeds, roots, tubers or stems for next season planting. The exchange and adoption of seeds is another element that adds to the dynamism of this system. Seeds are exchanged with friends, relatives, or via merchants. Farmers may also use produce meant for consumption as seeds or other way around, usually if no other opportunity exists."[174]

---

[172] Presentations by Dr. Shiva to nearly 300 assembled farmers, 17 December 2010, at JNP, Dewathang, and to an audience of 500 at the SJI Launch at CGI, Dewathang, 19 December 2010.
[173] Cribb, p. 117.
[174] National Biodiversity Centre, *Op. cit*., pp. 5–6.

Seeds drying in sun, Rikhey village, Dewathang Gewog

In Orong Gewog, one villager noted:

> Until now we have been saving seeds ourselves in a traditional method but with the development taking place in our country, the government has started giving us new seeds which are brought from other parts of the country. They have given us seeds for maize, paddy, and vegetables too. With these new seeds supplied by the government, we are not leaving our traditional methods for saving the seeds; yes we do continue that at the same time. It is benefitting us from both sides.

According to Gomdar's Agriculture Extension Officer (AEO), seed saving is currently underway there:

> We have started a community-based seed bank and very recently I have collected the baseline data and submitted it to the RNR [Renewable Natural Resources division]. There were very few farmers that grow finger millet, foxtail millet, and there is also maize—they have only two types now because the farmers from my understanding are using less varieties. That is in case of chera, that's a type of

millet. Now only one or two farmers grow it. Before most of the farmers grew it, now only few farmers."[175]

As a way to ensure that many traditional seed varieties are not lost, there is now a growing movement of seed saving in rural areas worldwide, which was pioneered by Dr. Vandana Shiva's farmer organization *Navdanya* in India. Saving seeds is a key way for farmers to maintain indigenous biodiversity. Navdanya will be working with the Chokyi Gyatsto Institute in Dewathang to set up the region's first community seed bank.

In 2008, Bhutan's Department of Agriculture initiated what it called "a seed improvement program" through "Community Based Seed Production." Essentially, farmers were trained to plant and produce seed varieties they prefer themselves in their own locality. However it appears, from the case study outlined in the Department's project description, that the maize seed variety being produced was *Yangstipa,* which is not a "local" or traditional landrace type, but rather the high yielding type.[176] If the Department of Agriculture were to broaden this project to include landraces, then it could be a highly beneficial and productive way to conserve agricultural biodiversity in the country.

2.3.5 Mixed farming, intercropping

Traditional farming systems are based on mixed or rotational cropping systems characterized by a diversity of crops: cereals, pulses, oilseeds, and with diverse varieties of each crop. Attention is paid to what was planted in one location before, and what will come next. Care is taken not to plant the same crop in the same location as it could drain the soil of certain nutrients. A variety of crops is often planted together because they are mutually beneficial. For example, lentil would be planted with maize because lentil will fix the nitrogen in the soil and maize will provide the structure on which the lentil will climb. The lentil will also provide good leaf cover to keep moisture in the soil. Similarly, maize and sweet potato might be grown together because the harmful insects attracted to one crop are driven away by those attracted to the other.

By comparison, industrial agriculture is based on a monoculture. As previously stated, a biodiverse, mixed farming, intercropping system minimizes risks and maximizes productivity, and at the same time decreases food insecurity for families. By comparison, write Shiva and Pandey, "while monoculture may allow for high yield of a single commodity, it subjects a farmer to a higher risk of crop failure, more dependent on costly inputs, higher vulnerability to market forces and drives households to nutritional insecurity."[177]
An analogy would be to compare a mixed forest with diverse age class and species composition to a plantation of one species and age class. Not only have plantations been proven to be far less productive in terms of volume of fibre per hectare, but they are also

[175] According to the Gomdar AEO this seed bank project is funded by the UNDP.
[176] T. B. Katwal and Sangay Wangdi. Community Based Seed Production (CBSP) benefits farmers in Broxsar, Saleng Mongar. Department of Agriculture.
[177] Shiva and Pandey, p. 61.

prone to being decimated by disease and infestations.[178] Similarly, mixed farming systems are not simply production systems, they are also ecological systems that maximize productivity when properly respected and conserved.

Crops planted together in a mixed planting system

A discussion regarding all the crops that could be grown in Samdrup Jongkhar, as well as how they could best be intercropped, is beyond the scope of this study, but certainly within the scope of the ongoing training and consultations with Dr. Vandana Shiva's farmer organization, Navdanya, and its farmer trainers who are presently coming to Samdrup Jongkhar four times a year to conduct farmer trainings.

(Please refer to Appendix for Navdanya's Annual Crop Calendar. It is also recommended that a crop calendar be developed for farmers in Samdup Jongkhar)

2.3.6 Labour scarcity and organic farming costs

One of the key concerns that came up regularly during field research involved labour shortages in general and the perceived increase in labour required when farming

[178] Please see GPI Atlantic. The Nova Scotia Forest Accounts, Volumes 1 and 2. Available on the GPI Atlantic web site at http://www.gpiatlantic.org.

organically. This question was raised during field research and was directed to Dr. Vandana Shiva and her farmer trainers during and after the SJI Launch in December, 2010.

According to Dr. Shiva, when organic farming is employed, all other species are working with the farmer, sharing the farmer's work burden: "Nature will control pests in a system that is in equilibrium." In chemical monoculture farming, she says, there is typically a peaking of labour demand (i.e. during planting or harvest). But in an organic mixed system "there is light work throughout the year, not peaking at one or two times. So labour scarcity really is a created scarcity, because everyone needs labour at the same time" in monoculture systems.[179]

Rural migration does create real labour shortage issues, says Shiva. But this shortage can be solved through "community enterprise." "Communities can come together when there isn't enough labour." Shiva gives the example of building compost: "Not every farm has to have its own compost. There could be a communal compost with a young person helping to run it and supplying the soil back to the farmers."[180]

Interviews with Dr. Vinod Kumar Bhatt and D.S. Negi—two of Navdanya's top farmer trainers—indicated that, in the first one or two years of a farmer switching to organic methods, the labour required will be higher. This is because manual removal of weeds and pests takes longer than applying chemicals and learning new techniques, and organic fertiliser systems also take time to work and have effect. But, they say that one these techniques have been used, the labour required will start to decline. "As years pass, you will require less and less labour," they say. So farmers should not compare the amount of labour required between organic and chemical farming systems in the first year alone, but they need to compare labour requirements at 5 years and then 10 years:—Only then the comparison is valid, they say. Labour requirements also depend on the state of the soil. In other words, if the soil is highly degraded, after years of chemical fertiliser application, for instance, then it will take longer to rehabilitate.[181]

During field research, farmers often said that they couldn't sell their more expensive organic produce because food from Assam is so much cheaper:—They argue that the labour costs are higher in Bhutan, and higher yet again to produce organically. According to Navdanya farmer trainers, as noted above, this increased labour cost for organic production is indeed possible in the first 1–2 years for the reasons described above, but after that, the organic techniques will result in less work.

Bhatt and Negi also noted that the organic movement is market driven, and that there is really no reason why organic produce should inherently cost more. They argue that

[179] Dr. Vandana Shiva, presentation to the SJI Launch, 19 December, 2010, Chokyi Gyatso Institute, Dewathang.
[180] Ibid.
[181] Interviews with Dr. Bhatt and D.S. Negi, on which this and the following paragraphs are based, took place at the Chokyi Gyatso Institute and Jigme Namgyel Polytechnic, Dewathang, during farmer trainings they offered on 21-26 December, 2010.

organic produce currently costs more because all the risk and expense (in transport, fancy packing, certification costs, and more—which can add up to Ru.150,000 for a farmer with an average small holding) is taken by the farmer, and there is no subsidy provided for any of this. Thus, the farmer incurs more cost in the marketing of his organic produce. But without any of this packaging or marketing, they argue, and especially with a PGS (participatory guarantee system of certification) rather than expensive third-party certification on the European/North American model, the organic produce—which did not require any expensive input costs—should not cost more. In other words, the increased cost for organic produce is not inherent in the fact that it is organic. On the contrary, organic avoidance of expensive fertiliser, pesticide, petroleum, and other purchased inputs, reduce organic farming costs and make it highly competitive with conventionally (chemically) farmed produce.

2.3.7 A healthy world diet

In the apocalyptically titled book *The Coming Famine,* author Julian Cribb sets forth a diet that is sparing of energy, land, water, and other inputs. Based on data collected by the World Vegetable Center, he explains that vegetable production actually yields more food for a given area of land than legumes, cereals, or meat production:

> Using the same land area, you can obtain twelve times more food from vegetables than from legumes and five times more food than from cereals. If you factor in the amount of grain needed to produce meat, a single hectare of land can produce 29 times more food in the form of vegetables than in the form of chicken meat, 73 times more than pork, or 78 times more than beef.[182]

Cribb goes on to say that in terms of small enterprises for farmers, vegetable production is actually ideal, especially where land is in short supply.

However, according to Cribb, vegetable production does require more labour inputs, which, he explains, is also conducive to a place where there is an abundance of people, but where resources are scarce. Two key benefits of vegetable farming put forward by Cribb and the World Vegetable Center are:

- Vegetable production is more sparing of its use of water—an increasingly scarce and valuable global resource. For example, the water needed to produce one kilogram of beef can grow 91 kg (200 pounds) of tomatoes or 175 kg of cabbages.
- Vegetables can help overcome malnutrition: They contain higher levels of micronutrients such as Vitamins A and C and folates than other food types, whereas cereals, legumes and meat contain higher levels of macronutrients (carbohydrates and protein) and minerals such as iron per gram. When the efficiency of land and water inputs into vegetable production is calculated, however, vegetables yield more energy, protein, vitamin A, and iron than meat

[182] Cribb, *Op cit.*

> per unit of land and water used. For the same area of land, vegetables yield slightly more iron than cereals, comparable levels of protein, but only half the energy yield. Legumes, however, produce much higher energy, protein, and iron than vegetables per unit of cultivated land. So a well-balanced diet is one that combines vegetable and legume consumption. Considering all the evidence, experts agree that vegetables play a key role in overcoming micronutrient malnutrition.

According to Cribb, doubling the proportion of vegetables grown, and making use of the many indigenous vegetables that have been forgotten in many places, are ways of improving the health and the viability of small farms, especially within an ecological system where water, land and energy are becoming scarce.[183]

[183] Cribb, Julian (2010), pp. 189-192.

Chapter 3. Markets that Work for Farmers

> *Globalizing the market has effectively transferred control of farming away from the farmer, and into the hands of those who can shape that market.*
>
> — Raj Patel[184]

> *The key to restructuring the global economy is... to get the markets to tell the ecological truth.* —Lester Brown[185]

The dozen or so shops in the small town of Dewathang sell a limited assortment of items. On most days in the winter, you find the basics: radish, potatoes, cabbage, onions, eggplant, green beans, tomatoes, garlic, ginger, bags of dried fish, and fresh coriander. There might be eggs and there's always doma. But if you ask for local produce, it's near impossible to find—occasionally bags of fresh picked mushrooms, a batch of surplus sag from someone's garden, some spring onions or some crab apples appear. Sometimes the tomatoes, chillies, or lima beans are local. But overall, not 5% of what's for sale is local. For the most part, even the local orange crop seems to bypass this market—heading straight for the auction yard at the border. Despite being surrounded by crop-producing villages, most of the fresh goods in Dewathang stores are from India, and anything packaged and processed (which is everything

Shops in Dewathang

[184] Patel, Raj. 2007. *Stuffed and Starved. The Hidden Battle for the World's Food System*. Harper Perennial. Toronto. p. 41.

[185] Brown, Lester. 2001. *Eco-economy: Building an Economy for the Earth*. Washington, D.C.: Earth Policy Institute.

else) is from somewhere else.

Shop-keepers and villagers all say that the vegetables in Dewathang are bought in Samdrup Jongkhar or at a lesser cost directly from market vendors in Darranga, India, and then resold in Dewathang at a slightly marked up price. To save some money, most villagers opt to go to Samdrup Jongkhar or into India themselves for their groceries. The mystery about why there isn't more local, Bhutanese produce being sold isn't actually that much of a mystery—in the summer there is so much rain that growing vegetables is very difficult, and in the warm but dry winter season when things grow well (if there is access to water), local produce can't compete with the inexpensive offerings from just across the border.

Most of the food that Bhutanese buy in Darranga is grown in industrial, chemical farms on the Assam plains by impoverished Assamese labourers paid rock bottom wages. But whatever doesn't grow seasonally in Assam comes from elsewhere. Cheap, chemically grown produce is shipped in to Guwahati from other parts of India by the truck load, and thence to Darranga, just across the Bhutan border. So the Darranga markets are overflowing with a wide variety of cheap produce, and swarming with Bhutanese customers. One thing is for sure: what everyone seems to be after is cheap food.

According to Bill McKibbon, in his book *Deep Economy,* there are essentially three reasons why food is cheap: a) the real costs of producing it are externalized; b) oil is still cheap and c) industrial chemical farms (like the ones in Assam) are heavily subsidized.[186] He says the "deepest problem that local-food efforts face is that we've gotten used to paying so little for food." But as previously noted, cheap, industrially produced food comes with real costs—the loss of local family farms means loss of farm communities and lots of displaced farmers; there are health costs associated with using pesticides and eating food laden with pesticide residues; there are costs associated with cruelty to animals in factory farms; and there are enormous environmental costs, including soil loss, degradation, and erosion, water pollution, greenhouse gas emissions, and fossil fuel depletion to name just a few. If these *real* costs were included in the price of food currently imported to Bhutan from Assam, no one would be able to afford it.

Secondly, says McKibbon, "we've substituted oil for people." Since the Second World War, it has been cheaper to use oil than people. And industrial farming depends on fossil fuels for everything from manufacturing the chemicals and fertilisers to running the machines and transporting the produce long distances. Without fossil fuels, the current food system (including what Samdrup Jongkhar residents currently import from Assam) would collapse. And, with fossil fuels running out, this will initially mean higher food costs in the future, and later the actual disruption of food supply lines and food shortages. Either way, it's not a dependency that should be supported. Unless local food efforts in

[186] Kibbon, Bill. 2007. *Deep Economy. The Wealth of Communities and the Durable Future*. Henry Holt and Company. New York.

Samdrup Jongkhar are supported now, residents will likely be seriously vulnerable to supply cuts and shortages later.

Cuba is a good example of what happens when oil supplies actually dry up: During what Cubans euphemistically called the "Special Period," after the Soviet Union collapsed in 1991, Cuba also became an isolated economic island, still subject to full embargo from the United States. During the Soviet era, Cuba's oil was supplied by the USSR, and its food either came straight from Eastern Europe or it was grown in Cuba on big industrial-style state farms. Like all conventional farming systems, these large Cuban industrial farms required lots of fossil fuels, fertilisers, and pesticides, which were suddenly no longer available when the Soviet Union collapsed.

In response to this sudden crisis, Cuba's choice was to starve or drastically reform its entire food system. So what Cuba did was stop exporting sugar—the sugar cane industry was huge, and as mechanized and fossil-fuel driven as you can get—and the country started growing its own food organically. According to McKibbon, Cubans grow as much food today as they did before the collapse, and "have created the world's largest working model of semisustainable agriculture."[187]

In the end, although not without serious disruption and hardship, a centralized 'command economy' like that of Cuba was able to respond effectively to the sudden disappearance of fossil fuel supplies, and to change its entire production system dramatically. A democratic, market-driven system like that of Bhutan may not respond as readily to the imminent global crisis of 'peak oil', with its inevitable concomitant supply line disruptions. Rather, Bhutan will ameliorate future hardships and benefit greatly by sharply increasing its local food self-sufficiency and minimizing its fossil fuel dependence while present times allow a more effective, gradual, smooth, and timely adjustment to the post-peak oil period. It is a key goal of the Samdrup Jongkhar Initiative to demonstrate how this transition can happen in the most benign way.

Another benefit noted by McKibbon of not using big fuel-dependent machines—more applicable to heavily populated regions than to Bhutan—is a requirement for more people. "The small farm grows more food per acre, but only because it uses more people per acre," says McKibbon.[188] So, there are employment benefits to having more small farms. Vandana Shiva agrees. She says our most productive form of agriculture is not the modern tractor-serviced, big field monocultures, but multiple crop, manual-labour intensive smallholdings.

Despite its much sparser populace and the labour shortages that inhibit farmers, as described above, this analysis by McKibbon and Shiva is not irrelevant to Bhutan for two reasons. Firstly, as noted by Bhatt and Negi above, organic farming labour requirements are greatest in the first year or two of transition. But secondly, and even more

[187] McKibbon, p. 73. McKibbon calls it 'semi-sustainable' because Cuba also has embraced the questionable use of biotechnology, the environmental and health impacts of which are not yet known.
[188] McKibbon, p. 67.

importantly, the McKibbon-Shiva analysis refers to farming efficiency altogether, of which labour is only one part.

Thus, Dr. Shiva cites abundant evidence to show that when farms get bigger, overall productivity drops. The most recent Worldwatch Institute's State of the World report found the same.[189] Even the United States Department of Agriculture (USDA) found smaller farms produce far more food per acre, whether you measure it in tons, calories, or dollars. As Brian Halwell of the Worldwatch Institute notes: "They use land, water, and oil much more efficiently…. In terms of converting inputs to outputs, society would be much better off with small-scale farms."[190]

Using examples from the United States, McKibbon points to the third reason why industrially produced food is cheap: subsidies. He says that almost 2/3 of all federal farm payments in the United States go to the largest 2% of farms:

> It's all politics. The farm program subsidizes those crops that are geographically concentrated in a few states, and in essence, have their own senators: wheat, corn, cotton, soybean, and rice growers get virtually all the federal subsidy payments. There is no butternut squash subsidy, no apple subsidy. And since big farmers quickly figured out that there was more money to be made 'farming the program,' the nation's croplands soon reflected the politics of subsidies just as much as the reverse.[191]

In other words, if a crop does not qualify for a subsidy, farmers in the U.S. don't grow it**.** If these subsidies were eliminated (or shifted to low-input farming) the food production system would change dramatically.

According to McKibbon, if strong local food networks develop further, then prices for local organic food will keep coming down as middlemen are eliminated. Food bought directly from the farmer is comparable to the price in the grocery store, but the farmer gets much more of the money. There's a huge margin that could be eliminated, making it possible for local food to work for everyone. This parallels the complaint of Lauri Gewog chirata collectors noted above that middlemen and traders are making most of the profits from sales of this highly valuable product, and that the price Lauri villagers get (Nu 260/kg) is only a fraction of the product's true worth and market sale price.

According to Raj Patel, power in the food system is held in only a few hands. He uses an hourglass figure to illustrate this: At one wide end there is a "superabundance" of farmers and producers, and at the other wide end are the mass of consumers willing to buy the produce, but the "bottleneck" happens in the distribution chain:

---

[189] Worldwatch Institute. 2011. State of the World 2011. Available online: http://www.worldwatch.org.
[190] Halwell, Brian. nd. "Where have all the farmer's gone?", Worldwatch Institute. http://www.worldwatch.org/node/490.
[191] McKibbon, p. 87.

> We've ended up at a world with a few corporate buyers and sellers. The process of shipping, processing and trucking food across distances demands a great deal of capital – you need to be rich to play this game. It is also a game that has economies of scale. This means that the bigger a company is, and the more transport and logistics it does, the cheaper it is for the company to be in the business. There are, after all, no mom-and-pop international food distribution companies. The small fish have been devoured by the Leviathans of distribution and supply. And when the number of companies controlling the gateways from farmers to consumers is small, this gives them market power over the people who grow the food *and* the people who eat it.[192]

Patel uses the example of coffee growing in Africa to illustrate this bottleneck and mal-distribution of power, but he says the same applies to a wide range of other foods all over the world. Although we did not have the resources for this report to trace specific supply and distribution systems in Assam, Patel's analysis here is almost certainly true of the supply chains that bring Indian food to the Darranga market for Samdrup Jongkhar and Bhutanese consumption. Future research should investigate more closely the degree to which Patel's following example applies to the Assam-Samdrup Jongkhar food trade and food system.

Today, Patel notes, most coffee farmers are struggling to survive. At the mercy of fluctuating world prices and a global coffee surplus of 900 million kilograms, they keep growing coffee even when it makes more sense for them to stop. One coffee grower in Uganda might typically sell his beans for 14 cents/kg to a middleman who turns around and sells it to a mill for 19 cents. By the time the coffee is processed (de-hulled), bagged, and transported, it's reached 26 cents/kg. The exporter isn't making the big profits either – usually only one cent per kilogram. But then the coffee is shipped to a roaster. By the time it lands in West London, where Nestle has a large coffee-processing facility, it will cost $1.64/kg. "Already at the gate of the Nestle factory, the cost per bag is well over ten times what the farmers received for it. But here comes the big jump. By the time the coffee rolls out of the other side [of the Nestle factory], the price is US$26.40/kg, or nearly 200 times the cost of a kilogram in Uganda."[193]

> While coffee farmers are living off their savings, Nestle's profits seem unstoppable. In 2005 they sold over US$70 billion in food and beverages. With high levels of brand loyalty, and with such market dominance, Nestle is in a position to raise the price that its growers receive. But why would it choose to do that? Nestle isn't a charity – it's a corporation in a world of other corporations, guided by the cardinal rule of market capitalism: 'buy cheap, sell dear.'[194]

Farmers dependent on this free market system have little if any power, and are typically struggling with little in the way of choices. Thus, during our field research, Samdrup Jongkhar farmers frequently expressed their inability to compete with cheap food from

[192] Patel (2007), pp. 11–13.
[193] Ibid. p. 10.
[194] Ibid. p. 11.

Assam, but had little if any understanding or knowledge of what makes that food so cheap, and they certainly had no power or control over the situation with which they have to deal, and which currently stops them growing more. This dependence on the so-called "free" market system, also makes farmers—in Samdrup Jongkhar, Assam, and elsewhere—highly vulnerable to a number of shocks that are also beyond their control.

According to the World Food Programme, Bhutan is not spared the external shocks that affect the market:

> [Bhutan] is prone to many kinds of natural, economic and political shocks. Monsoon flash floods, landslides, hailstorms, windstorms, crop damage by wild animals and pests, inflation, market closure due to ban on movement of commodities, strikes and lockouts etc. lead to fluctuations in market as there is a direct relationship between the market price of goods with seasonal variability and shocks. During periods of shocks, prices are usually unstable, making consumers pay higher than normal market price.[195]

The global food crisis of 2007-2008 is a case in point. A dramatic increase in world food prices—by 217% for rice, 137% for wheat, 125% for corn—caused the cost of some staple food items to skyrocket. In Thimphu, the cost of rice per kg nearly tripled overnight. Major rice producing and exporting countries imposed strict bans on rice exports. Initially, India stopped selling rice to Bhutan, which only produces 50% of its own current demand, but this decision was reversed and rice continued to be supplied to Bhutan. This story illustrates an important point—not only the serious and sudden vulnerability of Samdrup Jongkhar and Bhutan to potential food supply line disruptions but also, conversely, that greater self-sufficiency can greatly helps to protect against external market forces.

Even more importantly, the 2007–08 global food crisis raises another crucial question with which Samdrup Jongkhar and Bhutanese residents will have to deal in the future in the absence of greater food self-sufficiency: With record world grain harvests in 2007, why was there a food crisis at all? According to the World Food Programme: "There was food on the shelves but people were priced out of the market."[196]

This question brings us right back to Raj Patel's hour-glass figure: He cites world-renowned economist Amartya Sen, who has observed that modern famines are not related so much to the absence of food as to the inability to buy it. During so-called food shortages, which often result in famines, there is usually lots of food around, says Sen. Those who have it hoard it, "knowing that less food means higher food prices." In other

[195] World Food Programme. "Livelihoods: Vulnerable Profiles." Information from 2007 BLSS. http://foodsecurityatlas.org/btn/country/access/livelihoods

[196] World Food Programme Executive Director, Josette Sheeran, quoted in *Bhutan Observer* Focus article: "Rice Crisis Redux: Could Bhutan be cut off again? Food and Nutrition Security", Volume 3, no. 12, December 10–17, 2010.

words, the bottleneck—how food is distributed—is the problem. Patel concludes: "The hour-glass shape of the food system is almost certain to deliver not food, but hunger.[197]

That is a scenario that Samdrup Jongkhar and Bhutan will want to avoid at all costs, yet Samdrup Jongkhar's current very heavy dependence on Indian food means that it is far from immune to the frightening scenarios that Sen and Patel outline. Certainly any move at all towards greater food self-sufficiency is insurance against such possibilities.

In Bhutan, accessing markets is difficult at the best of times. Poor infrastructure, such as inadequate roads and storage facilities, as well as lack of adequate and reliable supply, are big obstacles to food security, particularly in more remote regions of the country, some still with no road access. Samdrup Jongkhar Dzongkhag is relatively isolated from the rest of Bhutan, particularly domestic markets in Thimphu and Paro,[198] but in terms of accessing a market, it is very close to one of the world's biggest markets—namely India. This reality makes Samdrup Jongkhar even more vulnerable than other parts of the country, since the dzongkhag is not easily supplied from other domestic markets in the event of international food supply line disruptions. India's temporary 2007 rice export ban may have been a useful warning signal.

The question then is: What kind of market can farmers in Samdrup Jongkhar rely on to work in their best interests? Vandana Shiva raises this point frequently in her work with farmers in India, and she applies the lessons unequivocally to Bhutan and to Samdrup Jongkhar. In her keynote address to the Samdrup Jongkhar launch in December, 2010, Dr Shiva counselled Samdrup Jongkhar and Bhutanese farmers to "look at the market *inwards*" rather than have the market dictate what their farms should look like. "A self-reliant marketing strategy looks at three things: it first looks at what grows well without damaging the environment; then at what adds to food security; and third at what is economically beneficial."[199] Dr. Shiva argues that, in sharp contrast, a marketing strategy that creates dependence (and vulnerability) for farmers allows big business to determine and mandate what the farmers will grow and sell, and it puts them firmly on the treadmill of using costly inputs.

Dr. Shiva told an assembly of nearly 500 Samdrup Jongkhar farmers the story of the Punjab in India. Farmer after farmer there has taken his life because of the burden of debt from buying machinery and chemical inputs his family could not afford. In this case, says

[197] Patel (2007), pp. 129–130.

[198] Samdrup Jongkhar may potentially benefit from recent initiatives to improve domestic market access. In 2006, for example, the International Fund for Agricultural Development (IFAD) initiated the Agricultural Marketing and Enterprise Promotion Programme (AMEPP) in partnership with the Kingdom of Bhutan. AMEPP has a total budget of $US19.6 million and will be completed in June 2011. In January, 2009, IFAD identified a new project, titled the Market Access and Growth Intensification Project (MAGIP) that is comprised of four components: Market Access Development; Pro-Poor Support; Growth Intensification; and Management. This project has recently incorporated an irrigation component focused on two gewogs in the Bhangtar region of Samdrup Jongkhar that are assessed to have some of the greatest potential for irrigation development in Bhutan.

[199] Unless otherwise indicated, all quotes by Dr. Vandana Shiva in this section are from her presentation given December 19, 2010, at the SJI Launch, Chokyi Gyatso Institute, Dewathang.

Dr. Shiva, growth was a "false measure of prosperity." This tragic outcome, she notes, came to countless numbers of farm families in India who lost a say in their farming enterprise. Their reliance on external and corporate market deprived these farmers of the ability to decide the direction they wanted to go in—a direction that would have ultimately been much better for their wellbeing. Instead, the direction of their farms was determined by what Dr. Shiva calls "globally integrated and industrially organized agriculture," in which she says there is no relationship between price and the cost of production.[200] Dr. Shiva remarks that cheap farm produce is "totally a result of exploitation, not a result of efficiency." Monopoly control of the market allows farmers to be exploited by traders, she says.

By contrast to this external market dependence, Patel defines a genuine vision of *food sovereignty* as the "right of farmers to produce food, and the right of consumers to be able to decide what they consume, and how and by whom it is produced…and with the recognition of the rights of women, who play an important role in agricultural production and in food."[201]

A food secure and food sovereign Samdrup Jongkhar is one of the explicit, stated goals of the SJI, and has been repeatedly emphasized in various ways by Dzongsar Khyentse Rinpoche in launching the initiative.

In furtherance of this objective, Navdanya scientist, Dr. Vinod Bhatt, and leading Navdanya farmer trainer, D.S. Negi, as well as Miguel Braganza, Ashish Gupta, and Vikram Rawat of the Organic Farming Association of India, have all advised Samdrup Jongkhar farmers to see the market expanding in concentric circles from the inside towards the outside. Their first objective is to grow enough and varied food to feed themselves and their families. Then they can aim to supply local markets in Samdrup Jongkhar (including stores in the local bazaar and local institutions like hospitals, schools, monasteries, JNP, and army bases).

Then, when Samdrup Jongkhar can feed itself, should farmers look to wider national markets elsewhere in Bhutan—such as hotels in Bumthang that will supply only organically grown domestically grown food to tourists? Finally, when these local and national markets are supplied, farmers might choose to grow certain select high-demand crops for niche international markets—catering for example to needs such as the high European demand for buckwheat that is needed to meet particular nutrient deficiencies there, or the growing urban Indian middle class demand for organic food.

A thorough investigation into market access with all the constraints facing farmers and others is beyond the scope of this study. What is presented here is a preliminary investigation into key issues and challenges faced, and into some of the possible models that could work in Samdrup Jongkhar. Monitoring the transition to organic farming in the coming year will include a specific focus on market access, as well as on crop output, farm economic viability, soil quality assessments, and other indicators, which are

[200] Ibid.
[201] Patel, 2007, p. 302.

presented in greater detail in Part 2 of this study. In sum, market issues will be seen in the Samdrup Jongkhar Initiative as part of an integrated agricultural strategy to improve food security and self-sufficiency in the region.

3.1 Market constraints faced by S/J farmers and others

The 12 km of rough and winding farm road leading to the villages of Orong Gewog was built only a decade or so ago. Yet, despite the road, many Orong villagers still walk the 2-3 hour trail to get to and from Dewathang, along the river, with orange-filled bamboo packs destined for the Dewathang market. The road is used for more distant markets. When we visited Orong, orange-growers were gathered near the road with sacks full of mandarins—being picked up by a truck and taken to be sold at the auction in Samdrup Jongkhar.

Citrus convoy, Tsangchello, Gomdar Gewog

Farmers in Samdrup Jongkhar Dzongkhag obtain market access in essentially three ways: they travel themselves to Samdrup Jongkhar town to sell at the local or weekend market; they sell to a broker or middleman at farmgate prices who in turn brings their produce to the Samdrup Jongkhar town market or to India for them; or they sell to an auction yard.[202]

It is often the logistics of transporting perishable produce over very rugged terrain that creates the biggest hurdle for most farmers in getting their produce to market. For instance, in remote Lauri Gewog, villagers explained that, because they have no road, *naspati*, a kind of apple, would usually go bad on the two day journey to Daifam. So, rather than take this risk, they simply feed the apples to the cattle.

[202] Support to Development of Farmer Groups' Enterprise in Eastern Bhutan, Dr. Udyog Subedi, SNV Consultant, Ministry of Agriculture and Forests, Royal Government of Bhutan, December 2009. www.moa.gov.bt/moa/downloads/.../MoADownload7xt3860xg.pdf. p. 26.

Transportation is also the biggest challenge reported by shopkeepers in Bhangtar (Phuntshothang). According to one Bhangtar shopkeeper:

> Nearly all the goods sold in these shops come from Samdrup Jongkhar, which is 60 km away. The costs for hiring vehicles are Nu. 1,500 per day for a light vehicle and Nu. 4,000 per day for a truck. Most shopkeepers have their own vehicles. Generally, they obtain transport for their own shop only, though sometimes they cooperate for very large orders.

Apart from the rice, which is grown locally, and some vegetables, purchased at Bhangtar's Sunday market from farmers travelling from neighbouring communities and gewogs, everything in the shops originates from India, the shopkeepers report.

Another challenge identified by one business owner and community leader in Bhangtar is the MRP (market-regulated price) of food. These prices are set by the government and trading industry and he says do not take into account the cost of transporting food to remote communities. Merchants are not allowed to sell above the MRP, which means that the profit margin on some products is small to non-existent.

In Bhangtar, there is a tasty and highly popular variety of rice grown called *Khampti*. People from as far away as Thimphu want it, but farmers are having troubles marketing it. According to one shop-keeper:

> They [the farmers] were not able to sell their rice and they were not able to find the right market. So in 2009 I took a little bit of risk, since there were no cash crops, but this rice was popular, but nobody was there to market it. So I took up the risk and I took the rice to Thimphu, but before I took the rice to Thimphu, I made fifty percent of the payment to the people, and they were quite satisfied, they were quite happy. So now this year I thought of doing the market, but again there are some problems. Because now people are trying to mix the rice varieties, so the consumers, they don't like that, naturally.

According to the shopkeeper, this initial venture to Thimphu was supported by the Department of Agriculture, which assisted not only with transporting the rice to Thimphu but also supplied the bags. But efforts to continue the sale of rice to the Thimphu market have stalled because "in order to make more quantity, the farmers are mixing the khampti rice with other rices, and the consumer knows this very quickly." Another problem is that the farmers are raising the price from 30 Ru/kg to 35 Ru/kg and consumers are not happy about it. "Increasing the price is actually harming the group. Our government can't control the price. Controlling the price we have to do. So because of the price, I cannot take the rice to Thimphu market."

Another constraint reported by farmers is the frequency of strikes in Assam and West Bengal, which often close the shortest overland route to Thimphu via Phuentsholing, and which therefore force farmers to transport their produce via lateral highways (through Bumthang), which takes longer and therefore proves to be even more expensive. The

strikes also result in delays, which can spoil perishable produce. It was not possible to assess with any degree of accuracy the frequency of strikes in Assam and West Bengal. However, during our field research period, such strikes did appear to be a weekly occurrence.

In Orong, many of the farmers also produce butter and cheese, which is sold for them by the Dewathang Milk Marketing Cooperative in exchange for 1 Ru per ball of cheese and 10 Ru per pack of butter. But the milk producers of Orong say their particular challenge is marketing—and they report having trouble selling their cheese and butter. In the summer, when there is a lot of fodder for the cows and when milk production is correspondingly high, the supply exceeds the demand, and excess butter and cheese go bad after 6-7 days without refrigeration. In the winter they don't produce as much of either, and what they do produce they consume themselves. The Orong farmers report:

> We cannot sell our products very well. Last time we took 1,000 pieces of cheese to the milk booth at Samdrup Jongkhar, but they were refusing to take it all. In this way we are having lots of problem in marketing. It was worse last time—we took 5,000 pieces of cheese from Orong and Wooling and there [in Samdrup Jongkhar town] we were faced with lots of problems. We could not sell it."

The farmers in Orong are looking for a solution: either finding a bigger market so they can sell their cheese and butter before it deteriorates, or finding a way to better refrigerate the products so the shelf life is longer.[203]

[203] The DMMC recently got a deep freezer, but it may be that the local people are not interested in purchasing frozen cheese and butter.

Orange auction in Samdrup Jongkhar town

According to a recent study conducted on behalf of Eastern Bhutan's farmers' groups, the physical movement of products in Bhutan produce high "transaction costs" that influence not only production but the growth of farmers' groups. According to the study, there are three areas that "are crucial to be addressed" — time, space, and form. This means the consumer is able to buy produce "(i) at different time from its harvest and sale by farmers (ii) at different place from its point of sale by the farmers which involves various aspects of transportation and storage of the produce (iii) in different forms (e.g. corn flake) as compared to its original form (maize grain)."[204]

Table 11 lists strategies to improve marketing of agriculture produce in Eastern Bhutan, as recommended by this study.

[204] Dr. Udyog Subedi, SNV Consultant. 2009. "Support to Development of Farmer Groups' Enterprise in Eastern Bhutan", Ministry of Agriculture and Forests, Royal Government of Bhutan. http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload7xt3860xg.pdf.

Table 11. Strategies for improving marketing of agricultural produce

Marketing Dimensions	Suggested Marketing Interventions to Strengthen Farmers Groups
Improve "time" dimensions	• Improve storage across seasons through improved post harvest technologies at farm household level • Improve storage across years through pocket storage facilities with capital investment from the government and subsidies for costs for using such storage by farmers • Institute a system to provide timely price information to the farmers' groups
Improve "space" dimensions	• Improve transportation through support for improving road accessibility (feeder roads) to minimize transaction costs • Improve storage facilities to minimize loss and transaction costs • Provide subsidies for licensing and taxation for marketing groups related to agricultural produce • Provide subsidies for delivery systems for produce where private or local markets in the farm locality are non-existent • Work towards linking the similar types of farmers' groups and develop a local network so as to share experiences and improve on their marketing through collective ventures
Improve "form" dimensions	• Improve and impart direct processing technologies such as cleaning, sorting, labelling, packaging, and processing • Diversify activities of the groups towards feasible products with advanced processing and packaging (e.g. advanced technology for butter and cheese processing and packaging, with diversification of products such as yogurt, canned butter) • Support machines or equipment that are economically efficient in terms of group activity and size and incur low maintenance costs

Source: Dr. Udyog Subedi. SNV Consultant. 2009. "Support to Development of Farmer Groups' Enterprise in Eastern Bhutan", Ministry of Agriculture and Forests, Royal Government of Bhutan.

3.1.1 Connecting buyers with farmers in Samdrup Jongkhar

In Dewathang there are four large institutions that once or twice a week purchase large quantities of fruit and vegetables: the Chokyi Gyatso Institute for Buddhist Studies, the Jigme Namgyel Polytechnic, the Military Hospital, and the Army base. Currently, nearly 100% of what they purchase originates from India. With the exception of the hospital, buyers from each of the institutions travel once or twice a week across the border into India (approximately 20km one-way from Dewathang) to procure food items. In the case of the hospital, where they can't plan ahead and needs depend on the number of patients, produce is purchased two to three times a week from the Dewathang market, where the food also comes from India.

Dewathang shop-keepers also cross-border shop and resell produce at a slightly marked up price to customers in Dewathang. For instance, one Dewathang shop-keeper said that he raises the price of produce by between Nu. 3–10 per kilogram, depending on the item. When spoilage is factored in (approximately 25%), he's not making any money.

"Providing vegetables to my customers is like a service," he says. In his case, the vegetables attract the customers to his shop because they are a daily requirement, and he makes money on the other things he has on offer.

Currently there is no real mechanism for farmers in Samdrup Jongkhar to sell their produce to the local institutions. Firstly, the institutions require a certain reliable quantity on a weekly basis and individual farmers are generally unable to meet this demand. Also, the cost of transporting goods is very high, again an obstacle when farmers are working alone. As will be discussed below, the formation of groups or cooperatives, can help farmers to provide and market their produce to these institutions as well as to local customers.

Field researchers informally surveyed the 4 institutions listed above, as well as the largest vegetable vendor in Samdrup Jongkhar town to find out what they buy from India and in what quantities each week. Kitchen managers from each of the institutions were also asked for their monthly food budget. These findings are summarized in Table 12 below, and will be used in the coming months as baseline data to measure progress towards buying local. Indeed, the key purpose of this survey was to assess the potential for shifting from imported to locally grown food—a key, explicit objective of the SJI emphasized by its founder, Dzongsar Khyentse Rinpoche, as a way to enhance local self-reliance. Thus, using these baseline data, an important indicator of SJI success and progress will be gradual movement towards greater local production and consumption.

Informal surveys conducted on the Indian side of the border—approximately 2 km from Samdrup Jongkhar town—indicate that Samdrup Jongkhar vendors, who purchase their vegetables there for re-sale in Bhtuan, add an additional 20% to their purchase price in India, while Dewathang market vendors add between 30 and 50% to the Indian purchase price of eggplant, radish, chillies, and other produce that are highly perishable and that have about a 20 to 25% spoilage rate if not sold within the week. The Samdrup Jongkhar and Dewathang market vendor margins are lower on ginger, potatoes, onions, and other produce that have a longer shelf life.[205]

[205] For assistance in assessing these margins, we wish to thank Miguel Braganza, Additional Director OFAI Central Secretariat, Goa and Convener-South Asia for IFOAM's Intercontinental Network of Organic Farmers' Organizations [INOFO]. Goa, India, who assisted us in this assessment during the OFAI farmer trainings in Samdrup Jongkhar in February 2011.

Table 12. Average weekly procurement of fruits and vegetables (kg) from India by Dewathang-based institutions and Samdrup Jongkhar vendors, 2011

ITEMS AND BUDGET	DEWATHANG INSTITUTIONS				
	Chokyi Gyatso Institute*	**Jigme Namgyal Polytechnic****	**Hospital**	**Army*****	**Vegetable vendor in SJ********
Rice	700 kg	900 kg	100 kg		
Potato	400 kg	420 kg	30 kg	20 kg	400 kg
Chilli (fresh)	10 kg	50 kg	1 kg	5 kg	200 kg
Chilli (dry)				2 kg	
Cabbage	80 kg	60 kg	10 kg	5 kg	300 kg
Onion	10 kg		5 kg	4 kg	300 kg
Garlic		6 kg			50 kg
Ginger			0.5 kg		50 kg
Tomato	10 kg	14 kg	5 kg	4 kg	200 kg
Green Bean	20 kg	20 kg			150 kg
Flat Bean					50 kg
Chick pea		20 kg			
Dal	5 kg		30 kg		
Eggplant	10 kg	7 kg	10 kg		100 kg
Cauliflower		30 kg	10 kg	5 kg	200 kg
Carrot		15 kg		3 kg	50 kg
Cucumber					50 kg
Radish			5 kg	3 kg	200 kg
Peas					100 kg
Turnip				2 kg	
Sag			8 kg		
Broccoli			5 kg		50 kg
Pumpkin		40 kg			100 kg
Banana		Yes	Yes		200 dozen
Apple					50 kg
Mango					200 kg
Monthly Food Budget	Nu. 65,000 (96 monks) (Nu.677pp)*	Nu. 1,000 per month per student	Nu. 30,000	Nu. 594 per month per person for vegetables**	N/A

Source: Informal survey conducted February, 2011, Dewathang and Samdrup Jongkhar towns.

* Many items are not purchased by the Shedra because they are given as donations. These include: sag, coriander, pumpkin, carrot, squash, kerang, wild mushrooms and banana flowers.
** Items such as rice, dahl and milk are not included, as they are provided as rations by the army. Also, data do not include fruit and vegetable purchases made by army officers' families.
***These data are based on the current year when there are one-third fewer students attending the college. In a normal year, the quantities would therefore be roughly one-third higher.
**** Data are based on interview with the largest vegetable vendor in Samdrup Jongkhar town.
Note: Except for the Hospital, which purchased 6 L of fresh local milk on average per day for patients, none of the institutions purchased local fresh milk or fresh cheese from the DMMC. Milk powder and processed cheese from India were purchased instead.

Based on discussions and interactions with Samdrup Jongkhar farmers and vendors during a two-week farmer-training programme organized by the SJI in February, 2011, Miguel Braganza of the Organic Farming Association of India stated:

> The vendors in Dewathang and traders in Samdrup Jongkhar were willing to sell fresh organic vegetables alongside the other vegetables. They also expressed their willingness to label and stack organic vegetables separately and even sell them with a reasonable premium if they were fresher than the regular vegetables. The customers would gladly pay more for better produce. Consumers already pay 30% more for local chillies over the chillies bought from Assam because of their superior quality. A beginning could be made in some of the kitchen gardens near Dewathang market. The possibility of covered cultivation of local chilli under poly-tunnels on bamboo frames during monsoons, with seedlings raised in kitchen gardens during late summer, needs to be explored. The price of chillies soars to Rs.80/- per kg and local chillies are presently non-existent in the market during monsoons.[206]

At a presentation of the Draft SJI Profile report on May 19, 2011 held in Thimphu, the Director of Marketing from the MoA agreed with the focus on developing local markets, and said that this was also of particular interest to the MoA and to his division in particular. He said his department is very willing to help in this process of linking local buyers in Samdrup Jongkhar with local producers.

3.2 Cooperatives and farmers' groups

Cooperatives are set up in order to enable individuals or enterprises to achieve something collectively—provide a service, market a product—that they could not ordinarily do on their own. This means cooperatives are created based on the needs in a community or within a group of people or organizations.

The fundamental principle of a cooperative is that of democratic control. For co-ops whose members are individual people this may mean that each member has one vote, regardless of his or her investment in the enterprise. This differs significantly from other forms of business corporation where investors purchase control with shares. A cooperative is directed and operates in the best interest of all of its members. Members set this direction through their involvement in members' meetings, and through the co-op's democratically elected Board of Directors.

Forming groups and working together for the collective good has always been key to traditional Bhutanese society (e.g. household labour sharing, communal management of

[206] Ibid. The two-week OFAI training program was particularly aimed at upgrading farming and marketing skills through collective action, teaching farmers how to form and manage organic marketing cooperatives, and linking organic farmers to potential buyers, both institutional and individual.

grazing land, protection and sharing of water sources and irrigation, etc). Other types of farmers' groups also provide ways to enhance rural development.

Cooperatives have social, environmental, and economic benefits:

Social benefits include:

- Empowerment of the members through ownership of the enterprise.
- Increased community participation
- Increased cohesion amongst the community members
- Skill building in technical and managerial skills (e.g. leadership, financial management, and accounting)

Economic benefits include:

- Improved rural livelihoods by providing increased cash income
- Reduced costs
- Improved access to resources and improved bargaining power (e.g. sustainable forest resource use through *community forest* management)
- Improved bargaining power for selling and buying
- Improved bulk delivery of products, making it easier and cheaper to access markets, and ensuring buyers reliable quantities
- Reduction of cost per unit of produce, and thus increased income
- Improved production techniques, skills, and quality of produce, including shared purchase and ownership of equipment that farmers could not afford individually
- Broadened market opportunities for value addition by processing and offering assured type and quality
- Improved products / services owing to improved facilities and equipment, and enhanced skills among the group members

Environmental benefits include:

- Increased vegetation cover through *community forest* plantation and crop production, conserving soil, and preventing erosion and landslides
- Controlling the incidence of forest fire through community monitoring of their forests
- Conservation and protection of watersheds
- Improvement of cattle breeds and a collective management system that reduces pressure on open forest grazing

In 2001, Bhutan's Cooperatives Act was enacted (and amended in 2009), and, within the Ministry of Agriculture, the Department of Agricultural Marketing and Cooperatives was created. One of the explicit objectives in the Accelerating Bhutan's Socio-economic Development Programme (ABSD) is to give legal status to Farmers' Groups and Cooperatives. In October 2010, when legal registration opened, 17 farmers' groups and 5 cooperatives registered.

There are currently about 480 farmers' groups for renewable natural resource (RNR) activities in the country.[207] Examples of groups are Water User Associations, Community Forest Management Groups, Seed Growers Groups, Savings Groups, and Dairy and other agricultural commodities marketing groups.

In Samdrup Jongkhar, there are currently about 17 reported farmers' groups: livestock (4); agriculture (4); and forestry (9) (see Table 13 below), compared to 13 in Pemagatshel, 28 in Mongar, 46 in Trashigang, 18 in Trashiyangtse, and 35 in Lhuentse.[208]

Despite the apparently widespread activity in forming farmers' groups, according to one consultant's report, there are a number of constraints farmers face, which often impede their effective functioning. These constraints include illiteracy, lack of awareness about the group benefits, lack of cohesion among the group members, lack of rural manpower to participate in group activities, lack of resources such as capital investment from the members (e.g. membership fees, purchase of cattle), lack of inputs (such as feed, improved cattle, pullets), and marginal land holdings for intensifying cultivation and pasture development. Limited access to markets—due often to lack of roads—also leads to high marketing costs even when farmers collaborate.[209]

[207] Dr. Udyog Subedi. 2010. Report of the Stakeholders Consultative Workshop on Farmers' Groups and Cooperatives. DAMC and MoAF.
[208] Support to Development of Farmer Groups' Enterprise in Eastern Bhutan, Dr. Udyog Subedi, SNV Consultant, Ministry of Agriculture and Forests, Royal Government of Bhutan, December 2009. www.moa.gov.bt/moa/downloads/.../MoADownload7xt3860xg.pdf. Table 2, p. 14.
[209] Ibid.

Table 13. Inventory of farmers' groups in Samdrup Jongkhar Dzongkhag, 2009

NAME OF GROUP	GEWOG	VILLAGE	TYPE OF GROUP	ACTIVITIES CARRIED OUT
Potato Group	Martshala	Rechanglo	Potato	Potato production and marketing
Orange Group	Gomdar	Amshing	Orange	Mandarin marketing
Vegetable Group	Gomdar	Rechanglo	Vegetable	Vegetable production and marketing
Tengma Group	Orong	Wooling	Cornflake making	Cornflake production and marketing
Dewathang Dairy Farmers & Marketing Group	Dewathang	All villages	Dairy	Milk, butter, cheese production and marketing
Orong Mar dang Datsi Thuendrel Tshogpa	Orong	All Village	Dairy	Milk, butter and cheese production and marketing
Denchi Pig Fattening Group	Gomdar	Denchi	Piggery	
Shilingay Bee Keeping Group	Pemathang	Shilingay	Bee keeping	
Chirata Management Group (4 groups)	Lauri	Zangthey Dungmanma Lauri Mumring	Community forest	Plantation of community forest trees
Ompuri Community Management Group	Dewathang			
Meephu Shakpashing Community Forest	Orong			
Reki Khuenphen Community Forest	Dewathang			
Domphu Phendey Community Forest	Dewathang			
Phunsumtsi Community Forest	Martshala	Kakpadung		

Source: Support to Development of Farmer Groups' Enterprise in Eastern Bhutan, Dr. Udyog Subedi, SNV Consultant, Ministry of Agriculture and Forests, Royal Government of Bhutan, December 2009.

According to the above cited study, which looked at the sustainability of farmers' groups in Bhutan, there are a number of challenges that they face in common:

> Certain groups without any benefits to [their] members have remained dormant. Likewise, groups dealing with crop production and marketing are struggling to make profits, though there are a few groups that are performing well such as groups on mushroom and corn flake (tengma). Most of the agricultural groups are facing sustainability problems mainly owing to the lack of inadequate market. In

> addition, lack of capable leaders, lack of trust amongst the members and lack of incentives to the board members are some other reasons identified for group failures…. Other factors limiting the growth of the groups include rural-urban migration of able youths leaving behind illiterate, aged and old people in the villages who are incapable of participating towards group activities.[210]

During our field research interviews, villagers talked about farmers' or forest groups that had formed in their area and how they were benefitting from them. In Morong village in Orong Gewog, villagers reported that in 2009 they started a vegetable group (not in list above) through which they sell their produce in Samdrup Jongkhar town. In Gomdar, nearly all the households (31) in Rechanglo are members of a vegetable group that sells vegetables in the summer in both Dewathang and Samdrup Jongkhar towns. According to the AEO in Gomdar, even though that is monsoon season, the village is able to grow many summer vegetables—perhaps due to the fact that it's situated at a higher elevation (1,900 ft) than some of the lower lying areas of the dzongkhag.

In Pemathang and Phuntshothang, many villagers were engaged in fish farming—though we were told these were individual enterprises and they were not yet organized as a group. In one village in Pemathang, for instance, roughly 60 villagers were engaged in fish farming. Each had constructed his own individual pond, stocked with fish provided by the fishery sector. The fish were fed with rice husks or in some cases with excrement from livestock. Fish were for personal consumption and sold in the local market.

In some cases the fish ponds were established some years ago – members of one family reported they built the pond 20 years ago and that today it contains 60 kg of fish. For this family, the pond contributes approximately Nu. 700 per month to their income. The fish were originally supplied by the government, from a hatchery in Gelephu.

Fish pond, Dungkarling, Phuntshothang Gewog

[210] Ibid.

Community forests are also starting in many places in Samdrup Jongkhar, and villagers say they are benefitting from being members of these community forest organizations. One of the founding members of Dewathang's community forest, Ugyen Taujay, says the group currently manages roughly 240 acres of forest in the area. He says that the 39 members have to pay a fee to join, and they then benefit from being in the group by getting 2-3 trees per year for their own use. "It is distributed in such a way that each gets a share, but at the same time we have to maintain this on a sustainable basis," he says. The way it works, he explains, is that members get their assigned share of trees and can make furniture or some other product from the trees, for which they get paid by the forest group for their labour costs. In exchange, the money from the sale of the items goes directly back to the forest group. Taujay also says there are several non-timber forest products that the group hopes to gather, but that this collection process has not yet begun.

3.2.1 Dewathang Milk Marketing Cooperative (DMMC)

A vocal advocate for the milk producing farmers in Dewathang, Tashi Tobgyel, is proud of the success of the oldest farmers' group in Bhutan, the Dewathang Milk Marketing Cooperative. The cooperative boasts 125 members—with 80 active members. Tobgyel, says the group has come a long way since its founding in 1993, with the assistance of the Danish aid agency, Danida, and of Bhutan's Ministry of Agriculture. For many years, issues of transparency and financial management plagued the group and the cost of transportation was very high due to the fact that the milk collection points were very far away. For instance, in the past, the group was collecting 300 L of milk per day, which required travelling 50 to 60 km, and the group had trouble meeting vehicle maintenance expenses.

In 2004, with the help of the livestock division of the Ministry of Agriculture, changes in management structure and operating methods led to greater success and improved financial returns for the farmers. Today, 380–400 L of milk are collected a day within a much smaller 14 km range of Dewathang—which in turn reduces transport and vehicle costs. As well, according to Tobgyel, the quality of the milk has improved greatly from past levels and is now greater than 25 lactometre units (a milk quality measurement). Also, Tobgyel says that now, between 6 and 10 am in the morning, milk is collected in a government supplied vehicle from collection points throughout the gewog. There are currently two collection booths—one in Chennari and one in Dewathang—but the other farmers, who come to these two designated collection booths from further a field, are compensated for their travel.

After this morning collection, the milk truck stops in Dewathang and customers come to the truck with containers to buy milk:—currently only 40 L are sold locally in Dewathang (see photo next page). Then, at around noon, the milk is brought to the market in Samdrup Jongkhar where the remainder is sold. Farmers are currently paid Nu. 25 (up recently from Nu. 21) per litre of milk, and it is sold for Nu. 30 per litre (up recently from Nu. 25)—a "handsome payment," he says.

Tobgyel says one Jersey cow can produce 10 L of milk per day, which is equivalent to about Nu. 200 /day /cow or Nu. 12,000 per month (at the old rates) if a farmer has two cows. “This is like the salary for a graduate,” he says. But from this amount, the farmer must also pay for the care and maintenance of the cow. For instance, an attendant would charge about Nu. 100 per day, so it’s more economical for farmers to have more than one cow – ideally 3 or 4, he says. If you take care of the cows yourself, then the care and maintenance cost even less, he says. However, the unpaid labour time of the farmer also has value and must be considered in the equation.

Dewathang Milk Marketing Cooperative milk truck

According to Tobgyel, the DMMC’s fresh, local, high quality milk is so popular among consumers that the cooperative can’t meet the demand and has had to set a maximum of 2 L per person. “They want our milk because of quality,” he says. Even though milk from India is cheaper at Rupees 18/L, people prefer the milk from Bhutan because the quality is very good.

He notes that this kind of knowledge around milk quality does not translate to vegetables. “We have started organic farming with our own members and have a huge marketing problem.” He says people are not educated about the vegetables and always opt for the lower price regardless of quality, origin, nutrition, health, or method of production. This includes the local institutions like the Polytechnic, Army base, and monastery, which could potentially provide a huge market for local produce.

About 3–4 times a year the Dewathang Milk Marketing Cooperative makes cheese and butter—especially at times that there is a problem with the milk truck. Otherwise, there is usually no “surplus” milk. There are two more milk groups in Orong which produce their own butter and cheese—products that are then sold by the Dewathang group in the Samdrup Jongkhar town market. In Orong, each of the two farmers’ groups has 50–60 members, and together they produce 2,200 balls of cheese every 8–9 days during the summer, and 50 kg of butter in the same time period.

As noted earlier, DMMC sells this Orong butter and cheese in Samdrup Jongkhar town in exhange for 1 Ru per ball of cheese and 10 Ru per kg of butter. But one of the challenges

facing the milk producers in Orong is marketing—they are having trouble selling their cheese and butter due to seasonal fluctuations, transport challenges, and lack of refrigeration. In the summer, when there is plenty of fodder for the cows and milk production is correspondingly high, the supply exceeds the demand and excess butter / cheese goes bad after 6-7 days without refrigeration. In the winter, the farmers don't produce as much of either due to lack of fodder, and what they do produce they consume themselves.

According to one Orong farmer: "We cannot sell our products very well. Previously we took 1,000 pieces of cheese to the milk booth at Samdrup Jongkhar, but they refused to take it all. In this way, we are having lots of problem in marketing. It was even worse last time: We took 5,000 pieces of cheese from Orong and Wooling, and there [in Samdrup Jongkhar town] we were faced with lots of problems, and we could not sell it."

Also as described earlier[211], there has been a move among the members of the Dewathang milk society to replace their "local cows" with a Jersey cross-breed—which produces much more milk: 7 to 8 litres per Jersey cow per day versus 1.5 litres per local cow per day. The group now produces roughly 13,500 L of milk per month, fetching Nu. 300,000 — the highest production rate so far, says DMMC representative, Tashi Tobgyel.

Jersey cows are expensive, Tobgyel reports, with a single cow costing approximately Nu. 35,000 to 50,000. As well, the cost to feed them is also much higher than for local cows that forage easily on the existing native shrubbery. Tobgyel says that to keep a Jersey cow in good condition requires 6 kg of grain feed per cow per day, which many farmers can't afford. As a result, many of the cows are in poor condition, which in turn affects milk productivity. Also, even though the demand for milk is quite high, it is very difficult for farmers to invest in more cows to expand their business, because many of the farmers are very poor, and are not able get loans without assets. Tobgyel says that about half the DMMC's active members (40) currently have loans from the BDFC to purchase the cows, at a rate of 10% interest/year. He says the loans are quite manageable for the farmers and that they don't have any problems with defaulting. Loan payments are managed by the milk society.

In Gotungma and Tishure villages in Martshala Gewog, villagers reported that a milk society/ group was recently initiated by the livestock officer. Each member of the society has a Jersey cow, purchased for Nu. 30,000 through a loan from the BDFC. Two staff members are employed by the milk group at Nu. 2,500 /month each. The farmers are presently concerned about turning enough profit to pay back their loans. Currently, milk and butter are produced and sold locally. According to the gewog Agriculture Extension Officer, the dairy group has been in operation for only a few months, and at the time of writing there were 33 members, all products were sold locally, and some farmers had already expressed interest in procuring more cows.

[211] As this Samdrup Jongkhar profile is not designed to be read cover-to-cover, but referenced by topic according to particular needs, we have deliberately repeated some information in different sections when that information is relevant to different topic areas.

In January 2011, representatives from two successful Indian small-holding organic farming cooperatives — in Himachal Pradesh and Uttaranchal — visited Samdrup Jonghar to describe to local farmers how their cooperatives have enhanced market opportunities and improved the economic viability of diverse multi-crop small-holding farming. For example, the Himachal cooperative owns two refrigerator trucks that transport local organic farm produce to markets in Delhi on a weekly basis. As part of their three-week March–April 2011 SJI organic farming study tour to India, 20 Samdrup Jongkhar farmers from all 11 gewogs, plus the dzongkhag District Agriculture Officer and three Agriculture Extension Officers, visited one of these cooperatives in Uttaranchal, and witnessed first-hand how it operates.

3.2.2 Cooperative model for weaving and handicrafts

In virtually all the villages we visited during our Samdrup Jongkhar field research, women of all ages were engaged in weaving for their family's needs. The only exception was in those villages where the people were Nepali-speaking, and where weaving was not a traditional handicraft in which the women engaged. In general, everyone said that the reason the village women don't sell their weaving is because there is no market for it. Nevertheless, a few women we met were selling their wares for the Thimphu tourist market.

One woman in Dewathang makes a meagre living from selling her handwoven kiras and ghos— the traditional clothing for women and men in Bhutan. In one year she says she typically makes 3 half kiras and 5 ghos— working roughly 3 hours a day— all she can do because the work is hard on her back and legs. She sells her work to a buyer in Samdrup Jonghkar town, who resells the clothing to shops in Thimphu for more than double the price she gets.

On the day we visited her, the silken red and gold warp threads of a patterned gho hung softly from her loom, which sits on a raised platform just inside the entrance to her small home. She says she can sell her half kiras for between Nu 14,000 and 15,000 and her patterned ghos for between Nu 20,000 and 25,000. But she doesn't bring home this amount because she has to subtract the cost of all the materials. In some cases, having to purchase the costly silk threads means her expenses are quite high, and she may only make Nu 6,000 for a gho and Nu 5,000 for a half kira. She says that the weaving is her family's only source of income—she has a small kitchen garden to grow much of the food for her family—but her husband is unable to work (see photo of her work below).

A handicraft cooperative could be very beneficial for the women weavers of Samdrup Jongkhar, particularly if the area opens up to tourism. It would make marketing more efficient and effective, eliminate the need for a middleman, provide them with better bargaining power to fetch a better price, and more of the money from the sale of the textiles would be returned to the group.

The women in the village of Wooling in Orong Gewog, unlike most other women interviewed who only weave for their families, sell their high quality woven textiles to

buyers in Thimphu. Again, what they are paid is much lower than what their products sell for in the Thimphu market, and a women's artisan cooperative could again be beneficial for them.

There are examples of successful craft cooperatives in Bhutan that might serve as models for the weavers, crafts-people, and artisans of Samdrup Jongkhar. For instance, in the village of Bjoka, in the southern part of Zhemgang district, the government established a bamboo cooperative (called Tsharzo Gongphel Tshogpa) with assistance from aid agencies. The community is a two-day walk from the nearest road, and the majority of villagers are farmers, with everyone engaging in making bamboo products.

Gho being woven in Dewathang

Because the village is not accessible by road, it was previously difficult for farmers to sell their bamboo products in the nearby town, so middlemen bought their products at very cheap prices and resold them at much higher ones. There was also no uniformity in price or quality, and so only a few households benefitted. The cooperative is now helping to alleviate these problems and is benefitting 120 households.[212]

In another community, Radhi, in Trashigang Dzongkhag, a new weaving centre was set up recently, where 60 women from the surrounding villages were being trained to use imported looms.

According to a recent newspaper article, five looms costing Nu. 300,000 were purchased with a "constituency development grant." The women, once trained on the looms, will weave the traditional ghos, kiras, tegos and scarves. The article reports that weaving using the traditional handloom had become "unsustainable" because of the change in

[212] *Bhutan Observer*, November 5–12, 2010.

market trends. “The traditional handloom weaving is time-consuming and production is limited and therefore, expensive.” The new looms will allow the women to continue to produce their high quality textiles but “faster and cheaper” compared to handloomed products.[213] These models could also be highly applicable to Samdrup Jongkhar, where weaving is widespread,

Bamboo, which grows naturally in Samdrup Jongkhar can also be used for handicrafts and other development projects. For example, it can be used in construction and scaffolding, roofs and walls of houses, irrigation channels, split and woven mats, cups and bowls, woven bowls, arrows, and even clothing. It is noteworthy that all food and drink for 500 guests for the three-day Samdrup Jongkhar Initiative launch on 18–20 December 2010, were served in beautiful, locally hand-made bamboo bowls and cups.

A number of examples of successful artisan cooperatives exist worldwide, particularly in Asia and Central America. These could also be explored as potential models to assist the women and crafts-people of Samdrup Jongkhar to make a decent livelihood from their traditional skills.

3.3 Market potential for non-wood forest products (NWFP)

Three herbs in Samdrup Jongkhar have been shown to have considerable potential for commercialization—Chirata (Swertia chirayita), Rubia cordifolia and Illicum griffithii. Community-based approaches to forestry and natural resource management have been promoted by the Royal Government of Bhutan in order to strengthen the link between protecting valuable natural resources and developing rural communities. As a result, there are now a number of groups formed in Samdrup Jongkhar for harvesting and marketing NWFPs. The most important of these is the Community Forestry group in Lauri Gewog, which includes all villages and is focused on managing and marketing Chirata—an important medicinal plant. There are two other NWFP groups formed in Martshala Gewog focused on management and marketing of Rubia cordifolia, which is mostly used as dye.

3.3.1 Chirata

As previously noted in Chapter 2, there are 19 different species of Swertia found in Bhutan. The most commercially valued species with high demand in the international market is Swertia chirayita or Chirata. In Bhutan, it grows most abundantly in Lauri—the most remote gewog of Samdrup Jongkhar Dzongkhag.

The plant is well known for its very bitter taste and its high medicinal value. All parts of the plant including leaves, flowers, roots and stems are used. Chirata is used for numerous purposes, including reducing fever and pain in the joints. It helps to get rid off

[213] Tempa Wangdi. “Weaving Centre Boasts Five Loom Machines*”. Bhutan Observer*, October 19–26, 2010.

intestinal worms and skin diseases, and is used to ease constipation, urinary discharges, ulcers, stomach aches, asthma, bronchitis, and leucorrhoea. It is also used as a breath fresherner, and to reduce vomiting during pregnancy. Traditional Bhutanese medicine also uses Chirata for blood purification and to cure common cold, gout disease, and even diabetes and malaria.

This medicinal herb is sold dried in local markets in bundles. In 2007, almost 42% of the households in Lauri depended on Chirata as a key source of income. In 2007, a total of 9,400 kg of Chirata, with a value of Nu. 923,000, was harvested and sold by the community of Shingkhar in Lauri Gewog. Farmers used to sell their products to the Food Corporation of Bhutan (FCB). Today, however, the Chirata goes mainly to Bhutanese or Indian middlemen who take it to markets in Dehli or Calcutta. According to Indian shop keepers in Daifam, through which the Chirata passes, the Chirata from Lauri is very good in terms of purity (based on bitterness), but is poor in colour and appearance, compared to the Chirata from Nepal. The colour difference is not the result of poor natural product, but is due to the drying and packaging process, which is very crude in Lauri. The quality criteria for Chirata include that it be reddish brown in colour (not black), very bitter in taste (used to differentiate mixture of species), well air-dried (—in fact it must be 100% air dried), and not infected by fungi (mycelium growth).

Farmers can lose about 30% of their product between the time of harvesting and selling because of improper drying, packaging, and storing. In 1999, the first solar drying unit for Chirata was provided for Zangthi village by a small UNDP funded project. The drying unit was handed over to the community, but no one was given clear responsibility for its maintenance, and today the unit no longer functions. The SJI recently trained six Lauri village women in solar drying at the Barli Development Institute for Rural Women in Madhya Pradesh, and the first solar drying unit based on the Barli model has been built at the Jigme Namgyel Polytechnic in Dewathang. It is therefore hoped that the SJI will be able to assist in overcoming the Chirata drying challenges that have impeded the Chirata trade in Lauri Gewog to date.

Chirata prices decreased dramatically between the year 2000 (Nu. 200 per kg) and 2005 (Nu. 45 per kg) due to the collapse of the auctioning system in Daifam and poor quality control. This led to adulteration of the product (it was mixed with other weeds, sprayed with water to increase the weight, and mixed with stones, etc.). But the market remain volatile, with considerable opportunities for Chirata to benefit the region. In 2006 once the middlemen became aware of the on-going process of community group formation, the prices for the product more than doubled and reached Nu.110 per kg—more than double the 2005 price, but still only about half the 2000 price. Efforts in preparing a management plan to be implemented by the communities have been made, and will hopefully enhance quality control, strengthen local governance, stabilize returns to villagers at a reasonable level, and improve the sustainability of the Chirata resource and market.[214]

[214] *Guidelines for Resource Assessment and Management of Swertia chirayita*, June 2008. Forest Resources Development Division, Department of Forests, Ministry of Agriculture, Royal Government of Bhutan; and Kuenzang Norbu and Jigme Gyeltshen. 2007. *CHIRATA—A Medicinal Plant Rescued by Community Forestry*. Dzongkhag Forestry Service, Samdrup Jongkhar, Bhutan.

According to farmers from Lauri, one serious problem that must be addressed in current stabilization efforts is that overall production of Chirata is on the decline. One farmer told us: "We used to fetch about 2 to 3 trucks but now it's hard to get even 1 truck." Farmers attribute the production decline to government rules about Tseri (shifting cultivation): "It is because the government is protecting the environment and the forestry people tell us not to fire the field. But Chirata, the production of Chirata, is good when the field is set on fire. The seed of this Chirata is like the grains of soil—very small. And when we set fire, the leaves of the Chirata are burned which then turn to seed, which is then taken by the wind and grows more." Farmers also note that when fire is used, the Chirata plant grows bigger.[215]

3.3.2 Rubia cordifolia

Rubia cordifolia (Tsoe in Dzongkha) is a species of flowering plant in the coffee family that grows in elevations up to 3,750 m. It can grow to 1.5 m in height and is cultivated to generate a red pigment that is derived from the roots. The plant is also a constituent of many Ayurvedic drugs like septilin (used to treat rhinosinal infections), rumalaya, and herbinol. *Rubia cordifolia* roots are credited with tonic, astringent, antidysenteric, antiseptic, and deobstruent[216] properties. They are used to treat rheumatism, and form an ingredient of several other Ayurvedic preparations in addition to those listed above. Roots are also said to be active against staphylococcus aureus (commonly known as 'staph infection') and are made into a paste for application onto ulcers, inflammations, and skin troubles. Roots are also used for colouring a range of medicinal oils. A decoction (concentration made from boiling) of leaves and stems is also used as a vermifuge that can destroy or expel intestinal worms.

In 2007, a total of 24,300 kg of Rubia cordifolia with a value of Nu. 368,100 was harvested and sold by Lauri communities. Production in Martshala Gewog was 5,024 kg. and valued at Nu. 75,360.

3.3.3 Illicum griffithii (star-shaped anise)

Illicium griffithii grows in the subtropical and wet temperate broad-leaved forests of Bhutan. It is usually found within the average elevation range of 1,200–2,670 m. Harvesting occurs between October and December. This timing ensures that the collected fruits are seedless.
The use of this medicinal plant is broad and invites potential markets. The fruits and seeds are used medicinally while preparing local liquor (ara), or are used for the sweet

[215] The issue regarding the benefits of using Tseri for Chirata production was also raised at the SJI profile presentation on May 19, 2011. One Samdrup Jongkhar Parliamentarian present suggested that the Ministry of Agriculture should study whether the ban on Tseri is adversely affecting the Chirata production in Lauri.
[216] A standard medical definition of deobstruent is removing obstructions and having power to clear or open the natural ducts of the fluids and secretions of the body."

fragrance in suja (butter salted tea) or ngaja (sugar tea). Dried seedless fruits are used as incense. Seedless fruits are also used to cure cough, toothache, and sinusitis (by inhaling the vapour by boiling the fruits in water). The fruits are also used as an aromatic stimulant (refreshment or tonic) and for carminative (relieving flatulence) purposes.[217] A recent study suggests that the essential oil isolated from Illicium griffithii can effectively be used both as an antifungal agent and as a food preservative. Shikimic acid, one of the main components of Tamiflu (drug used against bird flu), is found in Illicium Graffithii seeds—indicating a highly valuable potential market with great current demand.[218]

Altogether, Illicium griffithii is considered one of the most valuable tree species among many important species of NWFP. Nevertheless, Illicium fruits from Bhutan currently have only a regional market. In a good fruiting year, up to 1,004 kg / ha can be harvested, and in a bad fruiting year an estimated total of 251 kg / ha can be harvested.

In 1995, the market value for the fruit in Samdrup Jongkhar Dzongkhag was Nu.180 per kg. But by 2003, the market value had dropped to Nu. 45–55 per kilogram because collectors were selling through Indian middlemen stationed in Samdrup Jongkhar. By the time the product gets to the Indian market of Tezpur, it is worth Rs. 110–120 per kg, and it would be worth much on the international market. In 2007, 3,000 kg of Illicium griffithii valued at Nu 75,000 was sold by the community of Shingkhar Lauri—indicating a benefit to villagers of only Nu 25 / kg.

This points to the reality that Samdrup Jongkhar villagers are currently reaping only a fraction of the potential market value of this and other medicinal plants. It also points to a key danger against which the Samdrup Jongkhar Initiative must guard in promoting medicinal plant development in Samdrup Jongkhar—namely that future development and trade could be exploited by outsiders including large pharmaceutical companies and their agents, which could undermine both long-term ecological and economic sustainability and community viability. Extreme care must therefore be taken to create a viable and effective structure (including development of strong cooperatives combined with stringent regulation) to ensure that the resource is not depleted or degraded, and that the benefits of potentially lucrative medicinal herb collection are equitably reaped by local communities.

3.3.4 Agarwood

Agarwood is a dark resinous heartwood that forms in Aquilaria and Gyrinops trees when they become infected with a type of fungus. A dark aromatic resin is produced in response to the attack, which results in a very dense, dark, resin-embedded heartwood. The resin-embedded wood is valued in many cultures (from Saudi royalty to Bhutanese

[217] Prabhat Kumar Mukhia. 2006. *Management guidelines for Illicium Griffithii for community forests of Bhutan*. Social Forestry Division, Department of Forests, Ministry of Agriculture. http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload2go9765gc.pdf.

[218] A. Saraswathy et al. 2010. "Essential oil constituents of Illicium griffithii and its antimicrobial activity". *Pharmacognosy Magazine*, 6 (23): 208–211.

monks) for its distinctive fragrance, and is used for incense and perfumes as well as in medicines. It is particularly valued in traditional Tibetan medicine. Agarwood is still found in Bhutan's forests, though it is now considerably less abundant almost to the point of extinction. Despite the Forest Department's vigilance, many trees have been poached for their high value.

A kilogram of the fungus-infected tree's chip costs about Nu. 8,400 on the market, with better grades fetching up to Nu. 450,000 per kg—indicating the huge potential value of this product. Oils distilled from agarwood can cost from Nu. 900 (Aoud oil) to as high as Nu. 315,000 /kg (Oud oils). Bhutan's Institute of Traditional Medicine Services (ITMS) in Thimphu is the only organisation that currently buys agarwood for medicinal use. On average, ITMS uses 250–300 kg of agarwood annually. According to the Institute, in 2009 it used just 4 to 5 trees obtained from private landholdings.

Agarwood is not presently being exploited commercially in Bhutan. Because of its high market value, however, a few trial plantations were established in Panbang and Samdrup Jongkhar in the 1980s. These trial plantations have been successful in terms of growth of the trees, but efforts to inoculate the trees with the fungus infected branches (the source of the resinous heartwood) have not been encouraging.[219] Most of the plantations are quite small in size and very young (<10 years old). In Samdrup Jongkhar, there is a plantation in Bhangtar (Phuntshothang Gewog) and there are a few agarwood trees in Shilingay (Pemathang Gewog).[220]

3.3.5 Bio Bhutan

Bio Bhutan is currently the main provider of organic certified products in Bhutan and is a potential model for how to build an organic market for the products of Samdrup Jongkhar, especially NWFP. *Bio Bhutan*'s goal is to improve income and employment opportunities for rural communities as well as to promote the image of Bhutan as a producer of pure and natural products. It is currently working with 19 farmers' groups in 8 districts: Mongar, Trashigang, Trashiyangtse, Lhuentse, Chhukha, Tsirang, Sarpang, and Gelephu and is working in close collaboration with several community forests, womens' groups, and honey producers. *Bio Bhutan* products are sold in Bhutan, India, USA, Singapore, Thailand, and Europe. Once the products are collected, they are packaged in Thimphu or in India (in the case of tea bags). *Bio Bhutan* is considering expanding its line to new products (e.g. Chirata), and so there could be potential for it to buy herbs and medicinal plants from Samdrup Jongkhar.[221]

---

[219] A study was carried out in Panbang and Gelephu by Professor Blanchette from the University of Minnesota between 2001 and 2004.

[220] *Kuensel*, 18 April 2010, and personal communications between Tsering Om and Forestry officials, ITMS, and Dimple Thapa, Masters student at University of Boku, Austria, 2010.

[221] Bio Bhutan's organic products are certified and annually inspected by the Indian agency ADITI Organics (http://www.aditicert.net), which is accredited by India's National Programme for Organic Production Standards. The certification is equivalent to the European Council Regulation 834/2007. This allows the products to be sold on a small scale in several European countries. The National Organic Program (NOP) is working on developing a Bhutanese certification based on PGS (Participatory Guarantee System), which is far less expensive to producers than third-party certification, has been shown to produce

Please refer to the *Background Statistical Materials* at the end of this study for further information on other potential medicinal and non-medicinal plants as they relate to Samdrup Jongkhar.

3.4 Adding value to products

The challenge in a finite world is to extract the greatest economic and social value from a product with the least amount of damage to the environment—which in turn means increasing the value per unit of a product rather than simply harvesting more of the resource to make a living. For instance, the value of a felled tree increases with each additional degree of processing. In other words, a raw log has the lowest economic value and as it is transformed through various degrees of processing its value increases. Thus, this the wood becomes more valuable as kiln dried flooring, and even more valuable as furniture. If value can be maximized, then more jobs are created with fewer trees needing to be cut down. In order to harmonize social, economic, and ecological objectives, focusing on such a value-added strategy must therefore be a core principle of GNH-based sustainable development in the Samdrup Jongkhar Initiative.

There is currently an abundance of potential in the area of adding value to products grown in Samdrup Jongkhar, as very little is currently processed. Exceptions include making corn into corn flakes, milk into butter/cheese, and mustard seeds into mustard oil. According to Bhutan's Auditor General, who comes from Dewathang, at one time there was value being added to the region's citrus crop—with a bottling plant set up to make juice. But, he says, this effort was not sustained and the plant closed.[222]

Field research interviews revealed that, in the gewogs visited, there was some value-added processing already taking place. For instance, as noted above, in Orong Gewog, dairy farmers are processing milk into ball cheese and butter, which is sold for them by the Dewathang Milk Marketing Cooperative's milk booth in Samdrup Jongkhar. While they are currently having some serious marketing problems (discussed in Section 3.1 above on marketing constraints), when value is compared per unit of milk, the processed product does fetch a considerably higher price than the raw milk and—if marketing challenges can be resolved—could potentially benefit farmers even after the extra labour and processing costs are included.

In Gomdar Gewog there was discussion about processing the small oranges, which are not accepted in the market, into orange juice. However, according to the Agriculture Extension Officer (AEO), a proposal to this effect presented to their Member of

---

comparable results, and was promoted and explained to Samdrup Jongkhar farmers by the Organic Farming Association of India (OFAI) trainers during their February farmer training in Samdrup Jongkhar

[222] Information provided by Bhutan's Auditor General at the May 19, 2011, presentation of the Draft SJI Profile study held at Deer Park Thimphu. It might be worthwhile to investigate why this value-added citrus venture in Samdrup Jongkhar failed, in order to assess what SJI might do to support more sustainable and effective citrus-based value-added production in the future.

Parliament and National Councillor was not greeted with much enthusiasm, primarily because oranges are seasonal. One farmer reported: "They said there is a problem with this [idea] because production of oranges is not every season, but is only once in a year. So there will not be regular production of orange juice, but it will be produced once in a season only." Their parliamentary representatives wondered what those involved in orange juice production would do for rest of the year. In most cases, however, seasonality should not in itself nullify the value of creating a value-added product. In fact, most agricultural produce is seasonal, while processing a product to add value can generally be done in such a way as increase that product's shelf life, which in turn means the product could be available for many months on the market, even after the actual raw growing season has ended.

As well, a number of gewogs visited had a limited collection of machinery available for processing. For instance, in Martshala Gewog there was an oil press, but because the system didn't work well, farmers said they earned more by selling their mustard seeds directly to Indian buyers than by pressing them into oil. Some of the dried maize was stone-milled into corn meal. The Agriculture Extension Officer in Martshala Gewog also suggested that juicing of citrus should be explored because mandarins pay very little and farmers sometimes operate at a loss.

According to Dr. Vandana Shiva, farmers in Samdrup Jongkhar should sell low volume but high value products. Once the local market is built up, and after local institutions such as the Chokyi Gyatso Institute, the Jigme Namgyel Polytechnic, and the Military base and hospital have commited to "buy local," then attention can be paid to providing products for a national and perhaps international market. Dr. Shiva says these items must be non-perishable; otherwise the costs of transporting them increase. She suggests the sale of nuts, fruit preserves, dried spices, and squashes as a start in such value-added ventures. She also says that there is a big market in India for good quality organic cheese, and that perhaps the DMMC could look at that as a possibility if it increases supply and after it satiates the local market. She points to the proposed Centre for Appropriate Technology at the Jigme Namgyel Polytechnic as a place that "could play a role in the processing of produce."

3.4.1 Solar drying fruits and vegetables

In February 2011 two experts in low-cost solar drying technologies, who founded the Barli Development Institute for Rural Women in Indore, Madhya Pradesh, made an initial visit to Samdrup Jongkhar to present their work both to JNP faculty and to villagers and farmers in both Dewathang town and the Bhangtar area, and to assess conditions and potential needs for more extensive training. Farmers from throughout the dzongkhag and from as far afield as remote Lauri Gewog travelled to Dewathang for this presentation. Dr. Janak Palta McGilligan and the late Jimmy McGilligan[223] founded the Indian institute

[223] Jimmy McGilligan, who visited Samdrup Jongkhar in February 2011 with his wife Janak, as guests of the SJI, died tragically in April 2011. Please see the SJI website at www.sji.bt for our heartfelt tribute to Jimmy McGilligan. We hope that our effort to implement the Barli solar drying techniques in Samdrup

in 1985 to help empower the young rural tribal women to "become agents of social change through the acquisition of a wide range of skills," including literacy. They noted that currently less than 10% of rural tribal women in that region are literate.[224]

Since 2002, the Barli Institute has constructed and sold 370 parabolic solar cookers to villagers at a subsidized price.[225] According to Dr. Palta McGilligan, most of the villages where the solar cookers are being used are not electrified. She adds that the Barli Institute does not transfer any technology to users unless they are first trained to use it and able to fix it if it breaks down. She also insists that nothing be given away for free: "Whenever it's given for free, they never use them because they don't value them."

Based on these principles, the project has so far achieved remarkable success: Tribal women in the region report that 90% of the solar cookers are being fully utilized, saving the women from having to walk long, and often dangerous distances, to collect firewood. Women are often the target of violence and abuse when they are collecting firewood, says Palta McGilligan, so the innovation also protects their safety. Also, use of the solar cookers has freed the often very young girls from the arduous and time-consuming task of collecting wood, allowing them to attend school instead. In addition, one solar cooker saves 1 ton of wood each year and reduces carbon dioxide emissions by 1.8 tons/year, thereby producing ecological as well as economic and social benefits.[226]

The low-cost solar drying technologies developed and in use at the Barli Institute are of particular interest in Samdrup Jongkhar. According to the McGilligans, the low-cost drying technologies can help overcome some major agricultural marketing challenges currently faced in Samdrup Jongkhar, including poor transport and storage infrastructure by helping to extend shelf life. This is particularly true of many fruits and vegetables that are not currently fully utilized in the dzongkhag, such as bananas (which can very effectively and easily be dried into high value banana chips).

At the Barli Institute, surplus from the institute garden that is not consumed fresh is solar dried, using tunnel driers and chimney driers, and providing the institute with fruits and vegetables during the dry season. According to Jimmy McGilligan, large solar driers (serving several households /farms) cost about Nu. 40,000 and smaller units can be constructed for even less (as little as Nu. 10,000) using local materials, and will last for 15-20 years with low operation and maintenance costs.

In his presentations in Samdrup Jongkhar, Jimmy McGilligan pointed out that the mesh used in solar driers should be food grade, and the plastic should be *UV stabilized*. Any other plastic would break down and last only 6 months, he said. Mr. McGilligan argued

---

Jongkhar will not only benefit local farmers but also serve as our living homage to Jimmy McGilligan's outstanding and generous contribution to rural villagers in South Asia.

[224] Information taken from presentation given by the McGilligans at the JNP in Dewathang on Februrary 17, 2011.

[225] The SK14 parabolic solar cooker was invented and designed by the German scientist, Dr. Seifert. The much larger solar cookers, which can cook for groups as large as 100 are the Scheffler solar cookers, invented and designed by Dr. Scheffler, a German physicist. Ibid.

[226] Ibid.

that solar drying is superior to open-sun drying because it is much more hygienic—you can control the environment, thereby reducing the risk of contamination by insects or dust—and it is less time consuming, since produce can be dried fully in only two days. By contrast, open sun drying depends on the weather and leaves the produce susceptible to contamination. Using fuels to dry food is expensive and polluting, he noted, and thus both ecologically and economically inferior to solar drying.

As well, the McGilligans and SJI have recognized that the application of such appropriate technologies can provide good jobs and training for local youth and students, and thus potentially help stem the current tide of rural-urban migration among youth. Another advantage noted by the McGilligans is that dehydration also maintains the nutritional value of foods far better than other processing methods.

It is anticipated that Barli solar technologies will increasingly be incorporated into the curriculum of the Jigme Namgyel Polytechnic's new Centre for Appropriate Technology. In fact, this process began in earnest in September–October 2011, when the JNP faculty appropriate technology coordinator, Denten Zangpo, visited the Barli Institute in Madhya Pradesh for two weeks of intensive training in solar drying technologies in the company of the six Lauri women villagers who had previously trained for six months in solar engineering methods at the Barefoot College in Rajasthan.

In November 2011, with some of his JNP second year mechanical engineering students, Denten Zangpo fabricated a solar drier on the Barli model. This first prototype made-in-Samdrup Jongkhar solar drier was ready before the JNP winter vacation began in December 2011. During the December–January vacation, these mechanical engineering students worked with the six Lauri villagers to test the model in the field and train select other villagers in Samdrup Jongkhar to fabricate the solar driers themselves from locally available materials, using wood rather than metal bases for the driers. The students also trained these villagers in the use, maintenance, and repair of the driers. The development and testing phases were successful, and the dissemination phase is scheduled to take place during March–May 2012, when 24 more solar dryers will be built and distributed in the villages. The subsequent plan is to spread the use of these driers more widely throughout the dzongkhag.

Initial funding support for the September–October Barli Institute training and fabrication of the first local solar drier in the fall of 2011 was provided by the International Development Research Centre in Canada through GPI Atlantic. It is hoped that, if this project is successful, and if replication is of interest to other parts of the country and region, it might even provide a future source of income for Samdrup Jongkhar residents and for rural youth seeking good job opportunities close to home.

Chapter 4. Living Standards and Wellbeing[227]

> *The fate of the vast majority of those who sever their ties with their traditions will not be to attain the prosperity of the West, but to join the legions of urban poor, trapped in squalor, struggling to survive.*
>
> —Wade David[228]

Since the introduction of television about twelve years ago, much of Bhutan's population has been exposed to the same manipulative, consumerist advertising that has been transforming the rest of the world for decades. Traditional farming communities that at one time engaged very little with the cash economy are now being exposed to *consumer culture* and the excessive lifestyles that culture promotes, and with this naturally the requirement for money increases. Advertisements aimed at making people believe they are not quite right as they are, and that they 'need' something 'more' to make them happy, have intruded on traditional Bhutanese society. This new consumerist culture is creating new 'needs'—for lighter skin, for processed foods, for soft drinks, for fancy cars, and for of the latest clothing fashions.

Despite visible evidence to the contrary, on many occasions during field research villagers would say that people in Bhutan *don't* work hard enough and, as a result of this sloth, there was little money or development in the country. This belief in the benefits of modern industrial economies is no doubt compounded by the images from first world countries of luxurious lifestyles, now beamed into the living rooms of some of the poorest households in Bhutan.

One Dewathang shop-keeper (cited below) conveys this belief—that mainstream

---

[227] Much of the data presented here with regard to living standards were retrieved from the Bhutan Living Standards Survey 2007 Report (BLSS 2007). However, since the published BLSS 2007 report only contained a limited amount of data at the dzongkhag level, we requested the National Statistics Bureau (NSB), to provide us with previously unpublished micro-data files, which contain much more dzongkhag level data on living standards (including for Samdrup Jongkhar). Some of the data from these unpublished micro-data files are therefore presented in this chapter, and are therefore published here for the first time.

As the BLSS had a national sample size of 10,000, it can yield statistically significant results at the dzongkhag level. For Samdrup Jongkhar's population of 35,000, the probability tables indicate that a sample size of 380 is sufficient to produce results that have a 95% probability of accuracy 19 times out of 20 — which is accepted as statistically valid for reporting purposes. As the BLSS had a larger sample size than this, the unpublished micro-data files should yield important statistically valid results.

Other publications examined, based on the BLSS 2007, include the *Poverty Analysis Report (PAR)* and *Small Area Estimation of Poverty in Rural Bhutan*. In addition, the GNH data presented in this chapter were retrieved from the Centre for Bhutan Studies, and were also previously unpublished. Thanks go to Sangay Tempa (NSB) and Karma Wangdi (CBS) for their kind and helpful assistance in retrieving and providing these data for the purpose of this Samdrup Jongkhar Profile.

[228] Davis, Wade. 2009. "The Wayfinders. Why Ancient Wisdom Matters in the Modern World." CBC Massey Lectures. Anansi Press. Toronto pp. 197-198.

industrial development can "generate money" and bring development to Bhutan, raising the living standards of the poor. But what is commonly not understood, and what is now demonstrated by substantial evidence worldwide, is that this conventional, industrial model of economic development has often exacerbated, rather than alleviated poverty. In other words, the generation of large profits—because it frequently derives from cheap labour and excessive resource use—often requires exploitation of either poor populations or the natural world, or both. According to the Dewathang shopkeeper cited above:

> I feel that we are not as hard working as other countries. Because other countries are getting developed… How can we become like other countries, how can we generate money? I have seen [on TV] that in Japan, they are developed. They have systems: those people are very hard-working. They are busy. We should work hard.

The lure of money and what it can buy is strong. In order to "get good money" (a frequently expressed aspiration) young people move into cities and towns looking for work, and this exodus from rural areas in turn weakens the agricultural base of the country, as farmers age and can no longer care for their farms. However, what many rural youth do not realize is that the urban unemployment rate overall is more than double the rural rate (7% versus 3%).[229] Among youth, the statistics are even more dramatic. In fact, young people have the highest rates of unemployment in urban Bhutan—nearly 25%. In other words, nearly a quarter of young urban-dwelling people are without work.

According to the Population and Housing Census (2005), the country's overall annual population growth rate was projected to be 1.8% between 2006 and 2015. But during the same period, Bhutan's urban population was projected to grow at an annual rate of 4.2%, while the growth of the rural population was projected to be much lower—less than 1%.[230] Jobs are simply not keeping up with this urban in-migration and growth. Youth are flocking to urban areas for the promise of something that is not likely to be.

Earlier in this Profile (Section 1.3.6), we cited the deep expressions of concern on this very matter by His Majesty the Fourth King—his words echoed almost exactly by Dzongsar Jamyang Khyentse Rinpoche in launching the Samdrup Jongkhar Initiative. Because this Profile is not intended to be read cover-to-cover, but rather used in encyclopedic fashion to look up and reference particular information as needed, we have often repeated information in different places that is relevant to different sections. As it is highly likely that readers of this section will not have read Section 1.3.6 above, and because His Majesty's comments are so relevant to what we describe here, we repeat his comments and those of Dzongsar Khyentse Rinpoche here:

In his 2000 National Day Address to the Nation from Trashigang, His Majesty the Fourth King described the rural-urban migration trend in these words:

[229] BLSS 2007

[230] National Statistics Bureau. 2008. *Dzongkhag Population Projections (2006-2015).* Based on Population and Housing Census, 2005. p. 16.

> One of the serious problems we are facing today as a result of the rapid socio-economic development taking place in our country is the increasing trend in rural-urban migration. If all the people migrating to urban areas are able to get good jobs and earn a good livelihood we should all be happy. However, people migrating to urban areas are not able to find suitable employment and even then they refuse to return to their villages. If we do not make any effort to change this trend of large numbers of our villagers leaving to seek employment in urban centres, there is every possibility that, within the next twenty years, most of our villages will become empty andeven our ancestral homes and farms will be abandoned.

In line with the Fourth King's subsequent exhortation that steps *"must be taken to encourage our people to remain in their villages",* one of the key stated goals of the Samdrup Jongkhar Initiative is precisely to help reverse this rural-urban migration trend—particularly by creating good economic opportunities for young people in the region. Indeed, in launching the Samdrup Jongkhar Initiative and addressing the Samdrup Jongkhar community, Dzongsar Jamyang Khyentse's Rinpoche sounded themes almost identical to those expressed by the Fourth King:

> In our villages, even though we have enough to feed our children, the trend has set in where our youth want to go to Thimphu and to the urban areas. These days you can no longer say things like "you cannot go" and "you should not go." Why are our young ones wanting to go to the urban areas? Once they reach the urban areas, if they have no problems living a decent life, it is not a problem at all. But often they end up having no jobs, or if they get jobs, those jobs are not up to their expectations, and then they get exasperated and land up in a situation where they feel ashamed to go back to their homes and end up abusing drugs or drinking alcohol.
>
> How can we stem this flow of our youth to the urban areas? We cannot use force and threat. Within Samdrup Jongkhar and Dewathang, what are the things that we can do to create the enabling environment and conditions that will keep our young men and women here?[231]

Indeed, many of Rinpoche's initiatives and intended SJI actions are fully in line with His Majesty's specific recommendations to improve the economic viability of farming, to improve rural services, and "to boost economic activities in the rural areas."[232] Some specific SJI actions to date, such as the creation of the new Centre for Appropriate Technology at JNP and the organic farming and solar drying trainings, as well as future planned SJI actions like the Youth in Media project, the exploration of cultural tourism potential, and the creation of a Centre for Performing Arts are all designed to contribute to this effort.

---

[231] Dzongsar Jamyang Khyentse Rinpoche, video-recorded address to the Samdrup Jongkhar Initiative Launch, 18 December 2010, Dewathang, Samdrup Jongkhar.
[232] His Majesty the Fourth King. 2000 National Day Address to the Nation. Trashigang.

In order for these and other SJI actions to succeed in stemming the current rural-migration tide, it is essential to begin with good baseline data on current living standards in Bhutan and Samdrup Jongkhar. After all, if rural living standards are not addressed and improved, it will be well-nigh impossible to stem the rural-migration trend among youth, regardless of what other improvements are made. In the same 2000 Address to the Nation form Trashigang, His Majesty the Fourth King clearly and bluntly recognized this reality in the most practical terms:

> One of the most important steps that must be taken to encourage our people to remain in their villages is to make farming profitable and to increase the income of our farmers. It is also important to provide our farmers with the same service facilities that are enjoyed by people in urban centres such as telephone links, roads and electricity. As most of our villagers live far away from urban centres, it is also important to develop satellite towns to boost economic activities in the rural areas.[233]

Indeed, though there are numerous negative consequences associated with purely material development, a certain degree of cash income is clearly needed in this modern world. And at the same time, while there is a need for rural populations to generate higher incomes in order to reduce poverty and compensate for the new costs of living in modern Bhutan, there is also little doubt that consumer culture is likely the most significant threat to Bhutanese culture today.[234] It is therefore clearly a matter of balance. On the one hand, living standards are one of the nine key domains of GNH measured by the Centre for Bhutan Studies in assessing national and regional progress. And concurrently, it is the hope that the values of GNH and the GNH lens that is being used for development and policy purposes will ensure that Bhutan does not follow the materialist path that the rest of the world has taken—one that has often placed profit and material gain above all else, especially at the expense of the natural world, which has widened the gap between rich and poor, and which has frequently raised the living standards of only a small segment of society.

This chapter will explore, to the degree possible, the present living standards of people in Samdrup Jongkhar Dzongkhag by exploring poverty rates and the prevalence of child poverty, unemployment, equity, housing and sanitation, and access to education. Where possible, comparisons will be made with other dzongkhags.

[233] Ibid.
[234] Dr. C.T. Dorji. 2008. *A Concise Cultural History of Bhutan*. Prominent Publishers, Delhi.

4.1 Demographics

The total population of Bhutan in 2009 was estimated to be 683,407.[235] According to the Bhutan Living Standards Survey (BLSS) 2007, the average household size at the national level is 5.0, and the average age of a household head is 45 years. However, the percentage of household heads under 60 years old is 20% higher in urban areas than in rural areas. Household heads are defined as those in charge of making economic decisions for the household. Nearly one third of household heads in Bhutan are women.

Samdrup Jonkhar has a population of about 36,000, an average dzongkhag population, though the population disparity between some dzongkhags is quite extreme. As recorded in the 2007 BLSS, Thimphu has nearly 90,000 residents and Gasa less than 4,000. The total number of households in Samdrup Jongkhar is 7,000, and the average household size is 5.01—almost identical to the national average. Some analysts have remarked that these official statistics distort reality by registering many citizens as residents of their dzongkhag of origin rather than of their current place of residence, and that the disparities are therefore even greater than indicated in National Statistics Bureau (NSB) statistics. Thus, the population of Thimphu is said to be considerably larger than indicated here, while we were told that the actual resident population of Samdrup Jongkhar is considerably less than the 36,000 recorded in official statistics when the large numbers of recent rural-urban migrants are subtracted.

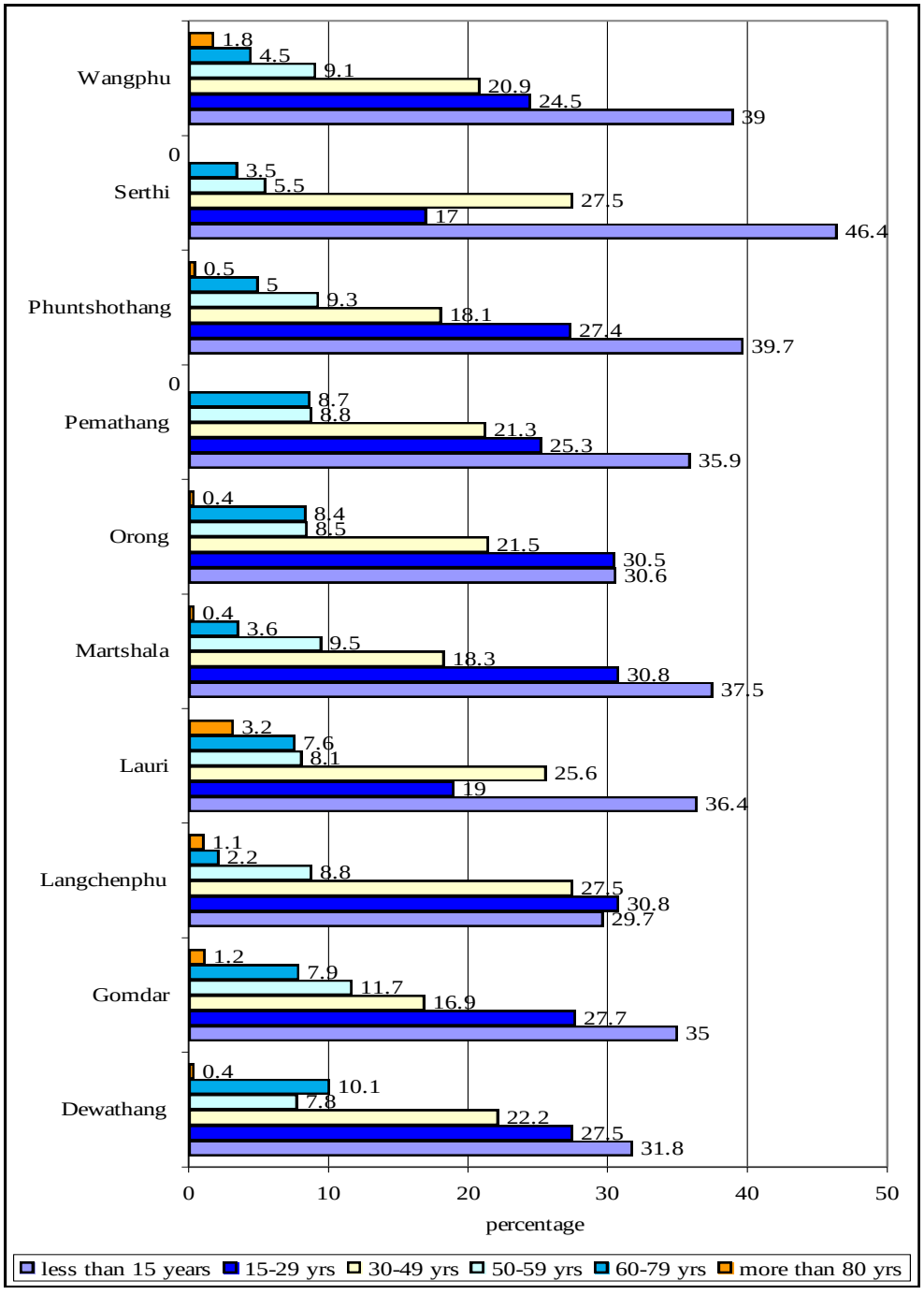
Nearly half the population of Bhutan is below 20 years of age; and three in five persons are below 30. Children (below 15 years) account for one third of the population, while the elderly (aged 60 and above) comprise less than ten percent of the population. The age structure in Bhutan yields a dependency ratio of 69%. That is, for every ten persons in the economically productive ages (15–59 yrs.) there are seven "dependent" persons – persons under 15, or over 60 yrs. old.[236]

Figure 7 below, based on previously unpublished BLSS micro-data files, illustrates age distribution in Samdrup Jongkhar by gewog. It is worth noting that in Martshala and Phuntshothang Gewogs, more than two thirds of the population is below the age of 30 years. In Phuntshothang nearly 40% is under the age of 15 and in Martshala 37.5% is under 15. In Serthi Gewog, nearly half of the population (46%) is under the age of 15. However, only 17% of the Serthi population is between the ages of 15 and 29—the lowest proportion among all 11 gewogs in this age group. This seems to imply that a very large percentage of Serthi youth leave the gewog when they come of age. In Dewathang 60% of the population is under 30 years of age (32% under 15). In all gewogs, the elderly (age 60 and above) comprise 11% or less of the population.

According to the 2005 Population and Housing Census, there are 17,786 children in Samdrup Jongkhar (age 18 and under): between 0-4 years there are 4,221, between 5–9 years there are 4,713, between 10–14 there are 5,110, and between 15–18 years 3,742.

[235] National Statistics Bureau (NSB), Bhutan at a Glance, 2009.
[236] BLSS 2007 for tables of age and sex distribution, pp. 22–23.

Figure 7. Age distribution, Samdrup Jongkhar by gewog, 2007



Source: BLSS 2007 unpublished micro-data files.

Note: Data for Samrang Gewog were not available.

For reasons that could not be determined at the time of writing, Samdrup Jongkhar has by far the lowest percentage of women household heads of any dzongkhag in the country at only 5.4%, followed by Samtse at 12.2%. The national average is 30.7%, with the highest percentage of women household heads in Bumthang at nearly 65%. Interestingly, data from The Poverty Analysis Report (PAR 2007) show that three of the poorest dzongkhags in Bhutan have the lowest rates of women household heads in the country.[237] Further analysis is required to determine whether or not there is a correlation between these factors.

The population of Bhutan includes many ethnic groups such as the Sharchops from the east, Ngalongs from the west, Khengpas from the central region, nomads from the north, and Lhotshampas (Nepali-speakers) from the south, who originally migrated to Bhutan from Nepal. These (and other ethnic groups) are all found in Samdrup Jongkhar. Sharchops are currently estimated to be the most numerous group followed by Lhotshampas. Because of the mix of ethnicities, a wide variety of dialects is spoken, of which Sharchop, Dzongkha, Khengkha, and various dialects of Nepali are the most common. The majority of the population is Buddhist (around 70%) and the remainder (30%) are mainly Hindu, located mostly in the southern gewogs.[238]

It was not possible to ascertain from published Census data what proportion of the total population of Samdrup Jongkhar each ethnic group comprises.

4.2 Economic security and equity

Economic security means that individuals have a sense of confidence, protection, and even certainty about their economic safety both in the short term and for the foreseeable future. The economically secure do not worry about finding adequate economic resources to support themselves and their families, especially when encountering the economic losses that may result from being unemployed, ill, separating from an income-earning partner, or growing old. Thus, they do not feel overly anxious about potentially adverse circumstances that they may encounter in the future, and they have confidence that existing social mechanisms will provide adequate protection against such circumstances and conditions.

Because the definition of economic security above is essentially subjective, based on an individual's perceptions and feelings of confidence, security, wellbeing or anxiety, these subjective experiences are very difficult to quantify and measure directly and consistently over time. It is also particularly difficult to assess the notion of economic security in the

[237] Poverty Analysis Report (PAR) 2007, p. 16.
[238] *Environmental Assessment Report: Preparing the Rural Renewable Energy Development Project: Initial Environmental Examination (Draft)*. Samdrup Jongkhar Accelerated Rural Electrification Subproject, March 2010. Prepared by the Department of Energy, Government of Bhutan, and the Asian Development Bank. http://www.adb.org/Documents/IEES/BHU/42252/42252-02-bhu-iee-08.pdf

context of Bhutan, which has long been a largely agrarian society in which entrance into a cash economy is new for large segments of the population, and in which traditional agrarian social networks and supports are breaking down for many urban migrants.

In past work on assessments of economic security (a key dimension of the Genuine Progress Index), GPI Atlantic used available objective data on a select number of known risk factors for economic insecurity—unemployment, illness, old age, and single parenthood—and on the social mechanisms in place to provide protection against those risks, as proxies for the assessment of economic security. The underlying assumption in such analyses is that changes in the subjective level of anxiety about a lack of economic safety are at least relatively proportionate to changes in objective risk.

However, due to data limitations and time constraints, this kind of assessment is not presently possible for Samdrup Jongkhar. Further study needs to be undertaken on what social mechanisms are in place in Bhutan to provide protection against risks not only to economic security but also to food security. These risks include but are not limited to: crop loss, crop damage, illness and inability to work, death or disability of income-earning partner, old age, and unemployment. Such an assessment will particularly need to take into account the dramatically changing circumstances of large numbers of citizens, such as rural-urban migrants, to ascertain whether present protective social mechanisms are adequate to replace the support networks that have traditionally been a mainstay of economic security in rural Bhutan.

Given the present challenges in conducting such a systematic assessment of economic security, we will, in this *Profile,* look instead at as much as possible of the existing data that relate to living standards: poverty, child poverty, the poverty gap, literacy, equity, access to education, and housing and sanitation. Taken together, those data may provide at least a partial and temporary proxy for economic security.

As well, we will report here on relevant results for Samdrup Jongkhar Dzongkhag from the Centre for Bhutan Studies' 2010 GNH survey indicators of living standards and wellbeing, which were presented for the first time at the SJI Launch held at the Chokyi Gyatso Institute in Dewathang in December 2010. Many thanks are due to CBS for its dedicated work in analysing these dzongkhag-level results in detail especially for use by the Samdrup Jongkhar Initiative.

4.2.1 Poverty

Kopur, a century old village of approximately 50 households is about 2 km from Dewathang town. In its basic socio-economic profile, Kopur is not unlike many of the other villages visited during our field research, and it shares some of the challenges faced by those other villages, including being plagued by water shortages—not enough of it for rice production—and by human-wildlife conflict. At one time the people of Kopur used guns to scare away the wild animals (perhaps even kill them), but this is no longer allowed by the military, which set up here in some strength during the Assam insurgent crisis. Some of the farms around Kopur have been abandoned because of wild elephants.

The villagers of Kopur say they are not doing well economically. When asked about how much of their family income was spent on food items, they replied: "Our monthly income is not sufficient to supply food." Most of the men generally work in the low-wage public works division, and the women are engaged in fieldwork, childcare, and food production.

According to the GNH Commission, there are three defining characteristics of poverty in Bhutan: remoteness, size of landholding (or lack of landholding), and the economic use of the land holding. Lack of road connection means farmers can't generate an income from their farm products. Small landholdings also mean that the poor can only cultivate enough for a few months, but must then rely on purchases for the rest of the year."[239] [240]

Landlessness was a key factor contributing to poverty in some villages visited. For example, in the village of Bawani in Phuntshothang Gewog, there are 33 households. Most people in the village are paddy farmers, but the majority labour for other landowners. The villagers estimate that 80% of households are landless.

In interviews, Bawani residents reported that the village's difficulties stem from isolation, landlessness, and the unrest in the 1990s. It was unclear to the researchers why there are so many landless in Bawani, but it may have to do with the movement of families from neighbouring villages into Bawani where they then remained without any land. For example, one nearby village decreased from 26 to 4 households, so the remaining families migrated to Bawani and are now landless.

One major problem facing this community, and contributing to its isolation and poverty, is that Bawani is separated from the road by a river, which swells during the monsoon season, making passage extremely difficult. Furthermore, there are no irrigation channels to support farming during the dry season. Most people depend on construction and public works to make a living, and others work in the houses of wealthier people. But the average daily wage is only Nu. 100, on which it is difficult to support a family. One villager explains:

> In Bawani we don't have any farming work that is productive. In the summer season we cannot go to market because we don't have a bridge. We don't even have enough production for our own consumption. We don't have water in paddy fields, and most of us work on sharing systems on others' land. They rent land to us and we divide the products. We do grow maize but the wild boar never lets it reach until harvest, it finishes before the harvesting time. We do grow paddy when there is enough rainfall… In Bawani, we have problems of irrigation channels, wild animals, road and we don't have a bridge either. Bawani is one of the most isolated and backward villages in Phuntshothang Gewog…. Some are equivalent to homeless, their house is just a bamboo shed, some are even striving for their daily meal… almost 30% they live below the poverty line.

[239] Nirmala Pokhrel. "What it means to be poor," *Kuensel*, November 2, 2010, p. 3.

[240] One SJ Parliamentarian present at the SJI Profile presentation on May 19, 2011, at Deer Park, Thimphu, noted that lack of landholding was a key factor contributing to poverty in Phuntshothang, Pemathang and Langchenphu, where poverty rates exceed 50%.

The community of Bawani is Lhotsampa (people of Nepali origin who reside in southern Bhutan). In the unrest of the early 1990s, a great many Lhotsampa left Bhutan. In the southern gewogs of Samdrup Jongkhar, the result was that land was left barren and, with fewer people available, many villagers were also not capable of keeping the wild animals from their crops. Villagers reported that according to government rules, there were too few households in Bawani to qualify for certain kinds of assistance and development. When asked about the changes they had observed in their community over time, an elderly woman replied that she had been living in this community since 1968 and has seen little development of infrastructure since then. At the time of these interviews, however, Bawani residents were about a month away from being hooked up to the electrical grid.

Rudimentary dwelling in Woosoon village, Wangphu Gewog

Overall, Bhutan has a rural poverty rate of 30.9%.[241] Urban poverty is much lower with only 1.7%. The highest rates of rural poverty are in Zhemgang (53%), Samtse (47%), Mongar (44%), Lhuentse (43%), and Samdrup Jongkhar Dzongkhags, where the overall poverty rate is 38% (see Figure 1 in Chapter 1).[242]

[241] Please refer to Chapter 1 (Food Security) for more information on poverty in Bhutan.

[242] According to the 2007 Poverty Analysis Report (PAR) *poverty* is defined as follows: "A household and all its members, are considered poor if the household per capita consumption level is insufficient to acquire a given level of goods and services regarded as essential for a minimum standard of living." The *total poverty line* is calculated by adding the *food poverty line* (derived from the Cost of Basic Needs approach) and the *non-food poverty line*. The authors of the PAR used the Nepalese calorie requirement to determine

Table 14 below indicates that the highest poverty rate in Samdrup Jongkhar is in Lauri Gewog, where more than 60% of households are classified as living below the poverty line — double the rate in Dewathang. More than half of the eleven Samdrup Jongkhar gewogs have a poverty rate greater than 50%.

The gewogs with the highest poverty rate are also not accessible by road: Lauri is a two day journey by foot from the nearest road in Gelongkhar; Serthi is a 4 hour journey by foot from Gelongkhar; Wangphu is a 4 hour journey by foot from Gomdar Gewog; and Samrang is a 4-5 hour walk from Diglai Khola in Pemathang Gewog.

Some of the poorest gewogs are also currently lacking in electricity. In Lauri, solar power for lighting has been supplied by the government for 160 households in Zhangdey village, but the village spokespeople we interviewed said that roughly 60 of these now had damaged batteries and that the villagers did not know how to replace or fix them. Serthi experienced a similar situation, and the interviewers were told that only those who could afford it owned solar lighting equipment. In one village, we were told, only 10 households out of 35 had solar lighting. However, all Samdrup Jongkhar villages are scheduled to be connected to the electric grid by 2013.

Samrang, once the district's 3rd most populated gewog, has only 21 households today.[243] The people who still live there have no road access or electricity, but have been provided recently with solar lighting.[244] Samrang is also the only gewog in the district not to have any health, education or cultural centres. To access any of these services, the villagers must walk more than 4 hours to Pemathang Gewog.

Langchenphu also has a high poverty rate (55%) even though, for the most part, it does have electricity and road access—both via India. There is no road access to Langchenphu within Bhutan and one has to drive 190 km from Samdrup Jongkhar town through Assam to get there. Furthermore, the electricity for the gewog comes from coal burning plants in India, and the villagers we interviewed from Langchenphu talked of periods of extreme power outages, on average 10 to 15 times per week and sometimes lasting for 2 months in the summer.[245]

In the gewog of Wangphu, the village of Benoporang has been solar electrified and has its own solar engineer—a woman trained at Bunker Roy's Barefoot College in India who

---

the Bhutanese food poverty line. The Bhutanese food poverty line is Nu. 688.96 per person per month. Those citizens consuming less than this amount are considered 'subsistence poor'. The non-food poverty line in Bhutan is Nu. 407.98 per person per month. Therefore, the *total poverty line (TPL)* in Bhutan is Nu. 1,096.94 per person per month. Those consuming less than the total poverty line are considered poor. From National Statistics Bureau. 2007. Poverty Analysis Report. Royal Government of Bhutan. Thimphu, pp.11–12.

[243] The historical context and challenges facing Samrang are discussed in greater detail in the Obstacles to Food Security section in Chapter 1, and in the section on *Equity* below.

[244] Solar lights were provided by the GNH Commission.

[245] Due to resource, time, and other constraints discussed in detail in the Appendix: Objectives and Methodology, with the exception of Wangphu, field research was not conducted in these most far-flung gewogs. However, where possible, interviews were conducted with villagers and spokespeople who came from these gewogs to attend the SJI Project Launch held in Dewathang in December 2010.

is now paid by the villagers to maintain the solar units.[246] Field research in the gewog revealed that the gewog was wired for electricity and, within a month of our visit in January 2011, was scheduled to be connected to the grid.

According to a recent newspaper report, the "poverty-stricken" people of Serthi Gewog have resorted to marijuana smuggling as an alternative source of revenue, "more lucrative than the rest of their cash crops put together."[247] The article states: "The strangling dearth of infrastructure and other social amenities in the geog have limited the scope for the people to break free from the quagmire of poverty."[248]

According to the *Bhutan Times* article, the marijuana is cultivated in and among the other crops and by spreading the seeds randomly in the wild. Villagers then cut and dry the plant and carry it down to the border town of Jomotsangkha (formerly Daifam)—a day's walk from Serthi. The marijuana fetches between Nu. 700–1,000 per kg. By the time it reaches West Bengal, it is sold for more than Rs 5,000 per kg.

Dewathang Gewog, which includes the towns of Dewathang and the administrative centre of Samdrup Jongkhar, has the lowest poverty rate (30%) in the dzongkhag. Dewathang town is a relatively prosperous area, even when compared to the other nearby villages, as it has a number of large institutions including an engineering college—Jigme Namgyel Polytechnic, a Buddhist monastery—the Chokyi Gyatso Institute, a military base, and a hospital.

[246] A total of 504 houses in 48 villages in Bhutan have been solar electrified by the efforts of Bhutanese women who have been trained at Barefoot College, an institute founded in 1986 by Bunker Roy with the aim to impart traditional knowledge and skills and appropriate technologies at the rural and village level.
[247] Karma Tenzin. "Cashing in on Marijuana," *Bhutan Times*. November 14, 2010.
[248] Ibid.

Table 14. Poverty and inequality in Samdrup Jongkhar, by gewog, 2007

Gewog	Number of Households	Poverty headcount rate estimate	Poverty headcount rate S.E.	Gini Coefficient estimate	Gini Coefficient S.E.	Number of Poor
Phuntshothang	599	0.458	0.060	0.245	0.013	1404
Pemathang	297	0.559	0.079	0.236	0.013	810
Gomdar	621	0.439	0.050	0.264	0.014	1161
Lauri	697	0.606	0.053	0.236	0.010	1619
Martshala	475	0.453	0.053	0.258	0.014	986
Orong	639	0.424	0.042	0.279	0.012	1194
Langchenphu	171	0.550	0.070	0.242	0.020	482
Samrang	22	0.570	0.148	0.252	0.045	60
Serthi	421	0.539	0.052	0.241	0.012	952
Wangphu	339	0.561	0.064	0.256	0.013	1077
Dewathang	653	0.300	0.040	0.292	0.014	899

Source: Bhutan Living Standards Survey, 2007. Unpublished micro-data files.

Note: The Standard Error (S.E.) columns above indicate the possible margin of error in the results, as the survey sample size at the gewog level is much smaller than at the dzongkhag level where results are more statistically reliable. For example, in Samrang Gewog, with its very small population, the poverty headcount rate may vary from between 42.2% and 71.8%, since the high margin of error of 0.148 is in either direction from the 57.0% listed rate. The margin of error is considerably less (only 0.040 in Dewathang Gewog) in the more populous gewogs.

According to the UNDP Human Development Index, roughly 32% of the total employed population in Bhutan live on less than U.S. $1.25 day. In 2010, the average gross national income per capita in Bhutan was U.S $5,607.[249]

According to BLSS (2007) unpublished micro-data files, in Samdrup Jongkhar, 44% of income comes from wages, 10% from own business enterprise, 12% from own farm enterprise, 2.4% from remittances, 0.6% from pensions, 0.6% from rental or real estate, 0.4% from selling assets, and nearly 30% from other sources.[250]

At first sight, those data appear to contradict what is reported in the agriculture diversity chapter, namely: "The economy of Samdrup Jongkhar is based overwhelmingly on subsistence agriculture with agriculture accounting for 83% of the cash income of rural households in 2008." However, those data come from the RNR Census, not the BLSS, and only refer to rural households, whereas the BLSS data are for all households, including the more substantial populations of the towns of Dewathang and Samdrup Jongkhar. This likely accounts for the reason that the BLSS reports a smaller proportion

[249] United Nations Development Program. Human Development Indicators. Statistical Annex. 2010. Available online.
[250] BLSS (2007) unpublished micro-data files.

of farm-based income than the RNR Census data reported in the agriculture diversity chapter of this report.

It is also worth noting here that in general when villagers were asked about poverty rates in their village, they would often reply that there were only a handful of poor and they were either the very old or those without land. This *village level* notion of poverty therefore does not correspond with the official rates reported above, and indicates that a certain degree of hardship and struggle seems to be accepted within the villages, and that only those who are in extremely dire circumstances are considered "poor."

The World Bank, National Statistics Bureau (NSB), and Gross National Happiness Commission (GNHC) have identified poor school attendance, road infrastructure, and access to markets as conditions correlated with high poverty rates. For example, in many poor areas (e.g. Chukka) there is markedly lower school attendance than in areas with lower poverty rates.

However, in examining these correlations more closely, there was found to be a discrepancy between the geo-referenced poverty data and the overall accessibility index. The NSB report authors draw a causal relationship between accessibility to markets (calculated with the overall accessibility indicator) and poverty rates. However, according to the NSB data, Gasa, and some areas of Wangdue and Thimphu Dzongkhags, have low market accessibility as well as extremely low poverty headcounts.

For Samdrup Jongkhar, on the other hand, there does appear to be a direct correlation between low poverty rates and accessibility to markets. Likewise, in areas of Samdrup Jongkhar without rural electrification, rural poverty rates are higher. Regression analysis is required to assess the degree to which these correlations indicate causal links, and further analysis is required to assess what other factors may be improving living standards in Gasa despite that dzongkhag's poor accessibility.

BLSS data indicate that poor households tend to be rural and large in size (i.e. have a number of children). They also tend to be headed by men, as opposed to women. In fact, the depth and severity of poverty is observed to be higher among male-headed households. Poverty rates are also observed to increase with the age of the head of the household.[251] Poverty rates by ethnicity were not available.

When looking at poverty rates, it is also important to assess the "depth and severity" of poverty or what is termed the "poverty gap."[252] The 2007 Poverty Analysis Report (PAR) found that poverty was deeper and more severe in rural areas than in urban areas. According to the PAR, a total of Nu. 502.2 million would be needed annually to eliminate poverty in Bhutan—the equivalent of 1.2% of the GDP. The report notes that a direct cash transfer to the poor is "neither sensible nor feasible: dole outs would only

[251] Ibid.

[252] Poverty gap index is the average depth of poverty for the population—it is the sum of the depth of poverty of each individual divided by the total number of individuals in the population. Depth of poverty data therefore depend on how far below the poverty line the poor are.

make the needy dependent. Poverty reduction can only be sustained if the poor are empowered."[253]

However, it is also worth noting here that the costs of poverty in terms of health and other societal costs (such as those stemming from family breakdown and addictions) might far exceed the costs associated with providing the poor with a stronger social safety net.

4.2.2 Child poverty

According to the Global Child Poverty Report for Bhutan, prepared by Lham Dorji for UNICEF, the child poverty headcount rate in Bhutan overall is 24.3%, with the incidence of child poverty in rural areas far exceeding that of urban areas (32.3% versus 1.4%).[254] BLSS 2007 data further indicate that child poverty in Samdrup Jongkhar is 40%—the fifth highest among dzongkhags, with the highest incidence occurring in Zhemghang (54%) followed by Samtse (49%), Mongar (47%) and Lhuentse (46%). The lowest rate of child poverty was found in Thimphu (1.3%). Gasa also had a low rate (5%).

The National Housing and Population Census (2005) provided data for "child deprivation." Based on these data, 52% of children in Bhutan overall are considered "deprived." The incidence in Samdrup Jongkhar was 60%. The highest incidence was Gasa at 75% and the lowest incidence was in Thimphu at 33%. Further investigation is required to reconcile these child deprivation data with the child poverty data cited above in order to understand, for example, why Gasa Dzongkhag has such a high rate for the former and low rate for the latter, and why Thimphu Dzongkhag, too, has such a wide gap between the deprivation and poverty rates.

The NSB child poverty study by Lham Dorji also indicated that the infant mortality rate (IMR) in Samdrup Jongkhar was the highest among dzongkhags: 69 per 1,000 in 2005. The IMR in Bhutan overall was 40 per 1,000 and the lowest rate was in Gasa (though no figure was provided).[255]

The prevalence of malnutrition, or "wasting," was also quite high in Samdrup Jongkhar where the problem was rated as "serious" (between 10–14%). Rated as having a "critical" rate was Haa with malnutrition higher than 15%. Dzongkhags classified as having "no wasting" (less than 2%) were Mongar, Zhemgang, Trongsa, Punakha, and Pemagatshel (no data were provided for Gasa).

Again, further investigation is required to reconcile these data with the child poverty data indicated above, to ascertain why Zhemgang, for example, has the highest rate of child poverty in the country but one of the lowest rates of malnutrition. Logically, a closer correlation between the two data sets might be expected.

---

[253] National Statistics Bureau. 2007. Poverty Analysis Report, p. 19.
[254] Data are from BLSS, 2007.
[255] *Socio-economic and demographic indicators 2005*, National Statistics Bureau. Cited in Lham Dorji's child poverty study prepared for UNICEF.

As well, some dzongkhags report a high incidence of both deprivation and child poverty but a low incidence of malnutrition, which also seems contradictory. It was not clear at the time of writing whether these apparent discrepancies are due to errors in the reported data or difficulties with comparability since data are from different surveys and sources. These issues clearly require further investigation.[256]

Lham Dorji's child poverty study also indicates that Samdrup Jongkhar is the third highest dzongkhag in the country in terms of percentage of children living at least one month without adequate food: 29%. On this indicator, Dagana had the highest rate at 62%, followed by Zhemgang at 31%. Lowest was Bumthang (1.1%).[257]

In terms of child health, the incidence of Acute Respiratory Infections (ARI) per 1,000 cases in Samdrup Jongkhar was fourth highest in the country at roughly 8 cases per 1,000. The highest ARI incidence was in Thimphu at rougly 10 per 1,000, followed by Samtse and Sarpang. The lowest incidence was in Bumthang.[258]

Insufficient information is presently available to identify the causes of differences in ARI incidence. While it is tempting to speculate that air pollution (from vehicles in Thimphu and from the Asian brown cloud in the southern dzongkhags) may be responsible for higher ARI rates in those dzongkhags compared to Bumthang for example, the high Thimphu rate may also be attributable to ease of hospital access and therefore higher reporting rates.

Among the 20 dzongkhags, the reported cases of pneumonia among children under 5 years of age were third highest in Samdrup Jongkhar at 585 cases in 2006. The highest number was reported in Sarpang (634), followed by Thimphu (591), and the lowest number of cases were reported in Gasa (5).[259] However, these absolute numbers are largely determined by population size rather than incidence rates, with the Gasa numbers attributable to its tiny population (about 4,000) and the Thimphu rate attributable largely to its much bigger population as well as greater access to medical facilities and therefore likely higher reporting rates.

4.2.3 Equity

A growing body of evidence links improvements in equity with positive economic, social, health, environmental, and political impacts. This basic understanding is backed by a growing body of research demonstrating that sharp wealth and income inequalities can threaten social stability and cohesion, and undermine productivity and health.

---

[256] National Nutrition and Infant Feeding Survey, MOH, 2009. Cited in Lham Dorji's child poverty study prepared for UNICEF.
[257] BLSS, 2007. Cited in Lham Dorji's child poverty study prepared for UNICEF.
[258] Annual Health Bulletin, 2006, Ministry of Health. Cited in Lham Dorji's child poverty study prepared for UNICEF.
[259] Based on clinical records, 2006. Cited in Lham Dorji's child poverty study prepared for UNICEF.

In a recent and seminal book on this subject—*The Spirit Level: Why Equality is Better for Everyone*—the authors concluded that, while researchers have known for some time that health and social problems are more common among the less well-off within each society, we also now know that "the overall burden of these problems is much higher in more unequal societies."[260] If growing inequality is bad for health, then the trends of the past 30 years are cause for concern: In most countries of the world the gap between the rich and poor is growing, including in Bhutan.

Thus, poverty is very different from inequality. In fact, an analysis of the data indicates that poverty and inequality levels stand in sharp contrast. In Samdrup Jongkhar, for example, Dewathang Gewog has the lowest poverty rate (30%) in the dzongkhag but the highest rate of income inequality, while Lauri (61% poverty) and Pemathang (56% poverty) Gewogs have the lowest rates of inequality, as measured by the Gini coefficient, which is the most widely used income inequality measure globally (see Table 14 above).

The Gini coefficient, however, also has its limitations. It represents the ratio of the gap between perfect income distribution and actual income distribution, and therefore measures income inequality throughout the income scale. But while the Gini coefficient is a well-recognized overall measure of income inequality, it does not necessarily register changes in the gap between the richest and poorest segments of the population, or the shares of income held by various quintile groups.

For instance, the Gini coefficient can stay the same while the gap between the richest and poorest segments of society increases.[261] For this reason, we also need to assess inequality by quintile groups, where "quintile" refers to one-fifth of the population, or the richest, second richest, middle, second poorest, and poorest 20% of the population.

According to the Poverty Analysis Report (PAR), in Bhutan, a person belonging to the richest 20% of the national population consumes 6.7 times more on average than a person belonging to the poorest 20% of the population.[262] What is also noticed is that the proportion of total consumption allocated to food tends to decrease as the level of per capita real consumption increases. In other words, the upper quintiles spend a smaller share of their total income on food than lower quintiles (see Table 15 and Figure 8 below).

[260] Wilkinson, Richard and Kate Pickett. 2010. *The Spirit Level. Why Equality is Better for Everyone*. Penguin Books. London, p. 20.
[261] Messinger, Hans. Statistics Canada. Personal communication. December 12, 2003.
[262] Poverty Analysis Report, 2007, p. 29.

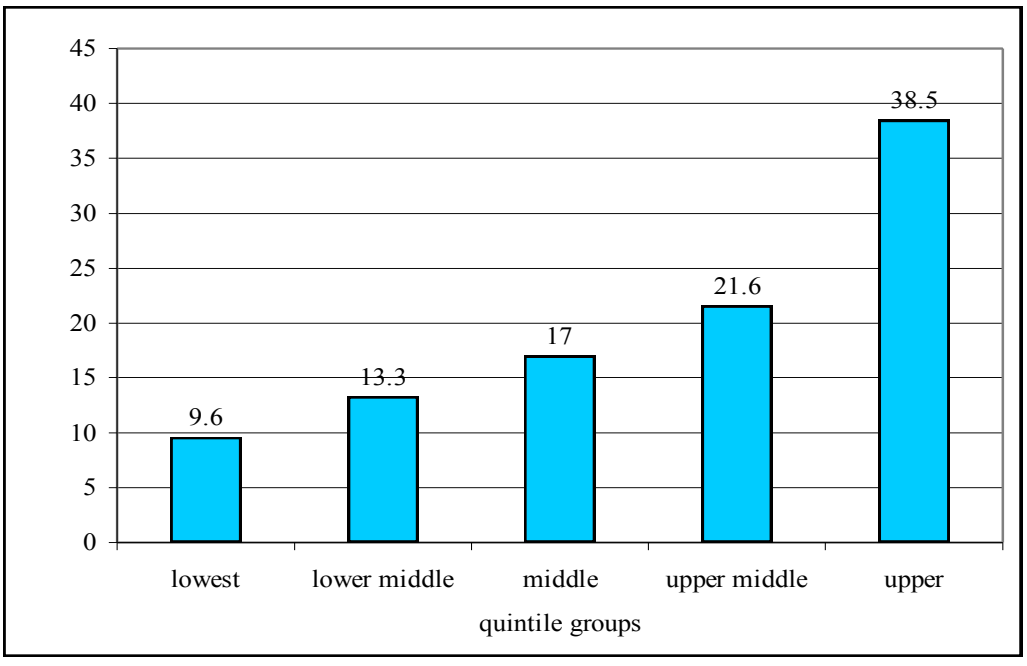
Table 15. Average monthly real per capita consumption (Nu), share in national consumption, average share of food to total consumption, average household size and dependency ratio, by population per capita consumption quintile, Bhutan, 2007

Indicator	Quintile of per Capita Real Consumption					Overall
	Lowest	Lower Middle	Middle	Upper Middle	Upper	
Average per capita consumption	771	1,249	1,771	2,662	5,217	2,314
Share of national consumption (%)	9.6	13.3	17.0	21.6	38.5	100.0
Average share of food consumption to total consumption (%)	66.4	62.6	56.3	50.5	37.4	54.6
Average household size	7.9	6.6	6.0	5.3	4.7	6.1
Dependency ratio	1.04	0.97	0.88	0.83	0.61	0.87

Source: Poverty Analysis Report, 2007, Table 14.

Note: Quintiles are based on consumption, or what people spend, not on earnings or income. Dependency ratio is the ratio of the non-working age population to the number of working-age members in the household, and is an indicator that captures the demographic composition of the families. (PAR, 2007)

Figure 8. Shares of national consumption by population per capita consumption quintiles, Bhutan, 2007



Source: Adapted from PAR, 2007, Figure 6.

In Bhutan there is recognition that inequality indicators are an important measure of societal wellbeing. From PAR:

> There is much interest in measuring inequality since high levels of inequality may contribute to, if not exacerbate, poverty… High inequality may result in lower subsequent economic growth and, consequently, in less poverty reduction. A high level of inequality may make it difficult for the poor to have a substantial share of the benefits of subsequent economic growth.[263]

An equitable society is also one that provides services to its population equitably. This principle is reflected in a one of the four core pillars of GNH, which calls for "equitable and sustainable socio-economic development." In other words, no matter where one lives, citizens should have access to basic services. In Bhutan, where rugged terrain, mountains, roadlessness, and scattered villages are the reality, providing services to its people, even in far flung places, has been a formidable challenge for the country, and one that the government continues to endeavour to meet in each 5-year plan.

However, it should be noted that even with dramatic improvements in service provision over the years, there are still many cases where villagers in distant villages experience hardship in accessing services located in larger population centres. For instance, in Wangphu gewog of Samdrup Jongkhar, while basic services such as schools, health units, and RNR centres, have now been provided, it might still take hours for villagers from far-flung villages to access these services.[264]

In another example, in Samrang Gewog (administered by the Pemathang Gewog Gup), there is no school, BHU, or RNR centre. There are currently no services provided to the villagers within the gewog itself. Only four villages—Samrang A and B, Hilley, and Sathpokri—comprise the gewog, but Sathpokri and Hilley villages are almost empty now. Samrang used to be the third largest gewog in Samdrup Jongkahr, with approximately 500 households, but now has only 21. During the unrest in the early 1990s, most Lhotsampas left the area. At one time there were many services provided to the villagers, but now this infrastructure sits empty.

The lack of population and resulting lack of services has consequently isolated the gewog and the villagers that remain: "It's difficult to get to the dungkhag office or gewog office, because we have to cross thick jungles infested with elephants and rivers that swell in the summer," said one villager.[265] When villagers are sick, they must travel several hours through the jungle to get to the nearest BHU. All the children must also walk long and dangerous distances to get to school, or else board in Pemathang Gewog, which increases the cost burden of education on already poor families. As a result, Samrang villagers are lacking in basic needs such as health and education facilities. At the time of writing, a plan to re-open the primary school in Samrang was awaiting approval by the Ministry of Education, and there was a possibility of opening a health facility in the gewog.

[263] PAR, 2007, p. 26.
[264] Based on BLSS unpublished micro-data files.
[265] *Kuensel Online*, January 4, 2011.

The BLSS found that overall in Bhutan access to health facilities is high, but the time to reach such health facilities also remains high in rural areas, particularly among poor households. For instance, in 2007, it took an average of 111 minutes for the rural poor to reach the nearest BHU, compared with an average of 76 minutes for the rural non-poor. In Bhutan overall, the difference was 109 minutes for the rural poor versus 56 minutes for the rural non-poor.[266]

Unpublished micro-data for distances to BHUs in Samdrup Jongkhar have been provided. However, due to time constraints and issues with data presentation, it was not possible at the time of writing to analyse these micro-data in any detail. Future updates of this Samdrup Jongkhar profile should include that analysis.

Here it suffices to note that, despite considerable improvements in service provision in recent years, both statistical data and our Samdrup Jongkhar field research point to significant remaining inequities and challenges in service access.

4.2.4 Household debt

Data are currently not available for levels of household debt in Bhutan. However, BLSS (2007) did collect information on sources of credit available to households and found that, in Bhutan overall, two out of three households have access to loans from relatives or friends, while five in seven households have access to banks or the Bhutan Development Finance Corporation (BDFC) for credit. One in two households in urban areas and one in four households in rural areas have access to banks.

Respondents were also asked whether their households owe money to anyone, and at least four out of five households do not owe any money (although they might have access to loans if needed). Nearly 20% of Bhutanese households owe money to relatives or friends; 10% owe money to a bank, and 9.5% owe money to the BDFC. In rural areas, only 6% of households have obtained loans from a bank, compared to 20% in urban areas.

BLSS also collected information on first sources of credit among borrowers, and found that in Samdrup Jongkhar dzongkhag, the bank was the first source of credit for approximately 9% of households (the majority of which resided in the town areas), the BDFC the first source of credit for 6% of households, while 8% got first loans from other sources, and nearly 60% borrowed first from relatives or friends. The highest rates of family/friend borrowing were found in Lauri (84%), Pemathang (83%), Serthi (74%), and Gomdar (70%) and the lowest rate of family/friend borrowing was found in Samdrup Jongkhar town (32%). Not surprisingly, these data point to a clear rural-urban divide in credit, with distant rural households correspondingly more likely to borrow from relatives and friends. Roughly 11% of households seeking credit had no access to loans, and 6% responded they didn't know.[267]

[266] PAR, 2007, Table 17.
[267] BLSS 2007 unpublished micro-data files.

However, given the serious debt problems that have arisen south of the border in India, and elsewhere in the world, particularly among farmers, it would be wise to monitor the levels of indebtedness in Samdrup Jongkhar and ensure that farmers and others don't amass unmanageable burdens. Based on field research interviews it appears that there may already be some warning signs in the dzongkhag in this area. It is estimated more than 200,000 Indian farmers have committed suicide in the last decade due largely to mounting debt burdens from which they cannot escape.

According to the Dzongdag of Samdrup Jongkhar, Phub Tshering, there is already a repayment problem in the district, particularly among rural people. He says that the gewog head—Gup—is now responsible to help the BDFC collect money from borrowers. While debt repayment has by no means reached crisis proportions in Samdrup Jongkhar or Bhutan generally as it has in other parts of the world, it will be useful to heed early warning signals to avoid any escalation of indebtedness beyond the point where debts can manageably be serviced.

The Bhutan Development Finance Corporation (BDFC) presently gives loans ranging from Nu. 10,000 to Nu. 50,000 at an interest rate of 10%. According to Tashi Tobgyel, the Chair of the Dewathang Milk Marketing Cooperative, many of the farmers are "very poor," and the cost of buying and maintaining Jersey cows is so steep that they have had to take out loans to do so. Tashi Tobgyel reports that many farmers do presently get loans from the BDFC to purchase the cows at the standard rate of 10% interest/year. Currently, Tashi Tobgyel reports, the BDFC loans are quite manageable for the farmers. Thus far they don't have any problems with defaulting, and their payments (every three months) are managed by the milk society. Currently about 40 farmers (out of the 80 or so active members) have loans.

4.2.5 Access to education: Walking distance to school

One grandmother in Bawani village in Phuntshothang gewog worries when the children leave to go to school:

> During summer season we are afraid that our school-going children will get washed away by the river. That gives us a lot of tension, because there is no bridge.

In another small village located about 5 km from the town of Dewathang, overlooking the open-pit coal mine, one villager explains:

> We have no school here for our children. They have to walk more than 2 hours to reach their school which is bad for their studies because they get so tired. During summer [monsoon] there is a risk from landslides and our children come home drenched and become sick.

River without bridge to Bawani village,
Phuntshothang Gewog

In Gomdar the children have similar problems related to weather. One villager reports:

> During summer season, there are landslides and heavy rainfall, so we don't send children to the school and they stay back around 3 to 4 days a week at home.

One spokesperson for Samrang Gewog explains the situation there:

> Before in the 1990s, we had a school, but it has been closed down. Now, we have a petition for a school saying we want an extended classroom. We are just determining how many children will be there. If it is above ten children, we thought we should open one extended classroom for them. Because from Samrang, it takes four hours for the children to reach the school in Pemathang. It is a big journey for the children.

Even within the town of Dewathang itself, there are disparities among the children when it comes to getting to school: some receive a ride to school and others don't. For instance, a vehicle is provided for those children who live at the Jigme Namgyel Polytechnic (a

JNP school bus) and for those who live on the military base (an army truck) to take the children to the Primary and Middle Secondary schools.

But those children who do not live in these institutional settings, and who are not provided with private transportation, have to walk. According to the Principal of the Garpawoong Middle Secondary School, approximately 30% of the students walk to school—a round trip distance of more than 7km from the town.[268] The distance from many villages is considerably longer. The principal says a bus has been provided, but it currently sits in Samdrup Jongkhar town awaiting a qualified bus driver.

In rural areas in Bhutan, approximately one quarter of primary school children take more than an hour to get to school, whereas in urban areas only one percent of primary school children take more than an hour to reach school. This disparity, and the far greater difficulty in reaching school in rural areas, is reflected in the sharp contrast in school attendance among rural and urban youth.

According to the 2007 BLSS, formal schooling rates are much higher in urban areas than in rural areas: Including all ages, 60.3% of rural dwellers in Bhutan have never attended school, almost double the urban rate of 31.9%. In Samdrup Jongkhar, 55.2% of the population never attended school. The main reasons given for not attending school are: too young or too old (24.2%), lack of interest (15%), not affordable (14.2%), need to work (10.8%) and school is too far (10.8%).[269] Among school-age children, needless to say, attendance rates are very much higher than indicated here for the population at large.

In 2007, 43% of children in Samdrup Jongkhar dzongkhag needed less than 15 minutes to reach school. However, 18% required between 15 and 30 minutes and 22% required more than one hour. In more remote parts of the dzongkhag, more time is needed. For example, about half the children in Phuntshothang, Serthi, and Wangphu gewogs needed more than one hour to reach school (46.8%, 52.2% and 60.0% respectively). The vast majority of Samdrup Jongkhar children and their families (96.3%) did not spend any money on school transportation.[270]

According to the Educating for GNH Principals' Survey (2010), nearly 47% of principals in Bhutan reported that their school was less than a 30-minute walk from the nearest road. However, nearly 20% reported that their school was between 2 and 5 hours from the nearest road and an additional 21% reported their school was more than 5 hours walking from the nearest road.

These data were further analysed by region, to ascertain where duration of walking was most problematic. Cross tabulation found that nearly 51% of principals in the East, 42% in the Central region, and 41% in the South reported walking distance to be greater than 2

[268] This round-trip distance refers just to the dirt road leading from the main highway to the Garpawoong M.S.S school, which is 3.5 km long.
[269] BLSS (2007) unpublished micro-data files.
[270] BLSS (2007) unpublished micro-data files. No data were provided for Samrang Gewog. According to Sangay Tempa, Samrang is now under Pemathang Gewog.

hours (between 2–5 hours and more than 5 hours combined), compared with 27.3% in the West other than Thimphu and 16% in Thimphu.[271] Data were not available at the dzongkhag level.

The BLSS 2007 also collected data on educational expenses incurred by households and found that, on average, the total amount spent per person in urban areas was practically twice that spent in rural areas (Nu. 3,400 versus Nu. 1,900).[272]

4.2.6 Literacy[273]

Literacy is deeply linked to all aspects of life and livelihood and is unquestionably a powerful instrument for empowerment. It is an essential condition for sustainable socio-economic development and a critical tool to eradicate poverty, enhance employment opportunities, advance gender equality, improve family health, conserve the environment, and promote democratic participation. In particular, there is a close and deep interrelationship between illiteracy and poverty at the global, national, and local levels.

The overall literacy rate among the Bhutanese population 6 years and older is 56%. Thimphu has the highest literacy rate (72%; 63% females; 81% males) while Gasa has the lowest rates (40%; 29% females; 51% males). Three out of every four persons residing in urban areas are literate, while less than half of the rural population is literate.

However, when literacy rates are compared to poverty rates, some exceptions to the normal high correlation appear. For instance, Gasa, which has the lowest literacy rate, also has one of the lowest poverty rates in the country. Further investigation is needed on the conditions that exist in Gasa that make it an exception to the rule.[274]

Nationwide, the literacy rate among males (66%) is twenty percentage points higher than among females (46%). Interestingly, the national data show that women who have attended school, particularly in urban areas, are far less likely to be household heads than illiterate women in rural areas. Nearly 85% of urban dwelling males are literate, while only 60% of rural dwelling males are literate. Similarly, while 65% of females are literate in urban areas, only half of the women residing in rural areas are literate.

The literacy gender gap widens with age; in the 6–9 year old age group, males are only 2.6 percentage points more likely to be literate than females — a testimonial to growing

[271] GPI Atlantic. 2010. *Educating for GNH Principals' Survey*. GPI Atlantic, Halifax.
[272] Expenses include: token fee/school development fund, boarding fees, books and supplies, private tutoring, public transportation to and from school, and other educational expenses such as uniforms. BLSS (2007), Table 3.15.
[273] A person is considered literate if s/he can read and write in at least one language, (i.e. Dzongkha, English, Sharchop, Nepali etc).
[274] Note that as previously mentioned, Gasa is also an exception when it comes to correlating poverty with inaccessibility, which are generally highly correlated, while Gasa has a low poverty rate despite it relative inaccessibility to markets. Gasa is also an exception to the usual high correlation between illiteracy and poverty, because it has a low literacy rate but also a low poverty rate. Further study is recommended on conditions in Gasa that might be modelled elsewhere.

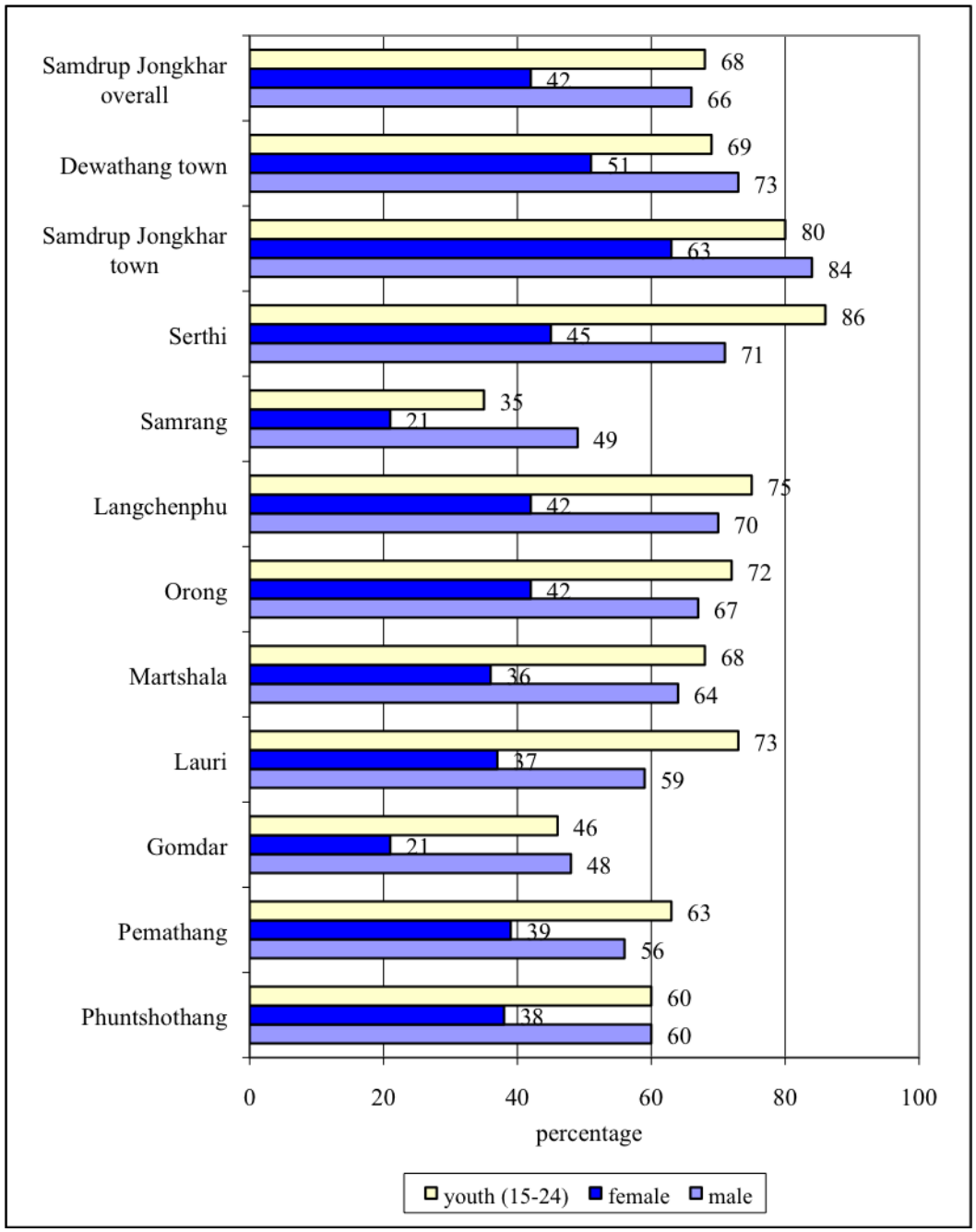
gender equality in primary education in Bhutan. In the 50–54 year age group, by contrast, the literacy rate among males is 40 percentage points higher than among females. In every dzongkhag without exception, males are more likely to be literate than females — although, as noted, the gap narrows markedly in younger age groups.

In Samdrup Jongkhar, the overall literacy rate is 55%, very close to the national average of 56%. The female literacy rate in Samdrup Jongkhar is 42%, and the male literacy rate is 68%, once again quite close to the national averages of 46% and 66% respectively.

At the gewog and town levels, literacy rates are highest in the two large towns of Dewathang (63%) and Samdrup Jongkhar (74%), and lowest in Samrang (36%) and Gomdar (34%). Serthi has the highest overall literacy rate of all the gewogs for which data were provided (58%). No data were provided for Dewathang or Wangphu Gewogs. Although there are data for Dewathang and Samdrup Jongkhar towns in Dewathang Gewog. (See Figure 9 below).

Lower female literacy rates in Samdrup Jongkhar (as in the rest of Bhutan) might contribute to the fact that women seemed to lack the confidence to participate in many of the field research interviews for this study, particularly when the men were present. In several villages, when women were asked questions directly, they often replied that they had nothing to say because the men had spoken for them. In Wangphu village, a group of nine women between the ages of 20 and 70 were interviewed (without any men present) and one of them said (to agreement by the others): “We don’t have the words we would need to be able to speak for ourselves.” The women also said that because they were uneducated, there was nothing that could help them improve their lives, save having a market for their weaving.

Figure 9. Literacy rates, Samdrup Jongkhar, by gewog, 2005



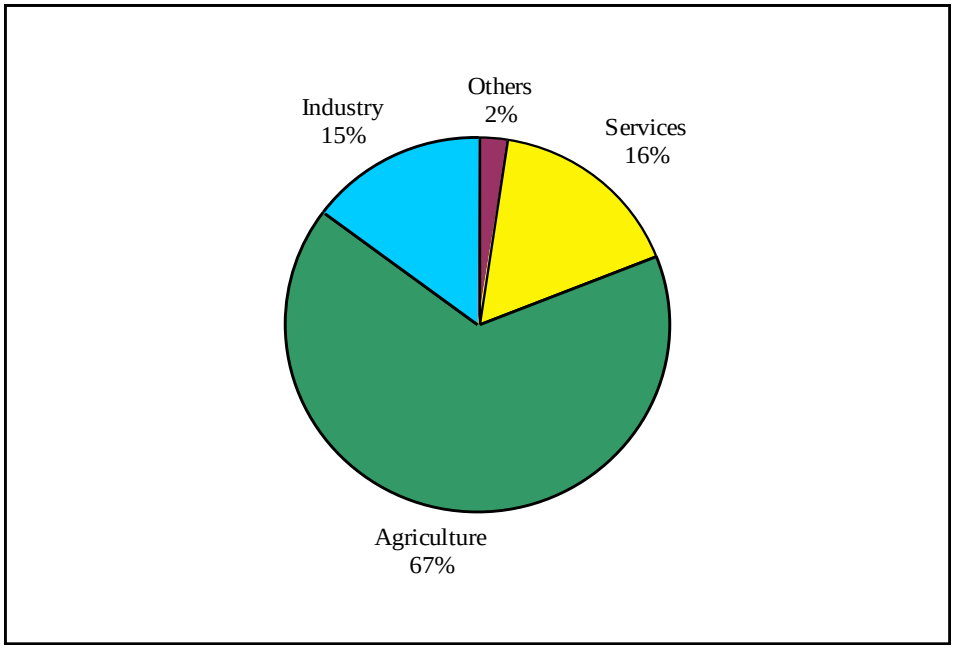
Source: PHCB, 2005.

Note: Data for Dewathang and Wangphu Gewogs were not provided, although data for Dewathang and Samdrup Jongkhar towns in Dewathang Gewog are shown above.

4.2.7 Employment

Among the estimated 274,000 employed persons in Bhutan, two thirds are employed in the agriculture sector; and the remainder work in industry, the services sector, or in other enterprises (see Figure 10 below).

Figure 10. Employed persons by major economic sector, Bhutan, 2007



Source: BLSS (2007), Figure 4.5.

Bhutan's unemployment rate in 2007 was estimated to be 3.7%. However, one in four Bhutanese between the ages of 15 and 24 years was unemployed, five times the rate of other age groups. The overall labour force participation rate nationwide was estimated to be 67.3%.[275]

In Samdrup Jongkhar overall, the labour force participation rate is 68%, just above the national average. This means that more than two-thirds of the dzongkhag's population is either employed or actively looking for work. Unemployment in Samdrup Jongkhar is 4.5%, slightly higher than the Bhutanese average of 3.7%. Mongar has the highest labour force participation rate in the country (79.6%) and one of the lowest unemployment rates

[275]The Bhutan Living Standards Survey categorises persons fifteen years and older as either (a) in the labour force—which includes both the employed and unemployed (but willing and able to work), or (b) economically inactive—those not working because of temporary illness, study, disability, family duties etc. This categorisation follows standard international definitions.

(1%), while the highest unemployment rates are in Lhuentse Dzongkag at 15.8%, followed by Thimphu (7.9%) and then Trashiyangste (7.1%).

Interestingly, despite the fact that young people flock to Thimphu from throughout the country in search of work and opportunity, the Thimphu unemployment rate is more than double the national rate, largely due to the high number of unemployed youth.[276] See Figure 11 below for unemployment rates by dzongkhag.

It should be noted that official unemployment rates only count those who are actively looking for work. They do not include discouraged workers—those who want work but have given up looking for it, largely because they believe they are unable to find a suitable job. Official unemployment statistics also do not count the underemployed—those who are working part-time but would rather be working full-time (also referred to as involuntary part-timers); or those who are working beneath their skill level. Therefore official unemployment rates worldwide are typically underestimates of the actual number of unemployed and underemployed.

In Bhutan overall, most of the unemployed (61%) report that the reason behind their joblessness is "a personal problem." A further 23% report the reason being "age factor." According to the BLSS, 2007, the proportion of unemployed citing personal problems is highest among the young, and age problems are cited most among the elderly. In rural areas, nearly 54% of the unemployed cite "personal problems" as the reason behind having no work while nearly 28% cite age as the factor.

Those without schooling comprise 77.4% of the economically active population nationwide, while those with more than higher secondary education (i.e. have gone beyond grade 12) make up only 2.7% of the economically inactive populace, but—perhaps surprisingly—34% of the unemployed.[277] In other words, contrary to normal assumptions, it appears that education does not help one get a job in Bhutan!

Results are somewhat different in Samdrup Jongkhar. According to BLSS unpublished micro-data, in Samdrup Jongkhar Dzongkhag, only 3.4% of those with more than higher secondary education are unemployed. However, if one includes those who have completed Class 10 and beyond, nearly 33% are officially unemployed.

Because some of those results are counter-intuitive — with highly educated people globally more likely to be employed than those with less education — these data will require further study to determine whether or not there is actually a correlation between level of education and unemployment in Bhutan and what its causes might be.

A likely cause of the apparent correlation between education and unemployment is that farmers (many of whom are illiterate) make up a large proportion of the economically active population and two-thirds of all employed people. By contrast, the traditional weakness of Bhutan's private sector, the very limited number of civil service job

[276] For more information, please see Chapter 4 of the BLSS 2007 Report.
[277] BLSS, 2007, p. 45.

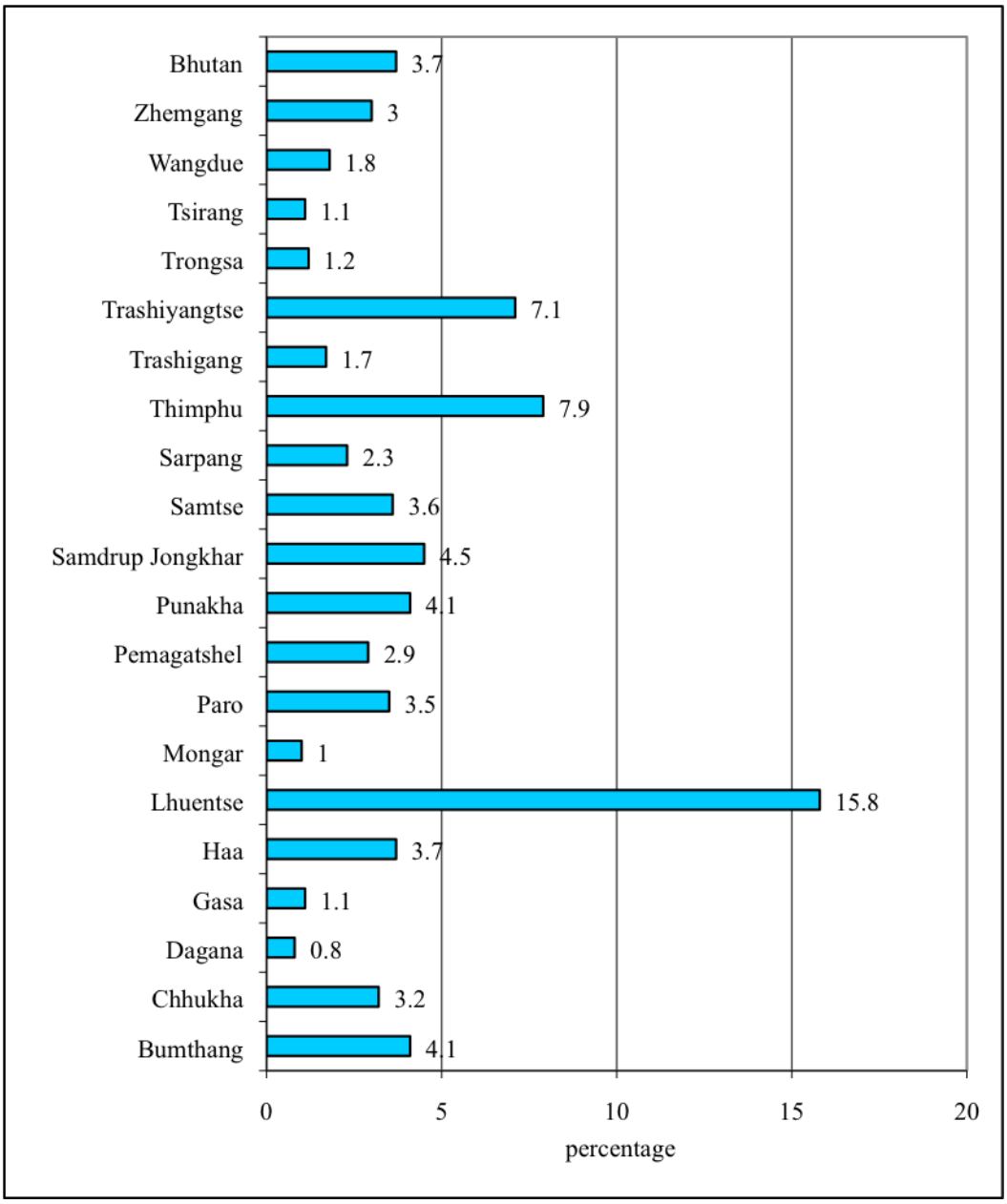
openings, and the burgeoning population of educated youth seeking work may help explain the limited opportunities available to them.

There are distinct urban/rural, female/male and youth/adult disparities in employment and in labour force participation. For example, in urban areas only 41.5% of women participate in the labour force, while 76.8% of men participate. In rural areas this disparity is considerably smaller—the male labour force participation rate is only 6.3 percentage points higher than the female rate. Further analysis will be required to assess the reasons for these disparities, but again it is likely that high female participation in farm labour will help explain the urban/rural disparity in labour force participation rates.

Additionally, the urban unemployment rate (6.8%) is more than double the rural rate of unemployment (2.8%). In some ways this is ironic, since so many youth migrate to Thimphu in search of opportunity and work. On the other hand, it may be a function of higher rates of schooling that lead youth to eschew farm labour in favour of urban office jobs that are in very limited supply.

Nationwide, youth aged 15–24 have the highest rates of unemployment (9.9%) in the country among all age groups. But if the focus is narrowed to urban areas, young people have an unemployment rate of 24.7%, while the next age demographic (25–34 year olds) has an unemployment rate of only 2.4%.

Figure 11. Unemployment rates, by dzongkhag, Bhutan, 2007



Source: BLSS 2007; Figures have been rounded.

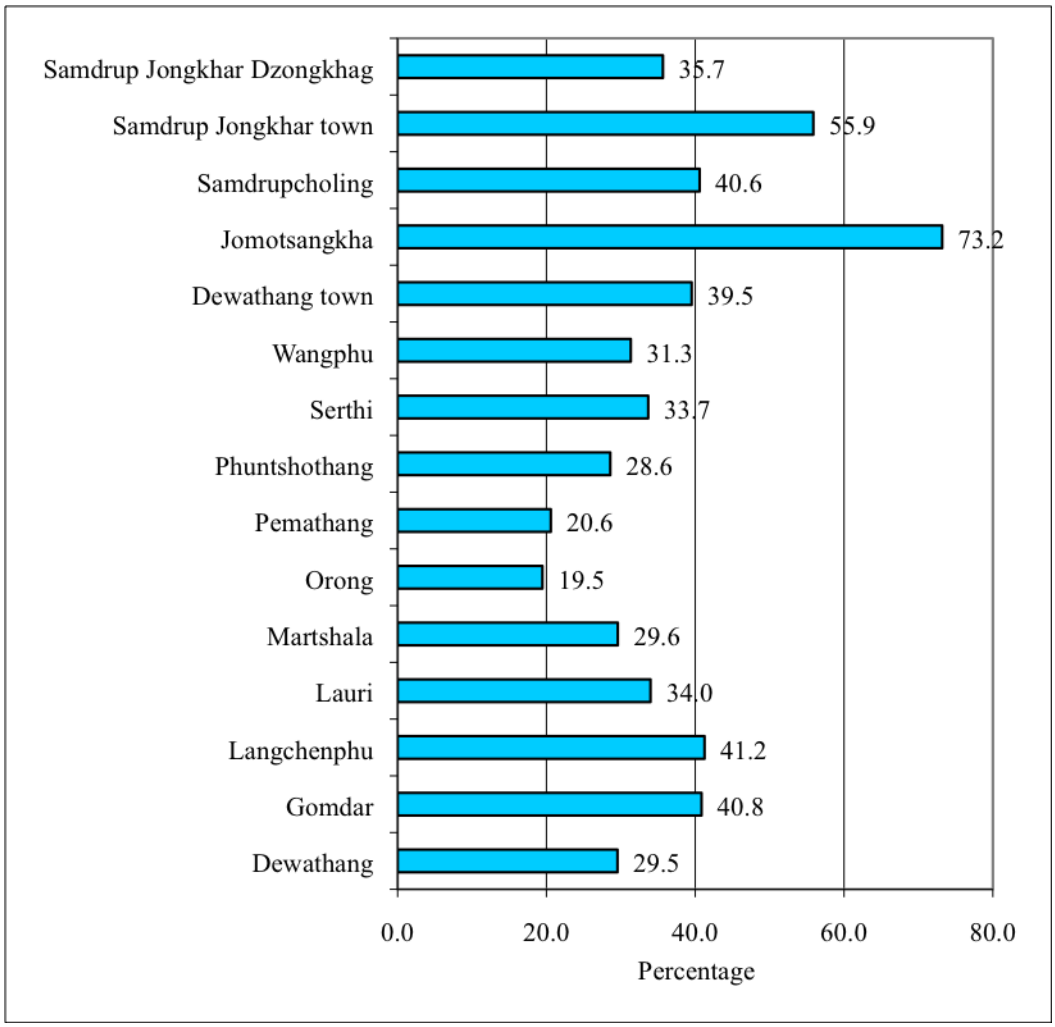
Note: It should be noted that official unemployment rates only count those who are actively looking for work. They do not include a) discouraged workers—those who want work but have given up looking for it, largely because they believe they are unable to find a suitable job; b) the underemployed—those who are working part-time but would rather be working full-time (also referred to as involuntary part-timers); or c) those who are working beneath their skill level. Therefore official unemployment rates worldwide are typically underestimates of the actual number of unemployed.

According to BLSS unpublished micro-data files, unemployment levels in Samdrup

Jongkhar Dzongkhag are highest in Jomotsangkha (formerly Daifam) at 73%, and in Samdrup Jongkhar town at 56%. The gewogs with the highest jobless rates are Langchenphu (41.2%), Gomdar (40.8%), and Lauri (34%). Orong Gewog had the lowest rate of unemployment at 19.5%. (See Figure 12 below.)

According to Sangay Tempa, who undertook an analysis of unpublished micro-data files for this study, unemployment in Samdrup Jongkhar appears very high because the BLSS excluded the 7,493 persons who worked, but for pay in kind rather than money. He noted that if these were included in the statistics, then the unemployment rate in Samdrup Jongkhar would only be 1.2%. It was not possible at the time of writing to reconcile those figures, which Sangay Tempa derived from the BLSS micro-data files, with the official unemployment figure given for Samdrup Jongkhar of 4.5% as reported in the BLSS 2007 report.

Figure 12. Unemployment rates, Samdrup Jongkhar, by gewog, 2007



Source: BLSS unpublished micro-data files, 2007.

Notes: Samdrupcholing was formerly called Bhangtar and Jomotsangkha was formerly called Daifam. Employed are those who worked in exchange for cash. Unemployment appears very high in Samdrup Jongkhar because, according to Sangay Tempa, the BLSS excluded from the employment statistics the 7,493 persons who worked in Samdrup Jongkhar, but for pay in kind rather than money. If these 7,493 additional people are included in the employment and unemployment statistics, then unemployment in Samdrup Jongkhar is only 1.2%.

4.2.8 Housing and sanitation

Nearly three in five households in the country have access to water through pipes in their dwellings (83% in urban areas and 46% in rural areas). The rest rely on outdoor taps and a few have access to water from either neighbours, wells, springs, rivers, or lakes/ponds. The source of water is very well correlated to the per capita expenditure of households: 89% of the richest households in towns have water supplied in their dwellings through pipes while about a third of the poorest households rely on public outdoor taps. In rural areas, the proportion of rich houses with piped water is twice as high as among the poorest.

In Samdrup Jongkhar Dzongkhag as a whole, 95% of people are classified as having access to an improved water source (i.e. public tap, pump, or protected well), a slightly higher percentage than the national average. The majority of the dwellings in Samdrup Jongkhar rely on public outdoor taps (49.0%). This finding was supported by field research. However, in the towns, water is more commonly supplied through pipes in dwellings: Dewathang town — 52%, Jomotsangkha (formerly Daifam) — 70%, and Samdrup Jongkhar town — 78%. Most households in the dzongkhag need less than 30 minutes to fetch water (63%), 26% need between 31 and 60 minutes, 2% need between 1 and 3 hours, and nearly 9% need more than three hours.[278]

More than nine in ten Bhutanese (99% in urban areas and 95% in rural areas) have access to improved sanitation facilities. According to the 2007 BLSS, 97% of people in Samdrup Jongkhar are classified as having access to improved sanitation facilities (sewers, improved latrines etc.). This is slightly higher than the national average of 96%. Overall in the dzongkhag, 71% of respondents reported having good toilet facilities. The highest rates of access to improved sanitation in the country are in Wangdue and Bumthang (99.6% and 99.4% respectively).

In Bhutan overall, more than half of the population (66%) belong to households using solid fuels such as biomass (wood, charcoal, crop residues, and dung) and coal for cooking and heating. The proportion of the rural population that uses solid fuels (80%) is more than three times higher than in urban areas (28%). This is largely due to the fact that, according to the 2007 BLSS, 99% of the households in urban areas have access to electricity while in the rural areas only 60% have access.

However, the country's rural electrification scheme has been expanding rapidly, with an increasing number of rural households now connected to the grid. By 2013, even the most

[278] BLSS (2007) unpublished micro-data files.

remote, non-electrified regions of Samdrup Jonkghar in Lauri, Serthi, Wangphu and elsewhere are expected to be electrified and connected to the national grid. In the case of lighting, the main source throughout the country is electricity (68.5% of households), while one in four households uses kerosene/gas lamps. Although nearly all (97%) the households in the urban areas draw their lighting from electricity, in rural areas, according to the 2007 BLSS, only slightly more than half (56%) do so. Again, as noted above, this is rapidly changing as electricity penetrates more and more rural areas.
In Samdrup Jongkhar, according to the 2007 BLSS, more than half of the households (51%) have electricity as their source of lighting. Kerosene or gas lamps account for 43% of lighting. This difference is largely correlated with whether the household is located in an urban or rural area, with the latter still significantly more likely to rely on kerosene or gas.

Overall, three quarters of households in Bhutan use wood (41%) or electricity (34%) for cooking, while nearly a quarter (22.6%) use gas. In urban areas electricity (50%) and gas (45%) are widely used for cooking. In rural areas, more than half use wood (57%), 27% use electricity, and 14% use gas or other sources.

In Samdrup Jongkhar Dzongkhag, most households use wood to cook their meals (56%). In some gewogs, such as Serthi, Lauri, Gomdar and Pemathang, which are situated in heavily forested areas, wood is used by more than 95% of the households. The second source for cooking is electricity (32% of households) followed by gas (11%).[279]

For example, the Chokyi Gyatso Institute (CGI) in Dewathang currently uses wood for cooking—some of it is dead wood taken from the monastery property and the rest is delivered to them. Households and institutions are allowed to cut a certain number of trees for cooking purposes. CGI also recently received two electric stoves from the World Wildlife Fund, but Ugyen Wangchuk, the manager of the monastery, expressed concern that the electrical use might be quite high and therefore expensive as well, so he expressed interest in the possibility of using gas or biogas, which is cheaper. Also the kitchen area where the electric stoves are located often have water standing on the floor, which makes the electric stoves dangerous, so they are not being used at present.

In Kharbandy village in Pemathang Gewog, one woman expressed concern about the use of wood for cooking:

> In my village one of the most valuable things is the environment around us. About 80% of the villagers cook their food relying on firewood, but the smoke of the firewood creates many problems to health and even in the sky, causing one of the main factors of global warming. Therefore we would be grateful if government could kindly bring some new strategy such as the biogas (cow dung) cooking system, which is useful. Of course we have electricity.

[279] BLSS (2007) unpublished micro-data files.

In Bhutan overall, 44% of the households in the country do not have heating sources. For those that do have heating sources, the most common source in rural areas, is the bukhari (wood/coal stove), while in urban areas, electricity is mostly used.

In terms of sanitation in schools, according to the Educating for GNH Principals' Survey (2010), overall, it appears that the functioning, cleanliness, and adequacy of student toilets in schools, particularly in non-urban settings, is a major area of concern. According to the survey, a majority of principals report student toilets as being either in need of repair (38.5%) or broken altogether (14%). Only 22% of principals report that all the student toilets work well in their school and 26% report that most work well.

When asked whether they agreed with the statement that their schools have sufficient toilets, roughly 48% of principals responded that they strongly agreed or agreed, while 40% either strongly disagreed or disagreed. The remainder (14%) neither agreed nor disagreed.[280]

According to cross tabulations by region, rural/urban differences, and school level, problems with malfunctioning toilets appear worst in the South where 19% of principals report that most of the toilets are broken and 40% report that some require repair. In the Central region, 15% of principals report that most of the toilets are broken and 46% report some are in need of repair. By contrast, only 8% of principals in Thimphu report mostly broken toilets.[281] Data were not available at the dzongkhag level.

According to the principals' survey, roughly 26% of principals in Bhutan report that their schools do not have adequate safe drinking water while 60% report they do and 14% are not sure. Cross tabulations were done for school drinking water safety by region, urban/rural difference, and school level. At the regional level, the safety of school drinking water in Thimphu seems mostly adequate—with 73% of principals either agreeing or strongly agreeing with the statement. However, the situation seems much more dire in other regions of the country with nearly 40% of principals in the south, 24% in the east, 25% in the central region, and 23% in the west other than Thimphu either 'strongly disagreeing' or 'disagreeing' with the statement that their schools have adequate safe drinking water. Again, data were not available at the dzongkhag level.

4.2.9 Types of dwellings

About two thirds of households in Bhutan own their dwellings, with only one in five owning their living space in the urban areas compared with 88% of households in rural areas. In Samdrup Jongkhar, 71% of the total households own their dwellings. Statistics show that the vast majority of people in the towns do not own their dwellings: in Samdrup Jongkhar town, 93%, and in Dewathang town, 91% rent their houses or apartments.[282]

[280] Numbers do not exactly add to 100% due to rounding.
[281] GPI Atlantic. 2010. Educating for GNH Principals' Survey Results. GPI Atlantic, Halifax.
[282] BLSS (2007) report and unpublished micro-data files.

Overall in Bhutan, 69% of households live in a house, 22% in an apartment, and 8% in part of a house. Living in houses is more common in rural areas (86%) than in urban areas (36%). The vast majority of residents of Samdrup Jongkhar Dzongkhag live in houses (75%). Most of the households in Samdup Jongkhar town and Dewathang town live in separate apartments (68% and 35% respectively). Rent is normally paid in cash (62%); however, more than a third of 'renting' households (35%) do not actually pay any rent due to family or sharing arrangements.

Most of the dwellings in the dzongkhag (72%) have one or 2 rooms, while 28% have 3 or more rooms. Surprisingly, household size does not seem to correlate with the number of rooms, indicating that some families are tightly packed into shared room-space.

Across the country, about two in five households live in dwellings made out of mud-bonded bricks/stones and a quarter in cement-bonded brick/ stone dwellings. In urban areas, about three out of four dwellings have cement-bonded brick/stone walls, while in rural areas the proportion is about one in ten. Half of all households in rural areas live in mud or mud-bonded brick/stone dwellings, while only two in five urban households do. Richer households in both rural and urban areas tend to have external walls made of concrete or cement-bonded bricks/stone while poorer households sometimes have wood/branch (17%) type walls or other types of walls (19%).

The most common materials used to construct the external walls of dwellings in Samdrup Jongkhar are mud-bonded bricks/stones (34%) and cement-bonded bricks/stone (20%). However, 52% of the dwellings in Pemathang Gewog are made of mud. Wood and branches are the materials used in 14% of dwellings in the dzongkhag as a whole.[283]

Throughout the country, metal sheets are the most common material used for roofs (90% in urban areas and 67% in rural areas). Plank/shingle constitutes 14% of rural dwellings compared to only 2% of urban dwellings. One in five rural roofs is made of thatch, while only 4% of the poorest households in urban areas use thatch.

Metal sheets are used in 63% of the roofs in Samdrup Jongkhar Dzongkhag. According to the data, "other" materials are the second most commonly reported category for roofs (nearly 19% of households). One out of ten dwellings has a roof made out of thatch, and 4% use plank/shingles. Concrete roofs are mainly found in the towns, with nearly 16% of the dwellings in Samdrup Jongkhar town having them.

[283] BLSS (2007) unpublished micro-data files.

4.3 Gross National Happiness (GNH) indicators

In the section that follows we will summarize the key preliminary findings for Samdrup Jongkhar Dzongkhag from the second GNH survey, 2010.[284] These data were presented for the first time by the Centre for Bhutan Studies (CBS) at the SJI Launch held in December 2010 at the Chokyi Gyatso Institute for Buddhist Studies in Dewathang. The original presentation, in powerpoint, cannot be reproduced here due to size. However, we will present the key findings, in bullet form below.

4.3.1 Psychological wellbeing

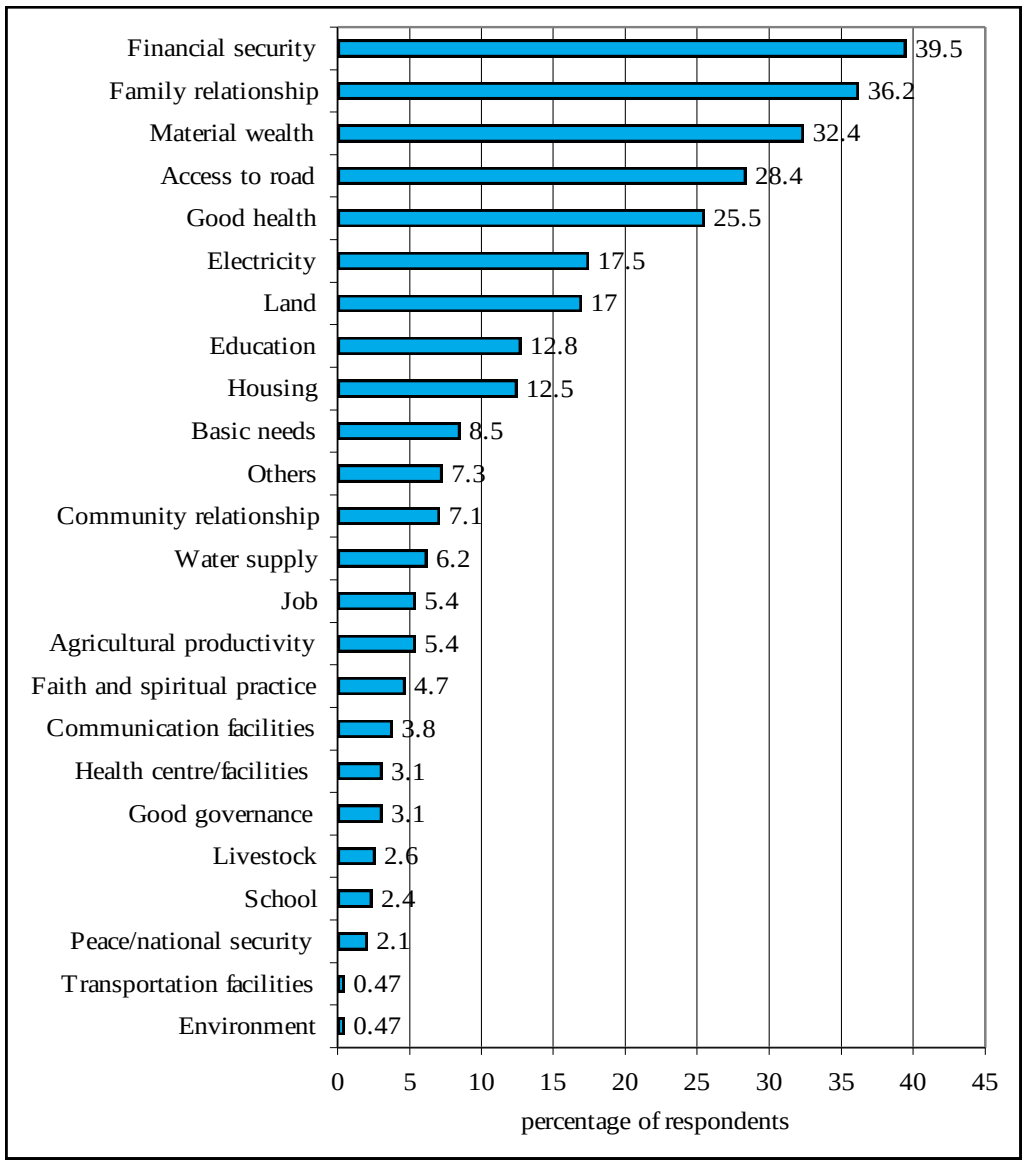
- Self reported stress level: 14.6% of Samdrup Jongkhar respondents reported their lives were "very stressful," 16.8% reported their lives were "moderately stressful," 38.7% reported their lives were "somewhat stressful," and 29.5% reported they were "not at all stressful."
- 8.3% of the respondents experienced "severe psychological distress" compared with nearly 12% who experienced "some distress" and 80% whose mental wellbeing was "normal."
- In terms of mental wellbeing, a higher percentage of women (8.7%) than men (7.9%) experienced "severe psychological distress." 12% of women compared to 11.2% of men experienced "some distress," and 80.8% of men compared to 79.2% of women had "normal mental wellbeing."
- In terms of happiness, it appears that the gewogs of Lauri, Phuntshothang, and Wangphu rank lower than the "mean" for Samdrup Jongkhar Dzongkhag, while Dewathang town, Orong, Martshala, Dewathang, and Samdrup Jongkhar town rank slightly higher.
- In terms of happiness by dzongkhag, Samdrup Jongkhar (5.7) is the second lowest among 14 dzongkhags reported (lowest is Pemagatshel at 5.61). The national mean for happiness is slightly above 6. The highest reported mean is in Haa (6.55) followed by Gasa (6.42).
- On a scale of one to ten, 36.8% of respondents in Samdrup Jongkhar responded that their level of happiness was 5, 23.1% reported 6, 11.1% responded 7, and 12.7% responded between 8-10.
- Financial security was chosen by the highest percentage of respondents, nearly 40%, as the source of happiness, followed by family relationships (36%), and material wealth (32%). The environment was chosen by less than 1% as a source of happiness. See Figure 13 below for the sources of happiness in Samdrup Jongkhar Dzongkhag.
- By contrast, in Thimphu, good health was the main source of happiness for 57.5% of respondents, followed by family relationships (47.7%), financial security

[284] There were 423 survey respondents in the district in total: 21 in Wangphu, 20 in Serthi, 43 in Phutshothang, 22 in Pemathang (includes Samrang), 31 in Orong, 33 in Martshala, 43 in Lauri, 20 in Langchenphu, 32 in Gomdar, 34 in Dewathang, 74 in Samdrup Jongkhar town, and 50 in Dewathang town. Overall, 57% were male and 43% were female. While the sample size for the dzongkhag as a whole renders statistically reliable results, inter-gewog comparisons are much less statistically reliable, due to small sample sizes and much wider margins of error.

(40.5%) and then material wealth (36.1%). The environment was the source of happiness for 1.7% of the respondents; faith and spiritual practice (3.7%); community relationship (7.9%); peace and national security (7.4%).

- When financial security as a source of happiness is analysed by income category, respondents in the highest income group (> Nu. 300,000), were least likely (19%) to choose it as a source of happiness when compared to those in the other income categories: i.e. 66.7% in the Nu. 200,001 to 300,000 group; 39.6% in the Nu. 100,001 to 200,000 group; 35.7% in the Nu. 50,001 to 100,000 group; and 41.6% of those whose income was less than Nu. 50,000.

Figure 13. Sources of happiness in Samdrup Jongkhar, GNH Survey, 2010



Source: Centre for Bhutan Studies, unpublished data for Samdrup Jongkhar Dzongkhag from second GNH survey, 2010.

4.3.2 Quality of life

- Less than 1% of respondents in Samdrup Jongkhar (0.71%) responded that their quality of life was "very poor," compared with 9% reporting it to be "poor," 48% reporting it to be "neither poor nor good," 37% reporing it to be "good," and only 4.3% reporting their quality of life to be "very good."
- The majority of Samdrup Jongkhar respondents enjoy their lives, with 53.5% reporting "quite a lot" of life enjoyment. Only 4% report their life enjoyment to be "an extreme amount," compared to 1.2% who experience no life enjoyment at all. A high proportion of respondents, 41.3%, report they only enjoy life "a little."
- Respondents report high levels of social support when they are sick or when they have to attend important personal events. However, social support was not as high in cases of financial problems or emotional problems.

4.3.3. Health

- Self-rated health: Less than 1% (0.95%) of Samdrup Jongkhar residents rate their health as "poor," 6.2% rate it as "fair," 21% rate it as "good," nearly 62% rate it as "very good," and nearly 10% rate it as "excellent."
- Incidence of long-term disability increases with age, particularly among respondents between 56-60 years of age and older.
- Suicide: According to the GNH survey, nearly 10% of respondents in Samdrup Jongkhar "thought seriously of commiting suicide" during their lifetimes. More than 6% thought of "seriously committing suicide in the past 12 months." In terms of attempted suicide, 1.2% of respondents attempted to commit suicide during their lives, and nearly 1% (0.95%) attempted suicide in the last 12 months.[285]
- BMI: Using Body Mass Index for 111 respondents, the survey found that 3.6% of the Samdrup Jongkhar respondents were underweight, 64% were normal weight, 26% were overweight, and 6.3% were obese.

4.3.4 Time use and balance[286]

- In Samdrup Jongkhar women spend more time working per day than men: roughly 9 hours compared to nearly 8 hours for men. In terms of non-work

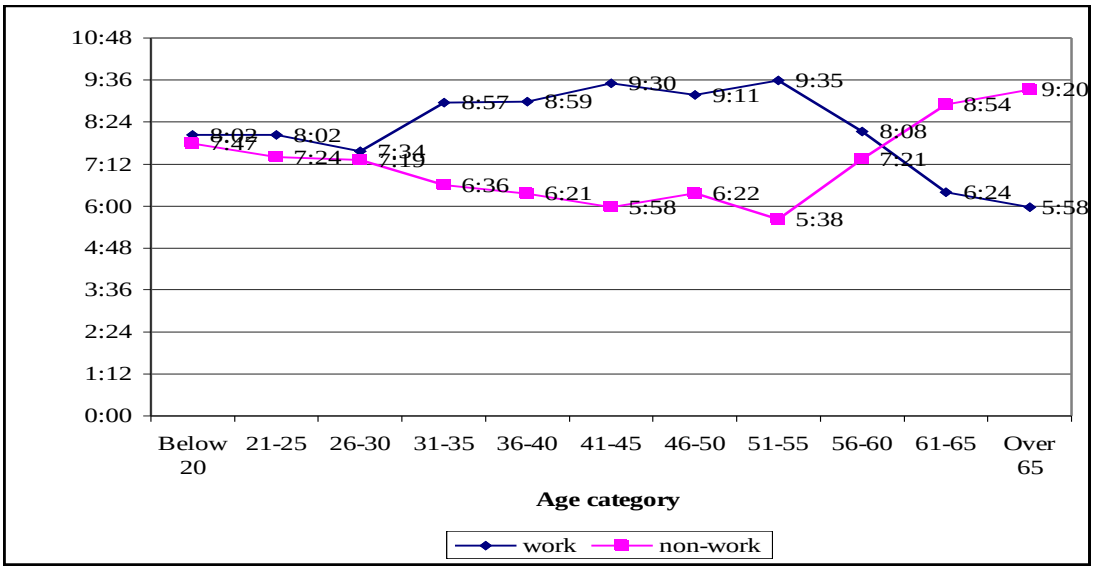
[285] According to global suicide data and statistics these figures seem very high. In the U.S., for instance, there are 750,000 suicide attempts per year – which works out to roughly 0.3% per year — much lower than the rates being reported in Samdrup Jongkhar. Further study needs to be done to assess whether rates are indeed significantly higher in Samdrup Jonkghar, and if so why, or whether the issue is with the data (i.e. sample size etc.). Thus 0.95% of a sample size of 423 amounts to only four people. To verify the results here, checking would need to be done to ensure these four properly understood the question, and even to cross-check responses with relatives, hospital data, and other sources.

[286] In the time use component of the GNH survey **non-work activities include**: community participation; social and cultural activities; religious and spiritual activities; education and learning; sports, leisure and mass media use; personal care; travel and commuting; and waiting. **Work activities include**: agriculture related activities; livestock related activities; forestry and horticulture related activities; processing of foods and drinks; construction and repairs; craft related activities; business, trade and services; household maintenance; mining and quarrying; care of children, old, sick and disabled.

activities, men spend 7 hours and 25 minutes compared to women's 6 hours and 17 minutes. Both genders spend roughly the same amount of time sleeping (average of 8 hours and 30 minutes).

- Both men and women in Samdrup Jongkhar spend an average of nearly 2.5 hours a day watching television; men spend 2 hours and 16 minutes on average praying compared to 1 hour and 25 minutes for women; men spend an average of 1 hour and 40 minutes socializing with others and women spend 1 hours and 27 minutes doing so; the least amount of time is spent socializing with family members—59 minutes a day for men compared to only 55 minutes a day for women.
- In terms of mean working hours, the least amount of time was spent per day on work in Pemathang (6:49) followed by Lanchenphu (7:25) and Samdrup Jongkhar town (7:46). Mean work hours in Dewathang were 7:56; Lauri (8:09); Phuntshothang (8:21); Dewathang (8:26); Orong (8:33); Martshala (9:27); Gomdar (9:35); Wangphu (9:56) and Serthi (10:45).[287]
- Between the ages of 26 and 55, it appears that the amount of time respondents spend working increases and the amount spent on non-work activities decreases. This trend reverses after the age of 55, when time spent on non-work increases and time spent on work decreases. See Figure 14 below for time spent on work and non-work by age cohort in Samdrup Jongkhar.

Figure 14. Time spent on work and non-work by age cohort, Samdrup Jongkhar, GNH Survey, 2010



Source: Centre for Bhutan Studies, unpublished data for Samdrup Jongkhar Dzongkhag from second GNH survey, 2010.

[287] As noted above, these inter-gewog comparisons have a low level of statistical reliability due to small sample sizes by gewog. Serthi, for example, is shown here to have the longest daily work hours — fully four hours per day more than in Pemthang. But sample sizes were only 20 for Serthi and 22 for Pemathang, leading to a wide margin of error.

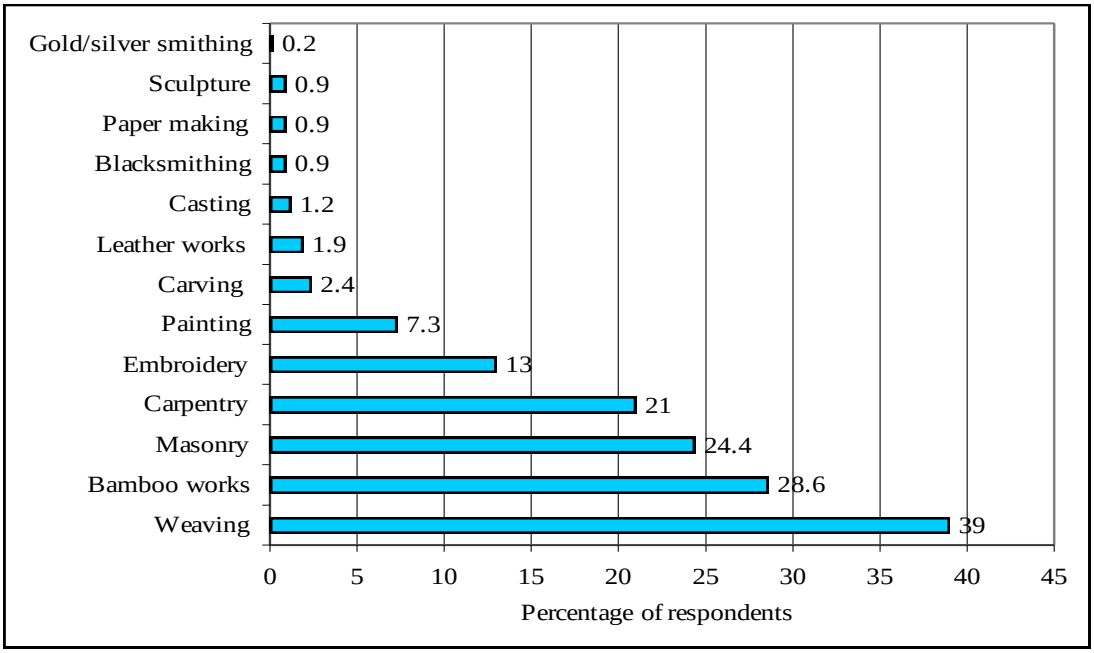
- In Samdrup Jongkhar, young people below the age of 20 spend the least amount of time per day praying (40 minutes) when compared with older cohorts. Between the ages of 21 and 60, respondents spend between roughly one hour and 1.5 hours a day praying. In the 61-65 age cohort the amount of time spent praying quadruples to 4 hours and 21 minutes a day. Respondents over 65 years of age spend roughly 5 hours each day praying.
- In all age cohorts, except 46-50, 51-55, and 61 and over, more time is spent each day watching television than is spent praying. The difference is greatest among the young—respondents below 20 years of age watch an average of nearly 3.5 hours of television per day and pray for 40 minutes—while the old—respondents over the age of 61—spend less than 2.5 hours a day watching television and between roughly 4.5 and 5 hours praying.
- When data for mean work hours were compared to mean household income (at the gewog level) it appears that Serthi, with the lowest mean household income in the dzongkhag (roughly Nu. 25,000), has the highest mean work hours (10 hours and 45 minutes).[288] Samdrup Jongkhar town had the highest mean household income (roughly Nu. 200,000) and one of the lowest mean work hours (7 hours and 46 minutes).

4.3.5 Education and traditional knowledge

- According to the GNH 2010 survery, overall, 46% of respondents in Samdrup Jongkhar are literate. 65% of female respondents are illiterate, compared to only 46% of men. Conversely, 35% of women are literate, compared to 54% of men.
- More than 71% of respondents had no formal education; 11% had primary education; 7% had lower secondary (LS) education; 5% had middle secondary (MS) education; nearly 3% had higher secondary (HS) education (until degree 2nd year); 0.5% had a diploma or certificate; and nearly 2% had a Bachelors Degree.
- When surveyed about knowledge in arts and crafts, nearly 40% of respondents indicated knowledge about weaving; 29% had knowledge regarding bamboo work; 24% in masonry; 21% in carpentry; 13% in embroidery; 7% in painting; 2.4% in carving; and roughly 6% had knowledge in casting, leather work, blacksmithing, paper making, sculpture or gold/silver smithing combined. See Figure 15 below.
- Nearly 40% of Samdrup Jongkhar respondents either did not know (9.2%) or were not sure about how HIV/AIDS is transmitted. Another 40% had heard of it and had "some understanding of how it is transmitted." Only 21% had a "good understanding of how it is transmitted."

[288] As noted above, such gewog-level findings are not statistically reliable. Serthi had only 20 respondents in the GNH survey, so confusions or ambiguities about definitions or questions among even two or three respondents may lead to very sharp inter-gewog disparities in reporting results.

Figure 15. Knowledge in 13 arts and crafts, Samdrup Jongkhar, GNH Survey, 2010



Source: Centre for Bhutan Studies, unpublished data for Samdrup Jongkhar Dzongkhag from second GNH survey, 2010.

4.3.6 Culture

- In Samdrup Jongkhar, 85.6% of respondents agreed with the statement "one must always love and respect parents, even if they are wrong"; 95% agreed with the statement "both husband and wife should maintain faithful and happy marriage"; and 98% agreed that "one must always maintain tha-dam-tshig between pon and yog."
- In 2007–2008, the GNH survey found that 16% of respondents in Samdrup Jongkhar believed that practice and observance of Driglam Namzha[289] was getting weaker, compared to nearly 20% in the 2010 survey. In 2007–2008, 23% felt it had stayed the same, compared to 27% in 2010. In 2007–2008, 61% felt observance was getting stronger. In 2010 this decreased to 53%.
- In 2010, 71% of respondents said they never played traditional Bhutanese games, up from 64% in 2007–2008.

[289] In order to preserve what it believed was Bhutan's threatened identity, the government in the 1980s introduced a policy of *Driglam Namzha*, which literally means the traditional values and etiquette. Under this policy all citizens were required to wear the national dress (gho for men and kira for women) at schools, government offices, and official functions.

- More than 50% of male respondents never play traditional sports; 34% play a few times a year; 10% play once or twice a month; and 6% play more than once a week.
- Participation in local festivals and community events in Samdrup Jongkhar was higher among older respondents: 50% of those in the 51–55 age group reported that they always participate compared to only 17% in the below 20 age cohort. Between 21% and 26% of those aged 21 to 45 reported they always participate. After the age of 55, participation in festivals steadily declines with only 24% of those over 65 always participating.

4.3.7 Community vitality

- In the past 12 months, 49.7% of Samdrup Jongkhar respondents reported they did volunteer work.
- Among these, the proportion of respondents who volunteered for each activity are as follows: labour during rituals (75.8%), labour during times of death (68.7%), labour to house construction (68.2%), labour during annual Choku (65.7%), construction and renovation of religious establishments (60.7%), labour to house repairs (55%), labour for religious figures (40.6%), labour during paddy plantation/harvest (32.9%), clean-up campaign (23.3%), and teaching (5.8%).
- In Samdrup Jongkhar, 66% of respondents stated that their sense of belonging is very strong, 28.5% felt it was somewhat strong, and 5.2% responded it was "weak."
- Sense of belonging seemed to be strongly correlated with living in a rural area: 77% of rural respondents in Samdrup Jongkhar felt a very strong sense of belonging compared to 39% of respondents from urban areas.
- When it comes to trust, nearly 19% of respondents trust none (1.4%) or only a few (17.3%) Bhutanese people in general. Nearly 46% "trust some of them," and 35% "trust most of them."
- Trust in neighbours was similar: 2.6% of respondents trusted "none of them," 16% trusted "a few of them," 37% trusted "some of them," and 45% "trusted most of them."
- Data also indicate that sense of belonging is strongly correlated with the number of years of stay in a community and increases with the number of years. The same relationship is true for trust in neighbours. That is, the longer one has lived in a community the more trust there is towards neighbours.

4.3.8 Good governance

- 78% of rural respondents in Samdrup Jongkhar and 25% of urban respondents attended a Zomdue in the past 12 months.
- Between 81% and 93% of respondents rated government as good or very good in a number of categories including provision of roads, electricity, reducing the gap between rich and poor, creating jobs, protecting the environment, and providing educational needs.

- Between 67% and 89% of respondents rated the performance of the Samdrup Jongkhar dzongkhag administration as good or very good in a number of areas, including providing agricultural implements and seeds, allocation of timber permits, farm and feeder roads, clean drinking water, health services, sanitation, and educational needs.
- In terms of the overall direction of the government, the vast majority of respondents (nearly 96%) felt the government was "going in the right direction," while 2% responded it was "going in the wrong direction" and 2.5% said they "don't know."

4.3.9 Ecology, diversity, and resilience

- Nearly three-quarters of Samdrup Jongkhar respondents felt that they were "highly responsible" for conserving the natural environment, 23% felt "somewhat responsible," 2% were "a little responsible," and 1.2% were "not at all responsible."
- Roughly 16% of respondents felt their drinking water quality was "very good" and 56% "good." More than 13% responded it was "very poor," or "poor." "Neither good nor poor was the response of 14% of respondents. Drinking water quality seemed to be better in rural areas than in urban areas, with 21% of rural respondents reporting "very good" water compared to only 4% of urban respondents.
- Reuse of materials: Nearly 56% of rural Samdrup Jongkhar respondents "always" or "most of the time" reuse materials, compared to 49% of their urban counterparts. 23% of rural compared to 32% of urban respondents said they "sometimes" reuse materials. More than 21% of rural respondents "never" reuse materials, compared with 19% of urban respondents.
- Segregate waste: Roughly 47% of rural respondents segregate waste "always" or "most of the time," compared to 33% of urban counterparts. Nearly 22% of rural respondents and 30% of urban respondents segregate waste "sometimes." Nearly one-third of rural and two out of five urban respondents "never" segregate their waste.
- Try to reduce waste: Urban and rural disparities were less in the area of waste reduction: 46% of rural compared to 44% of urban respondents either "always" or "most of the times" try to reduce waste. More than 36% of rural and nearly 40% of urban Samdrup Jongkhar residents try to reduce waste "sometimes." Nearly 18% of rural respondents and 16% of urban respondents "never" do so.

4.3.10 Living standards

- Mean household income is correlated with education level, with the exception of those holding a diploma or certificate: Mean household income for no formal education in Samdrup Jongkhar is Nu. 62,562; for those with primary education – Nu. 73,982; LS Education – Nu. 135,374; MS Education – Nu. 143,866; HS Education – Nu. 331,000; Diploma or Certificate – Nu. 150,000; and Bachelors Degree – Nu. 422,673.

- Roughly 8% of respondents in Samdrup Jongkhar reported that their household income was "not enough," compared to nearly 76% who said it was "just enough," and 16% who reported it was "more than enough."
- Overall, more than 8% of Samdrup Jongkhar respondents reported that their household income was not enough to meet their daily requirements. The highest percentage was in Wangphu (33%) followed by Pemathang (14%) and Phuntshothang (12%). Dewathang town reported the lowest rate of income insufficiency (2%).
- According to the GNH survey, nearly 71% of respondents in Lauri are poor, compared to 59% in Serthi, 38% in Wangphu, 33% in Martshala, 25% in Pemathang, 25% in Dewathang, 23% in Gomdar, 22% in Dewathang town, 19% in Samdrup Jongkhar town, 19% in Phunthshothang, 19% in Langchenphu, and 12% in Orong.[290]

[290] These data are based on only 335 respondents. As noted earlier, inter-gewog comparisons have low statistical reliability due to small gewog sample sizes and correspondingly high margins of error.

Chapter 5. Environmental Quality and Wise Development

Our natural world provides and performs a wide range of ecological, social, and economic functions, providing people with both direct goods and services like wood, food, and recreational opportunities, and indirect goods and services that support life and enable human society and the economy to function. For example, an intact, optimally functioning forest ecosystem provides, at no cost, a long list of vital services including climate regulation, habitat and watershed protection, flood and natural pest control, prevention of soil erosion, formation of topsoil, nutrient recycling, and long-term storage of carbon. It also provides us with beauty and a place to relax and rest our minds.

As previously discussed in the Chapter on *Agricultural Diversity,* agricultural production in Samdrup Jongkhar Dzongkhag—the focus of this study—depends entirely on a healthy, fully-functioning ecosystem. In other words, the production of food depends on the services nature provides, such as pest control through natural predation, nutrient cycling, pollination, waste decomposition, soil formation, nitrogen fixation, bioremediation of toxins, and many others.

Biodiversity is both the diversity of living organisms, and the interactions between those organisms. In order to understand biodiversity and its importance for maintaining ecosystems—including agricultural ecosystems—we need to study those organisms, and ascertain their numbers, their diversity, and their preferred habitats. We also need to understand and value the productive work they do, and how to encourage this work on farms. Biodiversity is the foundation upon which the earth's productive capacity is based. Humankind might be able to produce food with diminished biodiversity, but it would become a progressively more expensive enterprise—both financially and ecologically.

To a limited extent, ecosystem services provided freely by earth's biodiversity can be replaced by using purchased inputs of energy, built structures, synthetic fertilisers, pesticides, irrigation systems, and pharmaceuticals. On the one hand, these purchased inputs help to make agriculture more predictable, and may increase short-term yields. On the other hand, as discussed throughout this study, many of the inputs used to replace ecosystem services may be harmful to biodiversity, thus reducing the capacity to generate further ecosystem services. This can create a spiral of increasing needs for inputs, and reduced capacity of agriculture to tap into 'free' services. Depletion of ecosystem services, like any other critical resource, can be self-defeating, expensive, and ultimately reduce long-term net productivity, farm viability, and food security.

It is beyond the scope of this study to go into any depth regarding the quality of the Samdrup Jongkhar environment. However, by using some of the existing literature and data, observation, and field research interviews, we present here a brief overview of the state of the environment in this dzongkhag and present some of the key areas of concern.

We also discuss the potential for wise development, particularly with regard to cultural and eco-tourism potential.

5.1 State of the environment in Samdrup Jongkhar

5.1.1 Forests and protected areas

In 2010 Bhutan was reported by the United Nations Food and Agriculture Organisation (FAO) to have the second highest proportion of forest cover (69%) and the highest percentage of forested area under protection (27%) in East Asia.[291] According to the Secretary of the National Environment Commission, Ugyen Tshewang, Bhutan has 72.5% forest cover and 51% under protection. This more up-to-date figure of protected area includes the wildlife corridors and the recently added Jigme Singye Wangchuck National Park.[292]

An even more recent estimate, provided at the 10 February 2012 release of Bhutan's first natural capital accounts, shows 74.5% forest cover, providing more than Nu.700 billion worth of ecosystem services annually — amounting to 93.8% of the estimated economic value of all the country's ecosystem services. Of that value, about 53% goes to those outside Bhutan in climate regulation, tourism, watershed protection and other benefits.[293]

The FAO *Global Forest Assessment* also reports that 13% of Bhutan's forested area is characterized as *primary* forest,[294] 87% of the forested area is naturally regenerated, and 3% is planted. The area of primary forest has remained steady since 1990.[295]

According to reports, there are approximately 5,500 species of vascular plants, over 770 species of birds and 165 species of mammals, with many being endemic to Bhutan. This rich biodiversity is due to the remote nature, geographical relief, and climatic heterogeneity of the country. On a global scale, Bhutan is recognized as forming a major

[291] FAO, 2010. Global Forest Resources Assessment, 2010. Main Report. Food and Agriculture Organization of the United Nations. Rome. Report available online. Brunei Darussalam was reported to have the highest percentage of forest area (72%), compared with India (23%), Bangladesh (11%), Thailand (37%) and Nepal (25%).

[292] From introductory remarks given by Ugyen Tshewang at the 2-day NSB sponsored workshop: Accounting for the Value of Natural Capital and Ecosystem Services. March 29-30, 2011. Thimphu. However, it should be noted that the forest cover figure needs to be updated since the 72.5% figure is based on a 1994 satellite photo. It is not clear, based on informal communications with Department of Forests and Park Services (DoFPS) officials where the FAO got the revised 69% figure. A thorough forest inventory by Bhutan's DoFPS is to begin in the summer of 2011 and, once this 3-year process is completed, an updated figure for forest cover based on aerial photos and GIS mapping will be available.

[293] Kubiszewski, Ida, Costanza, Robert, et al. "An Initial Estimate of the Value of Ecosystem Services in Bhutan", February 2012. Results also reported in *Kuensel*, 11 February 2012 and other press.

[294] Primary forest is defined as forest of native species where there are no clearly visible indications of human activities and the ecological processes have not been significantly disturbed. Primary forests, in particular tropical moist forests, include the most species-rich, diverse terrestrial ecosystems. FAO, 2010.

[295] Ibid.

part of an area of especially high biological diversity known as the Eastern Himalayan 'conservation hotspot.'[296] A total of 14 bird species recorded in Bhutan have been identified as globally threatened, and nine of these can be seen in the forests of Samdrup Jongkhar Dzongkhag.[297]

The protected area system was initiated in the 1960s and has been periodically revised. There are now nine protected areas covering 51% of the country's land area. There are five National Parks in Bhutan, four Wildlife Sanctuaries, and one Strict Nature Reserve. The only protected area in Samdrup Jongkhar is a part of the Khaling Wildlife Sanctuary, which is the smallest protected area in Bhutan, covering 335 square kilometres and with elevations ranging between 400 metres and 2,200 metres. Khaling Wildlife Sanctuary is, despite its small acreage, an important habitat for elephants, gaur (*Bos gaurus*), and other tropical wildlife. It may also contain the rare pygmy hog (*Porcula salvania*) and hispid hare (*Caprolagus hispidus*) known to inhabit the adjacent Khaling Reserve in Assam, with which Khaling Wildlife Sanctuary forms a trans-border reserve.[298]

The only biological corridor present in Samdrup Jongkhar is the one connecting Merak Sakteng Wildlife Sanctuary (SWS) in Trashigang Dzongkhag to the Khaling Wildlife Sanctuary. Sakteng Wildlife Sanctuary was established in April 2003. That sanctuary is 741 square km covering Merak and Sakteng Gewogs in Trashigang Dzongkhag, with the biological corridor extending into part of Lauri Gewog in Samdrup Jongkhar Dzongkhag. Semi-nomadic highlanders live in the park area and use large areas for grazing their cattle.

Sakteng Wildlife Sanctuary includes a wide range of ecosystems and forest types in an altitude range from 1,600 to 4,500 m. The forests contain 203 tree species including herbs, shrubs, and small trees. The Sanctuary is also famous for its faunal diversity. There are 18 species of mammals and 147 species of birds seen in the SWS.

The forests of Bhutan, and elsewhere, are an integral part of farming systems and are linked to agriculture and livestock development. Forests provide food, medicines, energy, shelter, animal fodder, organic fertilisers, and more. Free access to such natural resources, especially for rural people, has effectively helped alleviate and protect against situations of extreme poverty, destitution, and homelessness. Forests are also vital to maintain water catchments, which support agriculture, the main source of livelihood for

---

[296] Inskipp, Carol, Inskipp, Tim and Richard Grimmett. 2004. Birds of Bhutan. Helm Field Guides. Christopher Helm Publishers Ltd., London, p. 18.

[297] The "rare" bird species that are found in Samdrup Jongkhar forests are: Pale-headed Woodpecker, White-gorgeted Flycatcher, Ward's Trogon, Blyth's Kingfisher, Pied Falconet, Silver-breasted Broadbill, Violet Cuckoo, Dark-rumped Swift, and the Rufous-bellied Eagle. Ibid, pp. 18-20.

[298] Khaling Wildlife Sanctuary, available at: http://en.wikipedia.org/wiki/Khaling_Wildlife_Sanctuary, citing references from "Parks of Bhutan". *Bhutan Trust Fund for Environmental Conservation online*. Bhutan Trust Fund. http://www.bhutantrustfund.bt/parks-of-bhutan; "Khaling Neoli Wildlife Sanctuary". *Himalaya 2000 online*. Bhutan Travel Guide. Available at: http://www.himalaya2000.com/bhutan/wildlife-sanctuaries/khaling-neoli.html.

most Bhutanese, and the hydropower sector, which is the largest source of national revenue growth.

In Samdrup Jongkhar Dzongkhag, 85% of the land area is under forest cover, mainly of broadleaf subtropical forest, conifer, scrub and forest plantation.[299] A wide variety of fauna inhabits these forested areas. Some of the protected species are the Asian Elephant, Leopard, Leopard Cat, and Himalayan Black Bear. Common wildlife species in the area include macaques, leopards, bears, wild dogs, wild pigs, barking deer, and sambar.

While it was not possible at the time of writing to locate data on age class distribution of forests in Samdrup Jongkhar, one former forest ranger in the district estimated that the majority of the dzongkhag's forests are between 50–100 years of age.[300] Most of the forest area in the dzongkhag has been harvested over time and regenerated naturally (— there are no plantations except for orchards and some teak —) but at one time, the ranger says, the area was full of very old forests. "We have only one or two areas that are untouched," he says. One is on the way to Bhangtar—the Kedung area—where there are elephants, wild buffalos, reindeer, black bears, and Bengal tigers.

Teak is an exotic tree in Samdrup Jongkhar, and plantations have been discouraged by the Department of Forests because the very large broad leaves of the tree block rain and sunlight and therefore do not allow minor species to grow—thus blocking natural tree succession. The problem with this interference with natural tree succession, says the ranger, is that the soil gets washed away by the heavy rains.

Field research interviews indicate there is some amount of cross-border smuggling of wood into India. It was not possible to determine the extent of the problem. However newspaper reports on smuggling elsewhere in Bhutan do raise cause for concern. One recent article reported that smuggling of forest products was "rampant along the Indo-Bhutan border," and that in the past six months, 14 vehicles with Bhutanese registration numbers carrying smuggled timber were confiscated in West Bengal, India, by forest officials there. Most of the vehicles were carrying Teak and Sal woods, which are not found in West Bengal, but are prized in furniture making.[301]

5.1.2 Water quality

There are four major rivers in Samdrup Jongkhar. The Jomo Chu flows from Trashigang through the eastern part of Samdrup Jongkhar into India. The Nonori flows through Serthig and Samrang Gewogs. The Deu Chu flows through Orong and Dewathang

[299] The Division Forest Office was established in 1971. It has a large jurisdiction covering an area of 230,837 hectares. Samdrup Jongkhar has 39.1 million m^3 growing stock of forest and its annual yield is estimated to be 317,000 tonnes. There are four Forestry Range Offices and five Forestry Beat Offices.
[300] Age class data for Bhutan's forests are not currently available. However, once the DoFPS completes its thorough three-year forest inventory, to begin in the summer of 2011, these data should be readily available for all of Bhutan.
[301] Sonam Tashi. "Cross Border Timber Smuggle". *Bhutan Times*. February 20, 2011. Available online.

Gewogs. The Nyera Ama chu flows through Gomdar, Wangphu, Martshala and Bakuli Gewogs.[302]

Ground water resources in Samdrup Jongkhar are abundant, with springs emerging from basement rocks, old landslides and fluvial deposits. Groundwater in landslide and alluvial deposits has been estimated at an exploitable rate of 3 litres/second/km^2. Currently water quality monitoring has only been conducted in the four major river systems in Bhutan.

Based on the preliminary data collected by the NEC, overall, the state of Bhutan's water resources is "very healthy." According to one 2004 study, "the data indicate that the main rivers and their major tributaries, with some exceptions, are still of a pristine quality. The natural water quality of Bhutan's rivers can be characterized as highly oxygenated, slightly alkaline with low conductivity and no recorded salinities."[303]

Despite the fact that the state of Bhutan's water resources is generally still very good, however, expanding settlements along rivers are resulting in localized pollution problems due to unsanitary conditions and waste along the banks both in urban and rural areas. For example, as reported by the National Environment Commission, uncontrolled seepage from septic and grey water tanks and from oil and grease spills are contributing the decline in water quality at the local level.[304]

Also, it should be noted that during field research there were several instances where villagers reported that their water sources were "drying up." While this was often attributed to climate change, it is unclear whether this was the case in each situation. Further investigation is required on the issue of water supply in Samdrup Jongkhar, and in Bhutan generally, and on how climate change may already be affecting available quantities.

5.1.3 Soil quality

According to an FAO study of three Southern Zone dzongkhags (Samdrup Jongkhar, Sarpang, and Samtse), much of the topsoil in those dzongkhags varies from light clays to sands. Soil in the region is generally not very deep and often overlays gravel. The most common present method for increasing soil fertility is tying cattle in the fields and incorporating this cattle manure into the soil. In what certainly constitutes a major advantage from a sustainability perspective, it is noteworthy that use of chemical fertilisers is still quite low in the dzongkhag.[305]

---

[302] Department of Parks.
[303] National Environment Commission. 2004. *Brief Report on State of the Environment*. Royal Government of Bhutan, Thimphu, p. 11.
[304] Ibid.
[305] United Nations Food and Agriculture Organization (FAO), March 2010. *Southern Zone Irrigation Development Reconnaissance Mission Report*, FAO. (on paper only) http://www.fao.org/

During the field research, farmers in most communities noted that production had declined over the years and they didn't know why. For example, in Orong Gewog, one villager stated:

> There is a vast difference between the crops that we were growing very well before and are not growing well now. Before, all nine seeds were grown here but now they are not. For example you could see our orange trees. Before we never used to do anything with the orange trees; they grew very well by themselves. But now we are given lots of training and methods to guide the orange trees, and still they are not growing. Oranges have started dropping now.
>
> With maize, we never used manure before, and still they were growing excellently. But now, even after inputting the manure and all, it is not growing well. Now everything is not growing well as it was before. We are wondering if it is the soil fertility that has gone down or if it is because of the varieties of seed that we are using—we really can't understand that. Production today compared to the last few decades has decreased 100%.

Soil erosion was often raised as an issue during field research and, given the ruggedness of the terrain in the dzongkhag combined with the lack of terracing and heavy rains (more than 5,000 mm/yr), this erosion is not surprising. The Tshokpa of Nainital village in Pemathang Gewog said that soil erosion and flooding were "the most dangerous natural calamities" in his village during the summer months.

In Wangphu Gewog, the Agriculture Extension Officer (AEO) is encouraging farmers to terrace their land:

> I told them, but they are so reluctant because you have to work a lot. The areas here are so sloppy, it's very difficult to make terraces. So we are planning with the gewog administration to give them training on land management and nutrient management. So at that that time, we'll try to train them about how to make a terrace, and if they cannot, then we can say that there is live fencing—the planting of hedges between the fields, so that nutrients are maintained in their field and the slope of the area can decrease.

Ugyen Taujay, a retired forest ranger who lives in Samdrupgatshel, says farmers in the area need to develop farming methods that protect the soil from erosion and increase land stability. He says this will help increase the living standards of the people here. "The rain is very strong and heavy," he says, "often washing away fertile soils." He says a way to combat this problem is by planting trees and other shrubs that help to stabilise the soil. The root system of a grass species currently used to make the local brooms, is also good for holding soils together—and he would encourage the planting of these grasses. He also says that terracing the rugged farm fields would be beneficial—a practice not frequently seen in the area at present.

According to the Bhutan: State of the Environment Report (2001) soil resources in the country are limited and rugged topography, combined with the heavy rains in the south, add to both soil loss and vegetative cover loss:

> Soil erosion and landslides wash away rich topsoil degrading the soil resources, and such degradation also affects the climate both at macro- and micro- levels. Fertility and the productivity of soil as a medium for biomass production depends largely on the thickness of the topsoil which, besides production of biomass, is important for many other functions such as filtering, storage and transformation of nutrients and water, mineralization of organic matter or wastes dumped on land, fixation of nutrients by microorganisms, conversion of pollutants to less harmful substances and elimination of toxics.[306]

The report also states that the "on-site" impacts of topsoil loss are reduced yield and disruptions in the functions stated above, as well as other impacts such as sediment movement, silt deposition, floods, and the formation of ravines. In 2001, it was estimated that 40,000 ha of land—10% of the total area of agricultural land in Bhutan—was affected by various degrees of water erosion.

5.1.4 Ambient air quality and transboundary pollution

Without clean air, we can expect ongoing damages to our ecosystems, our health, and our economy. Air pollutants are known to have substantial impacts on the health of waterways, the productivity of forests, and agricultural crop yields. They also reduce visibility through haze formation that impacts our enjoyment and experience of our environment.

Extensive research in the last two decades has established a strong correlation between air pollution and many health ailments. Statistics show that more people die and are admitted to hospital for heart and lung problems on days with elevated levels of air pollution, and that people do not live as long in cities with high levels of air pollution. If air pollution increases susceptibility to sickness, as the evidence clearly indicates, then it also contributes to the social and monetary costs of caring for those affected, and it correspondingly diminishes individual quality of life.

Apart from the direct physical damage to health, the environment, and materials caused by air pollution, the available evidence also points to known less tangible pollution-induced economic costs related to lost productivity, diminishing availability of natural resources, and social disruption, which must also be taken into account when assessing the overall effect of air pollution on human society and on the planet.

A 2004 National Environment Commission study reported that air pollution in Bhutan overall is an "emerging issue, especially in urban areas," due to the growth of the industrial sector—by 216% over a 5-year period (1997–2002)—and the rapid increase in the number of vehicles on the road—more than doubling from 11,800 to more than

[306] *Bhutan: State of the Environment Report*, 2001, p. 65.

25,000 between 1997 and 2003.[307] By December 2010, Bhutan recorded a total of 53,382 vehicles, an increase of 30,855 in the last decade alone.[308]

According to a 2009 presentation by the United Nations Centre for Regional Development (UNCRD), private vehicle ownership in Bhutan increased threefold in the ten-year period between 1997 and 2007, with the biggest increase recorded in light vehicles. According to the presentation, 43% of all vehicles are personal cars, causing troubles in urban areas where they are competing with urban transport systems, making the latter less economically viable.[309]

The National Environment Commission (NEC) study states:

> The main sources of air pollution are from combustion of biomass for supply of domestic energy and agricultural activities, combustion of fossil fuels from vehicular emissions, industries and fugitive dusts from unpaved roads and new construction sites. Heating bitumen along road construction sites, where the fire is lit in an open space with an open saucer pan to heat the bitumen, also contributes to air pollution. In this process, there is emission from the combustion of biofuels as well as from the heating of the bitumen itself. Most of the satellite towns in Bhutan do not have proper waste disposal systems so the waste is burnt thereby polluting the urban air.[310]

The 2004 NEC study also reported that in an attempt to deal with the emerging issue of air pollution, it has since 2002 been measuring the ambient air quality (PM, NO_2 and SO_2) in Thimphu and Phuentsholing periodically. Also in 2002, a transboundary air pollution monitoring station was established at Bhur, Gelephu, and industrial air pollution monitoring station were set up in Pasakha and Gomtu to measure air quality there.[311] According to the 2008 NEC Bhutan Environment Outlook report, at the time of writing, data from the Gelephu station (bordering the Indian State of Assam) were not readily available.[312]

According to results of ambient air quality monitoring in Thimphu:

---

[307] National Environment Commission. 2004. *Brief Report on State of the Environment.* Royal Government of Bhutan, Thimphu, pp. 6–7.

[308] *Bhutan Today,* 17 August 2011. Available at: http://www.bhutantoday.bt/index.php?option=com_content&view=article&id=867:bhutan-now-has-53382-vehicles

[309] United Nations Centre for Regional Development. "Transport System in Bhutan". Powerpoint Presention for the 4th Regional Environmentally Sustainable Transport Forum held February 24-26, 2009 in Seoul, Korea. Available from http://www.uncrd.or.jp/env/4th-regional-est-forum/Presentations/20_BS5_Bhutan.pdf

[310] NEC, 2004, *Op cit.*

[311] Ibid.

[312] Bhutan is party to the 1998 Male Declaration on Control and Prevention of Air Pollution and its Likely Trans-boundary Effects for South Asia. UNEP serve as the Secretariat for the Declaration, which focuses on the need for countries to carry forward, or initiate studies and programmes on air pollution in each country in the South Asian subregion. NEC, 2008, p. 54.

> [T]he quality of air is fairly pristine except during the dry winter seasons, where it is degraded by higher concentrations of particulate matter. This can be attributed to emission from source points, the constant winter high pressure system that sits over the South Asian region and temperature inversions during dry winter seasons.[313]

Data are not available for ambient air quality in Samdrup Jongkhar Dzongkhag. However, since Samdrup Jongkhar has a much lower population, less construction and industrial activity than Thimphu, and far fewer vehicles, one might expect the air quality to be much better than the one recorded in Thimphu. However, there is reason to believe that this is not the case, for an entirely different reason.

During field research, from November until March, the research team was stationed in the town of Dewathang, approximately 18 km from the border with India. On a clear day, from the elevation of Dewathang, one can see the plains of Assam and its patchwork quilt of fields. However, clear days were few and far between. Most of the time, a haze obscured the sun and reduced visibility. At first the researchers thought it was fog, or the result of a forest fire. But as the days became weeks it became apparent that what they were witnessing was much more sinister.

Studies indicate that what has been called the "Atmospheric brown cloud" or sometimes "Asian brown cloud" (ABC), is worse during the winter months (November until April) when there is less rain to wash the pollution from the air. Evidence also indicates the pollution is caused by a wide range of anthropogenic sources: coal-fueled power plants in India and China, airborne particles from combustion such as wood fires and forest fires, vehicle emissions, and factories, and the burning of biomass to generate energy.

Studies relating to the "brown cloud" that now penetrates southern Bhutan indicate alarming health consequences, including bronchitis, pulmonary edema, chronic bronchitis, emphysema, cancer, asphyxiation, and even death in cases of high doses. Most commonly observed effects at lower doses are eye, nose, and throat irritation.[314]

The image displayed below was taken in February 2006, by NASA's Aqua satellite. It shows a pale band of haze covering northern India, just south of the Himalayas. Haze also intrudes into the skies of southern Nepal, Bhutan, and Bangladesh.[315]

---

[313] Ibid. p. 8.
[314] United Nations Environment Programme. 2002. Asian Brown Cloud: Climate and Other Environmental Impacts Study. UNEP. Available from http://www.rrcap.unep.org/issues/air/impactstudy/Executive%20Summary.pdf. p. 42.
[315] Scripps Institution of Oceanography: http://scrippsnews.ucsd.edu/pressreleases/images/india_web.jpg. Image courtesy Jeff Schmaltz, Moderate Resolution Imaging Spectroradiometer Land Rapid Response Team at the NASA Goddard Space Flight Center.

Image showing air pollution taken by NASA's Aqua satellite, February 2006

One major 2002 UNEP study—the first time the "Atmospheric brown cloud" was assessed for impacts on climate, agriculture, and health—found that nearly 2 million people die each year in India alone from conditions related to atmospheric air pollution.[316]

According to the 2008 report by Bhutan's National Environment Commission (NEC) citing data compiled by the Ministry of Health, the occurrence of respiratory diseases in Bhutan is also very high. During the period 2003–2006, there were more than 1 million respiratory disease-related referral cases and 436 deaths due to respiratory problems—accounting for 20% of deaths caused by all diseases. NEC points out, that despite this high rate of respiratory illness, there is currently no national study assessing the correlation between air pollution and the occurrence of respiratory disease.[317]

[316] Ibid. Health effects and morbidity figures cited in *The Lancet.* "Pollution cloud over south Asia is increasing ill health". Volume 360, Issue 9332. August 2002. http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(02)09762-3/fulltext
[317] NEC, 2008, *Op cit.*, p. 50.

In addition to the untold health effects this transboundary air pollution may be having on the Bhutanese population, research is now indicating that the pollution-laden clouds now drifting into Bhutan could also be adversely affecting agricultural productivity, and rice production in particular. The 2002 UNEP study reported that the haze, which covers roughly 10 million square kilometres, can result in up to 30% reduction in direct solar radiation, causing declines in agricultural productivity.[318] The study also reports that the haze suppresses rain, and can settle on plants as dust, soot, and fly ash, further shielding plant leaves from solar radiation. Another major direct impact is acid rain.[319]

A 2006 report echoed some of these findings. One U.S. study found that the brown clouds, which cloak much of South Asia, have a negative impact on rice output by reducing sunlight and rainfall. The report also noted that elevated levels of greenhouse gas emissions contributed to reduced yields.[320] Using climate models and historical data on Indian rice harvests, the researchers found that if there had been no atmospheric brown clouds between 1985 and 1998, the annual rice harvest would have been 11% higher than it was. The expert team concluded that the brown clouds reduced agricultural productivity. The study also noted that the effect of the brown clouds will be greater on areas that use rain to water their crops and less pronounced where irrigation is used.

Ambient air quality data for Bhutan are presently very limited. According to the NEC, daily PM_{10} monitoring over time has so far only been done in Thimphu, Rinchending, Pasakha, Gomtu, and Kanglung.[321]

At the same time, transboundary pollution is recognized by the NEC as a concern. In its most recent 2008 *Bhutan Environment Outlook,* the NEC notes that in 1998 South Asian countries, including Bhutan, were party to a declaration on trans-boundary pollution focusing on the need for all signatories to initiate studies and programmes on air pollution.[322]

As noted, a transboundary air pollution monitoring station has been established at Gelephu, and NEC reports that there are plans to set up more air quality monitoring stations in "strategic locations around the country." At the time of writing, data from the Gelephu station (also bordering the Indian State of Assam) were not readily available. Once they are, it will be possible to identify the severity of transboundary pollution in Bhutan, the quality of the air being breathed, whether it is correlated with declines in human health, and whether it could be the culprit in the reduced agricultural productivity being reported by farmers in the southern reaches of Bhutan.

---

[318] UNEP, 2002, *Op cit*., p. 38.
[319] Ibid.
[320] British Broadcasting Corporation (BBC News). "Pollution Reducing Rice Harvest". December 5, 2006. http://news.bbc.co.uk/2/hi/science/nature/6206766.stm
[321] NEC, 2008, *Op cit.*, p. 49; Personal communication with Tshewang Dorji, Senior Environment Officer, NEC, April 26, 2011.
[322] Bhutan is party to the 1998 Male Declaration on Control and Prevention of Air Pollution and its Likely Trans-boundary Effects for South Asia. UNEP serve as the Secretariat for the Declaration, which focuses on the need for countries to carry forward, or initiate studies and programmes on air pollution in each country in the South Asian subregion. NEC, 2008, p. 54.

Post script: At a presentation of the Draft SJI Profile report on May 19, 2011, NEC's Senior Environment Officer, Tshewang Dorji, noted that plans were also under way to set up a monitoring station for particulate matter at the Jigme Namgyel Polytechnic in Dewathang, which would provide important information on air quality there, which is not presently available. Tshewang Dorji expects that this JNP monitoring will begin within a year.

5.2 Waste management in Samdrup Jongkhar

Waste is managed very differently in rural and urban areas within Bhutan, including Samdrup Jongkhar Dzongkhag. Differences are based not only on the size of communities, but also on their accessibility, as the latter affects how readily available different products are in any given area. The changing consumer market in Bhutan has meant that much more waste is being generated than in the past, and waste management systems therefore need to be adapted to address the changing situation.

The waste problem is particularly pronounced in larger cities such as Thimphu, and as such, it has spurred more action there, whereas smaller towns and villages have felt less pressure to react. However, with increasing population and waste generation, the problem is intensifying. Furthermore, increasing environmental awareness nation-wide is adding to the pressure to act.

5.2.1 Regulatory environment

There are a number of national government acts and plans that pertain to waste management in Bhutan. Though not explicit, emphasis is often on Thimphu, and there seems to be little discussion of waste issues in small towns or remote areas. The key acts and plans are:

National Environmental Protection Act, 2007 (RGoB)
The bill establishes the terms of reference of the National Environmental Commission, and sets out principles, which the Commission will aim to uphold. Some of these principles are relevant to waste management, such as the precautionary principle, the principle of the three Rs, and the polluter pays principle. The Act is essentially high-level legislation, and does not provide any specifics that would be mandatory for any level of government to implement in its waste management policy.

Waste Prevention and Management Act, 2009 (RGoB)
This act lays out the legal framework for waste management in Bhutan. It mentions the underlying principles, the requirements for different categories of waste, the implementing agencies and their respective powers and duties, as well implementing mechanisms (administrative, financial, physical, awareness, research). Offences and penalties for improper waste disposal are also described in general terms. As with many other acts, however, this is more of a high-level policy framework, and does not offer any

specific policies, leaving implementation to the relevant ministries, departments, and other organizations.

National Strategy & Action Plan: Integrated Solid Waste Management, 2007 (RGoB, MoWHS)
This document, developed with the assistance of the UNDP, provides a more detailed background and plan, including specific reference to current waste management practices, and a number of proposed actions (public-private recycling partnerships, community mobilization on segregation/minimization, establishment of a tariff system, new enforcement mechanisms). Responsibility is assigned to various government agencies. Implementation of this plan does not appear to have reached Samdrup Jongkhar in any way other than the recommendation to establish a waste transfer station, which was already planned.

5.2.2 Waste management in remote areas

Many areas of Samdrup Jongkhar Dzongkhag are quite remote and are without road access. According to the 2007 Bhutan Living Standards Survey, roughly 40% of rural residents in Samdrup Jongkhar are more than a 1 hour walk from the nearest road of any type.[323] From a waste generation and management perspective, this means that it is more cumbersome to bring goods or other materials into or out of remote villages. Consequently, fewer materials are returned for recycling while fewer materials make their way into remote areas in the first place.

While there are few numerical data specifically concerning this, field research interviews and observation show a clear negative correlation between the distance from the nearest road and the amount of packaged material available in shops, the amount of litter on trails, and the volumes of waste being disposed of in pits. The main difference appears to be in terms of snack foods and other processed food products. Plastic bottles are still used in rural areas, but are reused continually for other purposes, and are generally not recycled.

It should be noted that this lower level of waste generation in remote areas appears to be due to the impracticality of bringing in large amounts of packaged food items, as opposed to an active effort toward waste minimization in these areas. While there is generally less visible waste in remote villages, some exceptions were observed. Some areas are sufficiently remote that many villages share a common trail as their main access route, resulting in the trail becoming heavily trafficked (southern Gomdar and Wangphu Gewogs, for example). This high level of traffic and long distances means that it is viable for businesses to set up shop alongside the trail to serve as rest points, selling a variety of snack foods, most of which are pre-packaged. This results in a few areas of intense waste and litter generation in the vicinity of those shops. This indicates that once packaged foods become widely available, even remote areas will generate considerable waste.

[323] BLSS, 2007.

In remote areas, organic waste is generally separated, fed to animals, or scattered. A few villages reported performing pit composting, though this is a relatively new technique, often introduced recently by the Agricultural Extension Officers.[324] The waste that is collected for disposal typically consists almost entirely of plastics of various types, primarily from food packaging. This is largely different plastic films, but does contain some bottles as well. According to field research interviews with villagers in Pangthang and Woosoong villages in Wangphu, the waste is collected in pits and buried, though some villages reported burning it first. Most, however, reported that they had ceased the practice of burning waste or dumping it in the river on the advice of officials, or because they felt it damaged their crops.

The only product reported as being of sufficient value to warrant recycling in rural areas is beer bottles, which are collected in large piles for eventual return.

5.2.3 Waste management in rural areas and towns

Many rural areas do have some form of road access, either through direct connection to a highway, or via a farm road, both of which remove barriers to bringing large amounts of packaged goods to villages. This means that there is generally much more waste generated in rural and town areas than in remote areas.

Towns such as Dewathang or Bhangtar have a wide array of pre-packaged foods available in shops, resulting in greater waste generation. Even small towns with only farm road access such as Tsangchello or Martshala have a somewhat smaller but still significant array of packaged products available, and therefore substantially higher waste generation than in remote villages. Though there are few data concerning types of waste and re-use rates, the ease of availability of products in plastic bottles in urban and accessible rural areas means that containers are not re-used as frequently as in remote areas.

It is worth noting, however, that the government's ban on plastic shopping bags does generally seem to be effective in Samdrup Jongkhar. Bhutan first introduced a plastic bag ban in 1999. This ban was further reinforced in 2005. Due to difficulties in implementing the ban, the government reintroduced the ban in May 2009.

Currently, there are no formal waste management systems in the smaller towns and rural areas of Samdrup Jongkhar. There is informal recycling of glass bottles (primarily beer). In some cases, there is also very limited recycling of PET plastic bottles and cardboard in some areas by recyclers who bring these materials to India for resale. As with most informal systems, the high-value materials are prioritized and recycled regularly, and other less profitable materials are ignored or collected less regularly.

[324] Agricultural Extension Officer, Wangphu gewog. Personal Communication with Luke Raftis. Wangphu, January 16, 2011.

Illegal roadside dump

Organic waste in the smaller towns and rural areas of Samdrup Jongkhar is generally fed to animals, scattered in fields, or in some cases, composted for use in kitchen gardens. Plastics, bottles, wrappers, bags, etc. are typically disposed of in pits, either to be buried or burned. These pits are scattered throughout villages and institutions, typically placed in public areas, and with households contributing to whichever pit is closest. There is also a substantial amount of illegal dumping at certain locations along roads.

Schools have often made a concerted effort to collect waste and prevent littering, typically by constructing and maintaining waste bins. This is sometimes done by the school itself with some degree of student involvement, or in the case of Jigme Namgyel Polytechnic in Dewathang, by student organizations such as *Rover Scout*, which are closely linked with the institution. JNP also has a *Waste Management Club* comprised of student volunteers, which handles the Polytechnic's waste management. The institution received equipment from the RSPN's *Clean Bhutan* fund in 2008 to assist with the collection and separation of waste.[325] The intention is to separate recyclables for resale to markets in India, and to dispose properly of the remaining waste, though in practice this has not been happening lately.

[325] Royal Society for the Protection of Nature, *2008 Annual Report*, Thimphu, 2008.

Many villages have an annual ‘cleaning campaign’ which involves collecting waste scattered about the community, and disposing of it as any other waste would be, usually in the designated pits. Though symbolically important, this does not seem to have stopped littering or waste generation, and has not led to a change in waste management policy.

Informal recycling in Dewathang town

5.2.4 Waste management in Samdrup Jongkhar town

The proximity of Samdrup Jongkhar to the Indian border means that it has easier access to a much wider range of products, including food products, household items, construction materials, and electronic goods, than other parts of the dzongkhag. The town serves as a commercial hub for much of the east of the country, from where agricultural goods are auctioned and shipped to markets in India and Bangladesh, and as a supply hub for individuals and retailers who purchase goods to be taken back to smaller towns and villages.

Unlike much of the region, Samdrup Jongkhar town also has a number of industries including automobile repair, metal fabrication, chemical industries, and construction industries, all of which generate their own forms of industrial waste and construction debris. Furthermore, the town is also the administrative centre for the region, housing both the dzongkhag headquarters and also several offices for various government ministries. As well, Dantak, the Indian government agency currently responsible for the massive road-widening project in the area, has its offices there. This radically different

economy of course means that waste generation is dramatically different than in other parts of the dzongkhag.

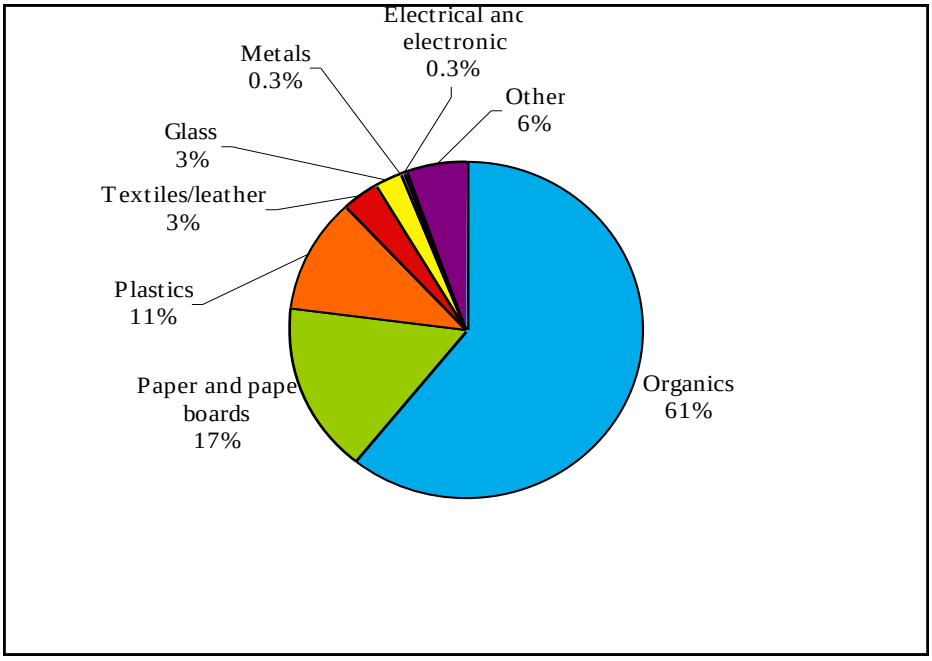
Samdrup Jongkhar was included in a waste audit done in 2008/9 for the ten largest cities in Bhutan. The study was a collaborative effort between the Department of Urban Development and Engineering Services (Ministry of Works and Human Settlements) and researchers from Griffith University and the University of Technology, both in Australia.[326] The audit sampled waste from households, offices, and commercial sources (bars, shops, restaurants), but did not sample waste from industrial or institutional sources.

The study found that the mean waste generation rate for households was 0.88 kg/day per household (median 0.68), which is slightly lower than the average of all 10 cities surveyed. Commercial waste generation rates were 1.89 kg/unit/day (mean) and 0.97 kg/unit/day (median), with rates from offices being similar. While the study did not measure the total waste going to landfills, the data were extrapolated and compared with measurements from other sources, to give an estimate of 998 tonnes of waste per year going to the Samdrup Jongkhar landfill from all sources (163 kg/year/resident).

The waste composition, as shown in Figure 16 below is largely composed of organic material such as kitchen/restaurant scraps. The authors of the 2008/09 waste audit noted that this organic proportion of waste generation in Samdrup Jongkhar is likely underestimated, as their sample did not include waste from the weekly vegetable market, which generates a large amount of organic waste.

[326] Herat et al. 2010. "Studying municipal solid waste generation and composition in the urban areas of Bhutan*." Waste Management and Recycling*. No. 28: 545–551.

Figure 16. Composition of municipal solid waste, Samdrup Jongkhar town, 2008/09



Source: Adapted from Herat et al. 2010. "Studying municipal solid waste generation and composition in the urban areas of Bhutan." *Waste Management and Recycling*, No. 28: 545–551.
Note: Percentage of sample is determined by weight.

Materials, which are typically recycled through informal processes in the area (glass, metal, PET plastics) were notably absent from the samples collected during the audit, even though participants were explicitly asked not to withhold any waste. The authors suspect that these materials were actually being recycled in any case. The glass that made its way into the landfill during the audit was mostly broken, meaning that it could not be recycled, and only a minimal amount of metal was found.

Paper and paper boards (newspapers, magazines, boxes, etc.) made up the second largest component of municipal waste in Samdrup Jongkhar at 16.5%. Although most of these materials are in theory recyclable, the rates offered for them at present do not seem to provide sufficient incentive to motivate recycling action. Clean cardboard seems to be the only exception, and is often recycled.

Plastics made up 10.7% of the waste stream at the time of the study, though no further detail was given regarding the make-up of this category, other than to say it was comprised of a mix of plastic packaging and wrappers, hard and flexible household plastic items, and some PET plastic bottles. Though there is some informal recycling of PET plastic bottles, it is certainly not universal or institutionalised.

The category of electrical and electronic waste, though small, is an area that the authors noted was important, as the rate of electronic waste will be significantly higher in the

future. They noted that computers are still a fairly recent advent in the area and will need to treated separately in the future. The 'other' category was comprised largely of construction waste, including timbers, plywood, masonry, brick, and aggregates, but it also included household hazardous chemicals, batteries, etc.

Samdrup Jongkhar is the only jurisdiction in the dzongkhag with a municipal solid waste collection system. Waste is collected by truck from the bazaar area every day except Sunday, and there are a few large bins in the downtown area in which area businesses can deposit their waste at any time. From the residential areas, waste is collected three times per week, all by a small (2 tonne) compactor truck.[327] All waste is currently taken to a landfill outside of town and dumped, with occasional burning to reduce volume.

There is currently no waste diversion other than the informal recycling of scrap metal, bottles, clean cardboard, and bulk PET bottles. These are taken to India for resale to scrap dealers. The amounts of such recyclables collected seem to vary dramatically. Bottles are generally collected throughout the dzongkhag, whereas PET and cardboard are only collected in Samdrup Jongkhar and Dewathang, and even then, not universally.

Plans are under way to construct a sanitary landfill near the town, which would have a transfer station to separate some of the recyclable materials for sale to local dealers, who would then take it for resale in India. The issue of waste management is officially the responsibility of dzongkhag-level officials, so city officials feel constrained and cannot move ahead with actions unilaterally.[328]

The 10th five-year plan envisages the Samdrup Jongkhar area as a "regional growth centre," which means that plans for waste management in addition to other urban infrastructure plans will be established in coming years.[329] Because the new landfill is part of the 10th 5-year plan, it should be completed by 2013 at the latest. Even with the new landfill however, burning is still being considered for volume reduction.

There seems to be little interest at present in any sort of source separation, more recycling, or municipal composting, as efforts seem to be focused on the new landfill and transfer station. The area's *source reduction* and *waste management* plans are still in the consultation phase. The Environmental Officer is responsible for source reduction and waste awareness, though in practice, the vast majority of his time is spent undertaking permitting and environmental assessments, so waste unfortunately does not receive much attention.[330]

The current dzongkhag administration expressed little faith that residents could be convinced to cooperate with any sort of source separation. While it will in theory be

[327] Municipal Engineer, Personal Communication with Luke Raftis, Samdrup Jongkhar, December 1, 2010.
[328] Tshering Dorji, Environmental Officer, Personal Communication with Luke Raftis, Samdrup Jongkhar, December 1, 2010.
[329] Royal Government of Bhutan, 2008. *Tenth Five-Year Plan*, Thimphu.
[330] Tshering Dorji, Environmental Officer, Personal Communication with Luke Raftis, Samdrup Jongkhar, December 1, 2010

possible to separate waste at the new waste transfer station once it is constructed, this will make the cost of obtaining pure streams of each material higher than they would be had they never been co-mingled in the first place. This is not an issue for high-value materials such as bottles and metals, since these are not making their way into the waste stream in the first place. However, the low-value recyclable materials, such as paper, paper board, and plastics are only marginally profitable at best, so any cost added to their acquisition could make the difference between their being recycled or being landfilled. The same is true of organic materials, which are only compostable if a relatively pure stream can be obtained, which would essentially require source separation.

Plastic films such as those typically used for packaging are particularly difficult to recycle as they are frequently contaminated, and can be made from a number of different types of plastics, which are not easily distinguished. These include linear and regular low-density polyethylene (LLDPE#4, LDPE#4), medium and high density polyethylene (MDPE#4 & HDPE#2), oriented polypropylene (OPP#5), polyvinyl chloride #3, and nylon #7. All of these materials are used for packaging food and consumer items, and this heterogeneity combined with the low rate paid by Indian scrap dealers (4Rs/kg for clean HDPE,[331] for example) makes plastic films a low priority for informal recyclers. Consequently, plastic films are rarely recycled in Samdrup Jongkhar Dzongkhag, and they make up much of the waste that is dumped illegally, burned in pits, or discarded as litter.

There are no towns with municipal sewer systems in Samdrup Jongkhar.[332] Individual septic systems are generally used in towns and many villages, and simple pit latrines are more common in rural areas. There is a plan to develop a municipal sewer system in Samdrup Jongkhar town, though this will not be done immediately.[333]

5.3 Industry in Samdrup Jongkhar

5.3.1 Overview

While industrial development is seen as *progress* in much of the world, the commitment to the values and pillars of GNH in Bhutan means that any development that does take place in this country is supposed to be seen through a GNH policy lens. In other words, it is legitimate to ask in Bhutan whether a particular type or form of industrial development contributes to the four pillars of GNH or detracts from them?[334] In many cases in

[331] Ministry of Works and Human Settlement, Comprehensive Master Plan of Solid Waste Management System for Thimphu, Thimphu: 2009.
[332] Tshering Dorji, Environmental Officer, Personal Communication with Luke Raftis, Samdrup Jongkhar, December 1, 2010.
[333] Ministry of Works and Human Settlement, Comprehensive Master Plan of Solid Waste Management System for Thimphu, Thimphu: 2009.
[334] The four pillars are environmental conservation, equitable and sustainable socio-economic development, cultural promotion, and good governance.

Samdrup Jongkhar, it appears that the costs associated with certain industries far outweigh the benefits.

Since Samdrup Jongkhar is one of the key gateways to Bhutan and the main commercial hub for the eastern region of the country, it attracts considerable industrial and commercial activity and accounts for 4.6% of the country's total industrial licenses. In 2009. there were 8 agro-based, 10 forest-based, 3 mineral-based, and 54 contract-based industries in the dzongkhag.[335]

Samdrup Jongkhar Industrial Estate is one of the 3 existing designated industrial estates in the country with four wood-based industries covering an area of 3.2 acres. The other two are Phuentsholing Industrial Estate and Njemina Industrial Estate. The 10th FYP is aiming at developing several other Industrial Estates in the country, one of them being Motanga Industrial Estate in Samdrup Jongkhar Dzongkhag with the objective to promote balanced regional development and enhance growth of the rural economy. The land acquisition (152 acres) for Motanga Industrial Estate is almost complete.

The S.D. Eastern Bhutan Coal Company Ltd is approximately 5 km from Dewathang town and is the largest coal mine in the country. It is owned by Sonam Dukpa and has been operational since the early 1990s, when it won the first licence auction for ten years. The company again won the re-auction for Nu 521m in August 2004 for a lease of 15 years.

According to newspaper reports, the mine was shut down in April 2009 on orders from the Anti-Corruption Commission, after an investigation found out that the company had been operating for five years without an environmental clearance certificate. The mine re-opened in October 2009 after obtaining the certificate. According to *Kuensel*, 150 nationals are employed with the company in addition to the truck drivers.[336] See more on the Rishore coal mine and the ferro-silicon factory below.

Samdrup Jongkhar is also the locale for a rosin and turpentine factory. Resins are obtained from mature chir pine (Pinus roxburghii). In Bhutan, tapping of chir pine is primarily carried out by Tashi Rosin & Turpentine, a branch of Tashi Commercial Corporation, under a 50-year lease running from 1972 to 2022.

Commercial extraction of chir pine resins amounts to 272 tons per year—extraction is limited by difficult terrain, the wide and scattered distribution of mature trees, and insufficient number of labourers. The resin from chir pine is collected in central and eastern Bhutan and is then transported to the rosin and turpentine factory in Samdrup Jongkhar for processing into rosin (78%) and turpentine oil (14%). The processing plant's annual production capacity is 300 tons of resin.

All rosin and turpentine products are sold to India, with the price for rosin ranging from Nu. 20 to 24 per kilogramme and the price for turpentine oil at Nu. 11 per litre. Rosin is

[335] Dzongkhag Administration. Samdrup Jongkhar Profile. 2009. Available online.
[336] "Coal company gets clearance", *Kuensel*. November 30, 2009. Available online.

used in making paper (39%), paints and varnish (25%), soap (18%) and ink (1%). Turpentine is used in the production of camphor (85%) and paints (15%), and in the pharmaceutical industry.[337]

5.3.2 Mineral exploration in Samdrup Jongkhar

> *[T]he concept of large-scale industrial development is in direct conflict with the country's policy of environmentally sustainable development especially when bearing in mind the country's fragile mountain ecosystem and limited usable land. The key environmental problems arising from industries are air pollution, water pollution, hazardous waste generation, and land degradation.*
>
> — National Environment Commission[338]

At present, with the exception of ferro-silicon, there is very limited mineral extraction in Bhutan. But that may change. One recent report noted:

> The Himalayas are undoubtedly rich in abundant natural minerals, and the global demand for dolomite, gypsum, and quartzite means big economic opportunities for Bhutan. Ferrosilicon, commonly used to prevent oxidation when forging steel, was Bhutan's number one export in 2009 after electricity. While in 2009 the Bhutanese mining industry reported negative growth, global demands for Bhutan's mineral resources are likely to increase, and along with them, the increase of environmental impacts associated with the extraction of these minerals.[339]

Between the 1970s and 1990s mineral exploration covering one-third of the country, was done through the Geological Survey of India (GSI). The GSI found potential for oil in Bhangtar, in Phuntshothang Gewog of Samdrup Jongkhar; traces of gold, silver and copper in the Black Mountains; and tungsten in Sarpang Dzongkhag, with an estimated value of Nu. 50–60 billion.

Now there is an American mining company willing to follow up on these finds and explore the rest of the country, with a few strings attached. In 2009, *Kuensel* reported that U.S-based Cline Group is trying to gain mineral exploration rights for the entire country.[340] J. Matthew Fifield, managing director of Cline Group, has proposed he would get a group of American investors to invest in Bhutan's mining sector "in a big way."

The Department of Geology and Mines (DGM) under the Ministry of Economic Affairs and Druk Holdings Investment (DHI)—through which Fifield communicated with the Bhutan government—have so far expressed interest in the proposal and are in the process

[337] Moktan, M.R. 1994. Review on the Resin Tapping Operations in Chir Pine Forests of Bhutan.
[338] NEC. 2008. *Bhutan Environment Outlook,* p. 18.
[339] Jack Chance in *Drukpa,* 1 February 2011.
[340] "American Interest in Mining Rights". *Kuensel*. August 29, 2009. Available online.

of studying it, say newspaper reports. If an agreement is reached, the mining company would get exploration rights and the government of Bhutan would get mining shares and royalties.[341]

Seen through a GNH lens, large-scale mineral extraction could be disastrous for Bhutan, both in costs to the environment and to community health and wellbeing. Already there are reports that dolomite mining in Gomtu in southwestern Bhutan is causing serious environmental, health, and agricultural damage.[342] But the damages caused by mining are not a Bhutanese problem alone. Worldwide, mining operations frequently cause serious harm both to the people of the country in which they are located, and to the natural environment.

Indeed, the documented costs associated with mining go far beyond the costs involved in exploration and extraction, because many of the short and long-term costs of mining are externalized. That is, they are not paid for by the company but by future generations. For example, the removal of forest ecosystems, environmental destruction, contamination of water bodies, the lowering of water tables affecting rivers and streams, the creation of waste tailings, and the displacement of people, are just some of the hidden costs of mining.

Before opening the country to mineral exploration and exploitation by the Cline Group, therefore, such long-term costs and their compatibility with GNH values and considerations need to be carefully considered. The past records of companies like the Cline Group are also relevant. Thus, U.S. news reports indicate serious concerns raised by residents and environmental groups over a highly contentious proposal by the Cline Group for an open-pit iron mine that is predicted to destroy an ancient mountain range in Ashland Counties, Wisconsin.[343]

By contrast to the "large-scale industrial development" which the National Environment Commission says "is in direct conflict with the country's policy of environmentally sustainable development," the 2008 NEC report instead recommends:

> The potential for future industrial development in the country lies in the development of a network of small-scale and cottage industries based on sustainable management of cultural and natural endowments, especially focusing on niche products such as hand-woven textiles using natural dye and organically produced food and medicinal products.[344]

Such choices are directly relevant to the future directions of the Samdrup Jongkhar

---

[341] Ibid.
[342] Bappa Majumdar, *Reuters*. 5 June 2007. Available at: http://www.reuters.com/article/2007/06/06/environment-bhutan-dolomite-env-dc-idUSPAR54656020070606.
[343] Kaeding, Danielle. December 30, 2010. "Pondering Environmental Impacts of Potential Mine". *Ashland Daily Press*. Wisconsin. Available online. Also, Duncan, Casey. January 2, 2011. "Public Meeting Held on Proposed Penokee Iron Mine. Headwaters". *Community Journalism for the Great Lakes*. Available Online.
[344] *Bhutan Environment Outook*, 2008, p. 18.

Initiative as it identifies the types of development that will be most beneficial to the people and natural environment of Samdrup Jongkhar.

5.3.3 Rishore coal mine

In Rishore village, about 6 km from Dewathang town, one woman explained that, after her husband died, she spent her time tending her one-acre garden of maize and looking after her children. Most of her children have moved away now, except for her daughter, who now helps to look after her. At 23 years of age, the daughter provides for her mother and herself by working as a dispatcher at the nearby office of the S.D. Eastern Bhutan Coal Company. She completed Class 9 at the local High School, one year short of completing the all-important year, Class 10. Successful Class 10 completion opens doors for Bhutanese students, and leads to the option of continuing on to college or university. But this girl's family could not afford higher education and she needed to work to support her family—and so she left school and joined the ranks of workers at the nearby open pit coal mine (see photo below). She says that, for local high school "dropouts" (like herself), the "only option is coal mining." She says that if the coal mine were to close, the people of her village would have a very difficult time.

The S.D. Eastern Bhutan Coal Company, owned by Sonam Dukpa, is a site to behold. As you descend into the vast pit, the lush greenness of the subtropical jungle gives way to scraped and terraced rock faces. Tata trucks can be seen below stopped near the groupings of men perched, digging with pick axes, to free the coal from the visible coal seams on the mountain sides (see photo below). These trucks travel day and night along the 6 km stretch between Rishore and Dewathang village, carrying coal to Samdrup Jongkhar town, about 18 km away, where the coal is unloaded, next to the S.D. Eastern Bhutan Ferro Silicon Ltd. plant, which is also owned by Dukpa.

Some of the coal is used at the S.D. Eastern Bhutan Ferro Silicon Ltd. plant, whose product is exported to India for the making of steel. The rest is used to fuel India's electricity needs. Thus, directly or indirectly, all the coal from Rishore eventually makes its way across the border.

Rishore coal mine

The labourers in the mine pit itself are Indian, we are told by the woman working in the head office. “Bhutanese don’t want this kind of work,” she says.

When asked what the working conditions are like at the mine, many of the villagers say they are simply happy to have work and don’t want to complain. However, others who did not want to be identified talked about the noise and dust created by the transporting of the coal. Another individual, who no longer lives in the area, worked at the mine between 1997 and 2001, and reported that there were many health problems, mostly respiratory, associated with working there, as well as several work-related deaths.

In addition, residents of Khorpan village, also near the mine, reported that the coal mine was causing landslides, eroding land, and creating dust, and that out of 35 households, three were “badly affected.”[345]

While it was not possible to ascertain the health status of the employees at the mine, coal mining is known to be hazardous to health. According to the U.S. Centers for Disease Control, both surface and underground coal miners suffer from coal dust exposure and associated lung diseases such pneumoconiosis (black lung) or anthracosis. The report states that at most risk are those who cut the coal directly from the coal seams.[346]

In 2008, data from communities located near coal mines in the U.S. were analysed by University of West Virginia researchers, who found that residents had an increased risk of developing chronic heart, lung, and kidney diseases. The study found that coal-processing chemicals, equipment powered by diesel engines, explosives, toxic impurities in coals, and even dust from uncovered coal trucks, can cause environmental pollution that in turn can have negative effects on public health.

According to the data, people who live in coal mining communities had a 70% increased risk for developing kidney disease, a 64% increased risk for developing chronic obstructive pulmonary diseases (COPD) such as emphysema, and were 30% more likely to report high blood pressure. One of the lead authors of the study concluded: “People in coal-mining communities need better access to healthcare, cleaner air, cleaner water, and stricter enforcement of environmental standards.”[347]

In Dewathang, complaints about the dust created by the coal-carrying trucks during the dry season lead the coal mining company to water the roads daily to keep the dust down. However, in many places, the result may be just as hazardous to health. The water, when mixed with the spilled coal from the trucks, leaves an iridescent slurry coating the roads

[345] Information from Khorpan villagers obtained during a break-out session at the SJI Launch held at the CGI in Dewathang, December 2010.
[346] Centers for Disease Control. Respiratory Diseases Induced by Coal Mine Dust. National Institute for Occupational Safety and Health, Evidence Package for the National Academies’ Review 2006–2007. Available online.
[347] Study reported in *Science Daily*. “Chronic Illness Linked to Coal-Mining Pollution, Study shows”. March 27, 2008. Available from http://www.sciencedaily.com/releases/2008/03/080326201751.htm

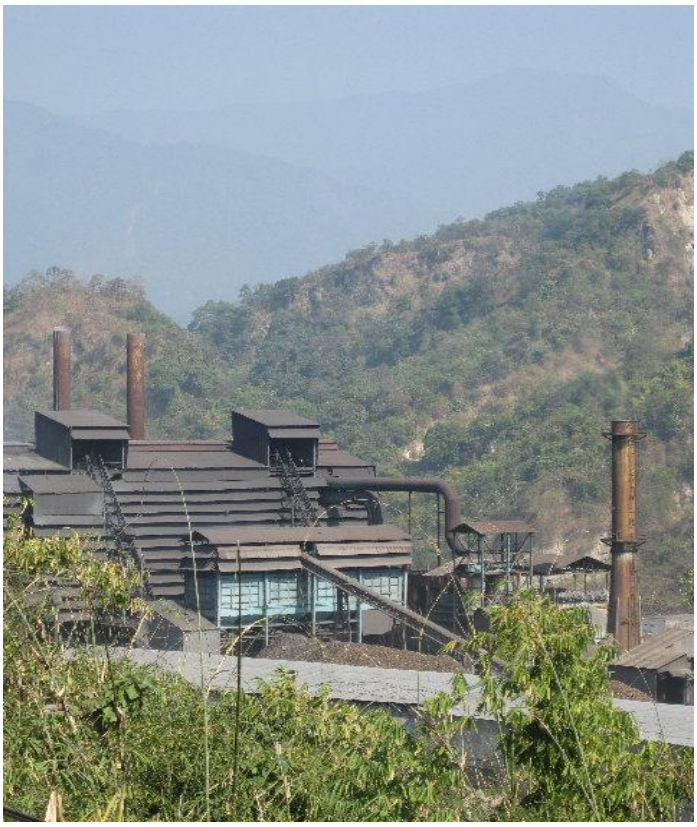
and filling the pot holes. Invariably, this mixture washes down the hills, polluting agricultural fields, streams, and potentially water sources.

As stated, the coal from Rishore is trucked to a location adjacent to the Silicon factory in Samdrup Jongkhar, and from there is destined for India.

Workers digging at coal seams by hand, S.D. Eastern Bhutan Coal Company, Ltd., Rishore

5.3.4 Ferro silicon production

In 2007, the S.D. Eastern Bhutan Ferro Silicon Ltd. plant opened in Phuntshok Rabtenling, about 7 km outside of Samdrup Jongkhar town. It is owned by Sonam Dukpa, who also owns the S.D. Eastern Bhutan Coal Company in Rishore village near Dewathang town.



Ferro silicon is an alloy of iron and silicon with varying percentages of silicon in the product. The ferro silicon produced in Samdrup Jongkhar contains 70% silicon, 28% iron, and about 2% by- products. The ferro silicon produced at the plant is sold to steel plants in India where it is used as an alloying element or de-oxidizer to purify the steel.[348]

Due to time constraints it was not possible to interview anyone at the Silicon factory. However one observational field visit was made.

S.D. Eastern Bhutan Ferro Silicon Ltd.

5.4 Tourism potential in Samdrup Jongkhar

5.4.1 Overview of tourism

Before the 1970s, visitors to Bhutan were generally only those invited as guests by the Royal Family. The coronation of the Fourth King in 1974 was the first time a large number of foreign visitors entered the Kingdom. Soon afterwards, the first paying tourists arrived.

Tourism grew gradually, and in 1991 the industry was privatised, and numerous tourist agencies were established. Visitor numbers have continued to rise, particularly over the past few years. In 2007, about 21,000 tourists visited the country spending $US29 million.[349] In 2010, about 41,000 tourists entered the country, of which 27,000 were international, dollar-paying tourists who spent spent $US36 million.[350] In 2011, the

[348] *Kuensel Online*. "Eastern Ferro Silicon Factory to start Production". February 3, 2007. Available online.
349 Gross National Happiness Commission. *Tenth Five-Year Plan (2008–2013*), Volume 1. Main Document. Royal Government of Bhutan, p. 96.
[350] National Statistics Bureau. 2011. *Statistical Yearbook of Bhutan 2011*. Royal Government of Bhutan. http://www.nsb.gov.bt/pub/syb/syb2011.pdf.

number of international tourists increased to about 37,000.[351] The target set for 2012 is 100,000 tourists, however according to a *BBC News* report, it is not clear whether this number includes tourists from India, Bangledesh, and Maldives, who do not pay a daily tariff.[352] The adoption of a "low volume high value" approach, whereby tourists (except for those from the above three countries) pay a high daily tariff, has thus far limited tourism and ensured that a portion of tourism revenue goes to the government.[353]

Currently, the majority of tourists visit Paro, Thimphu, Punakha, Wangduephodrang, and Bumthang. By contrast, Samdrup Jongkhar (similar to the other southern and eastern dzongkhags) has had little or no tourism. Little infrastructure and access difficulties, combined with security risk issues of the last twenty years, have kept the area almost tourist-free.
However, this is starting to change, with recent security improvements in Assam, improved access, and new hotel construction removing key past impediments.

Under the 10th Five-Year Plan (FYP), Samdrup Jongkhar is slated to provide a major entry and exit point for tourists to the eastern region. The new flight from Paro to Guwahati to Bangkok introduced by DrukAir at the end of 2010 will certainly open the region to tourists since the flight from Paro to Guwahati is roughly 50 minutes, and the distance from Guwahati airport and Samdrup Jongkhar by car is approximately 3 hours. This route to Eastern Bhutan via India would remove two to three days of driving through Bhutan, and will appeal to some tourists.

Two additional airports, in Trashigang (Yongphula) and Bumthang, with Paro as the hub, were completed in 2011, with Bhutan's first domestic flights to both locations inaugurated on National Day (17 December) 2011. Another airport in Gelephu is due to become opearational in the near future. These new domestic flights will further facilitate the movement of people from western Bhutan to the east and south of the country, and are seen as playing a crucial role in accommodating and spreading the sharp projected increase in tourists. As well, the lower altitudes, and hence much milder winters, of Samdrup Jongkhar and other southern dzongkhags, are seen as having potential to spread the projected increased tourist numbers through the winter months when tourists tend to avoid the chill of Paro, Thimphu, and Bumthang. The Royal Government of Bhutan's new tourism tariff policy gives a $U50/day discount for off-season winter visitors, which will act as a further incentive to tourism development in Samdrup Jongkhar and neighbouring dzongkhags.

---

[351] *The Refuge Herald*. "Bhutan shows a significant increase in the number of UK visitors". 15 Feb 2011. http://refugeesvoice.wordpress.com/2012/02/15/bhutan-show-a-significant-increase-in-the-number-of-uk-visitors/.

[352] Bhaumik, Subir. "Bhutan looks to raise annual tourist numbers to 100,000." *BBC News*, Calcutta. 15 Sept 2010. http://www.bbc.co.uk/news/world-south-asia-11313412.

[353] National Environment Commission. 2008. *Bhutan Environment Outlook*. National Environment Commission Secretariat, Royal Government of Bhutan, Thimphu. Available online.

The 10th FYP also promotes ecotourism in protected areas, with the objective of sustainable income for park residents from tourism and biodiversity conservation. Through the *South-South* cooperation program, Bhutan has received valuable information on how to develop and manage eco-tourism from Costa Rica, which is world renowned for its success in this area. Eco-tourism development is planned for the six national parks and wildlife sanctuaries in Bhutan. The Department of Forests and Park Services, in collaboration with the Tourism Council of Bhutan, will be responsible for the execution and coordination of these programs.

Mother langur with baby

5.4.2 Eco-tourism potential in Samdrup Jongkhar

As previously noted, Bhutan is rich in biodiversity, with 5,500 species of vascular plants, over 770 species of birds, and 165 species of mammals. This rich biodiversity is due to the remote nature, geographical relief, and climatic heterogeneity of the country. On a global scale, Bhutan is recognized as forming a major part of an area of especially high biological diversity known as the Eastern Himalayan 'conservation hotspot.'[354] A total of 14 bird species recorded in Bhutan have been identified as globally threatened, and nine of them can be seen in the forests of Samdrup Jongkhar Dzongkhag.[355]

Since the vast majority of Samdrup Jongkhar is under forest cover (77%), mainly of broadleaf subtropical forest and conifer, a wide variety of fauna inhabits these forested areas. Some of the protected species in Samdrup Jongkhar are the Asian Elephant, Leopard, and Himalayan Black Bear. Common wildlife species in the area include langurs (see photo inset), leopards, bears, wild pigs, barking deer, and sambar.

[354] Inskipp, Carol, Tim Inskipp, and Richard Grimmett. 2004. *Birds of Bhutan*. Helm Field Guides. Christopher Helm Publishers Ltd., London, p. 18.

[355] The "rare" bird species that are found in Samdrup Jongkhar forests are: Pale-headed Woodpecker, White-gorgeted Flycatcher, Ward's Trogon, Blyth's Kingfisher, Pied Falconet, Silver-breasted Broadbill, Violet Cuckoo, Dark-rumped Swift, and the Rufous-bellied Eagle. Ibid, pp. 18–20.

A reconnaissance survey on probable recreational spots in the eastern part of Bhutan in order to create potential winter visiting venues was submitted in August 2008 by the Department of Forests and Park Services. One of the potential areas identified is located in Samdrup Jongkhar. BanglaPhu Recreational Park (4km from Samdrup Jongkhar town and 16km from Dewathang) is considered a biodiversity hotspot. It contains a rich diversity of trees, shrubs and herbs, bamboo, cane, orchids, and bananas. Elephants, Comodo Lizards, lowland fish, and even the biggest species of python (that has been caught swallowing an adult barking deer) are inhabitants of the park. The park is seen as a possible destination for naturalists and tourists in winter, and as botanical venues for Bhutanese schools.[356] However, when the research team tried to find and visit this park, no one in the area seemed to know where it was or had ever heard of it, so at this stage it still appears to be just a location on a survey map without proper access.

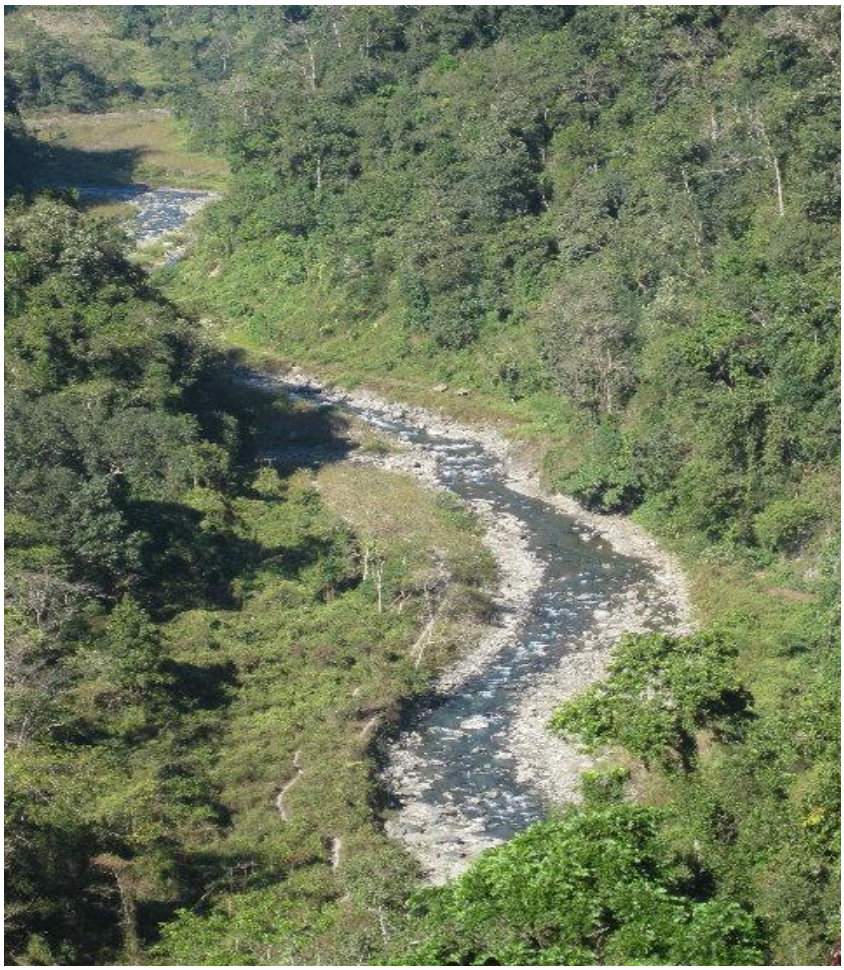
During field research in the winter months of 2010–11, the research team had the opportunity to visit a number of villages in seven gewogs in Samdrup Jongkhar Dzongkhag, and asked villagers both about the tourism potential in their vicinity, and whether there were any trails in particular that would be appropriate for tourists. As in many of the villages, however, villagers in Domphu village, a few kilometres from Dewathang town, were hesitant to suggest trails for tourists. This was the response in many places, largely because of the perceived danger involved due to the presence of elephants.

However, approximately 2 hours walk from Domphu, villagers noted there was a "virgin" forest called Kedung. Ugyen Taujay, the former forest ranger for the area, also talked of this area: "There are elephants, wild buffalos, reindeer, black bears, and Bengal tigers. It is not appropriate for trekking, because it is very far away and also dangerous due to the wild animals." Three or four of the Domphu village men offered to go out and clear the trail and survey it to prepare it for us to try out. They said they needed one week's notice to do so. However, due to time constraints, the research team was not able to follow up on this offer, but recommends that future research into the eco-tourism potential of the region investigate the possibility of a trail into the *Kedung* area, with appropriate safety measures of course.

Another possible trek for tourists, one partially taken by the field researchers, would begin in the town of Dewathang and descend approximately 1 hour to the river *Deu chu* (see photo below). This trail is already well established, as it has been travelled by villagers to and from Orong Gewog (and beyond) for decades to access markets and other villages. Apparently there is also a trail to Pemagatshel and to Trashigang (a 7 hour car ride), and either of these could be used for longer treks. However, for shorter day trekking, the walk from Dewathang to Orong takes in the vicinity of 4 hours in one direction.
Not too far from Dewathang town, there is a well-known route taken by wild elephants, and just above this elephant trail there is a tourist lodge now being built. This would

[356] Department of Forests and Park Services. 2009. *Reconnaissance survey on probable recreational spots in eastern part of Bhutan mainly to create winter visiting venues*. Department of Forests and Park Services, Royal Botanical and Recreational Parks Division, Royal Government of Bhutan. Only hard copy available.

undoubtedly be a major draw for tourists, especially if they were able to watch elephants from a safe distance, without disturbing the elephants' traditional route.



Needless to say, all tourism carries potential threats of cultural and ecological degradation, and dangers of widening inequities, consumerism, waste generation, and other ills. Community-based tourism may therefore well be the model that best suits Samdrup Jongkhar, and that may have the greatest potential to avoid such adverse impacts and to spread tourism benefits equitably among local communities.

River Deu chu, 1-hour walk from Dewathang, on a short, 4-hour day-trek from Dewathang to Orong

The Nabji Trail (Zemthang) in the Jigme Singye Wangchuck National Park (JSWNP) may provide an example of potential eco-tourism development in Samdrup Jongkhar. That project was initiated collaboratively by the Department of Tourism, the Nature Conservation Division (NCD), the Association of Bhutanese Tour Operators (ABTO), and SNV (the Dutch development agency), and has been in operation since 2005. The idea behind "community-based tourism" is that specific activities are developed for each village to generate revenue for that community in a sustainable and equitable way. In this model, the community as a whole is involved in organizing camping sites and cultural programs, and in providing meal service. On a rotating basis, individuals from different villages can also generate income through portering baggage from village to village, or assisting as cooks, kitchen staff, or village guides.

Other activities that generate income for community members in the Nabji Trail development are construction and maintenance work in the JSWNP for campsites, viewpoints, and trails, along with sales of firewood, crafts, vegetables, and other agricultural products. A percentage of the revenue is also presently collected in a "Village Tourism Fund" aimed at generating benefits for those not directly involved in tourism activities, such as children and the elderly. Distribution of this fund will be decided upon by each village. This kind of tourism may be particularly useful during non-farming seasons, to assist villagers in generating additional income, and thereby also to help stem the rural-urban migration tide that is fuelled by higher rates of rural poverty.

Despite this undoubted potential, which is certainly worth investigating in Samdrup Jongkhar, it must also be acknowledged that, unless very carefully developed, eco-tourism may not always be beneficial when full costs are considered. In a 2002 study of effects of eco-tourism in the Seychelles—where, like Bhutan, efforts have been made to attract "high value" tourists—a footprint analysis concluded that:

a) success was based on a significant ecological trade-off because a large ecological hinterland is needed to maintain the system;
b) high value tourists are also characterized by the highest resource use per capita;
c) development of high end resorts and creation of a destination for high end tourism has significantly increased the ecological footprint of the Seychelles;
d) environmental conservation based on funds derived from long-distance tourism is problematic, and can at best be seen as a short-term solution to safeguard threatened ecosystems; and
e) from a global perspective, including generation of greenhouse gas emissions, there are significant environmental impacts to long-distance travel.[357]

Since investigation of eco-tourism potential is still in its infancy in Samdrup Jongkhar and neighbouring dzongkhags, the opportunity exists to give careful consideration to these wider impacts, to avoid errors made elsewhere, and to develop new models that are particularly suitable to the region.

5.4.3 Cultural tourism potential in Samdrup Jongkhar

According to the Tenth FYP, the promotion of cultural industries in addition to cultural tourism is one way to help preserve Bhutan's unique and diverse cultural traditions and further strengthen Bhutan's cultural identity. The number of persons involved professionally in cultural industries in Bhutan (or who have the required skills) is significant by international comparisons, and therefore justifies the creation of a strategy at the national level. Based on various surveys, the most feasible cultural industries are

[357] Gossling, Stefan, Carina Borgstrom Hansson, Oliver Horstmeier, and Stefan Saggel. 2002. "Ecological Footprint Analysis as a tool to assess tourism sustainability". *Ecological Economics*, 43:199-211. Available from http://webs.uvigo.es/maxose/pdf/gossling.pdf

traditional painting, traditional boot-making, sculpturing, traditional architecture, performing arts, and contemporary visual art.[358]

According to the UNDP:

> The United Nations is concerned at the challenge of jobless growth throughout the region. It is particularly important to identify means of economic growth that generates decent jobs and avoids widening income gaps. Inclusive growth and equitable income distribution are prerequisites to sustained economic growth in the process of development. Culture-based creative industries have an important role to play in this regard.
>
> Culture industries are income-generating initiatives based on activities such as handicrafts, textiles, music and dance, oral traditions among others. Because cultural knowledge and skills are prevalent among all Bhutanese, rural and less-educated Bhutanese can participate in cultural industries for sustainable livelihood.[359]

In Samdrup Jongkhar, according to Census statistics, nearly 12% of the population has professional cultural skills, compared to 14% in Bhutan overall. The highest percentage of population with professional cultural skills is found in Bumthang (25%) and the lowest in Chhukha (8%).

Roughly 5.4% of Samdrup Jongkhar's population is engaged in cultural occupations. This is one of the lowest percentages in the country, and compares to 10% in Bhutan overall. This is not entirely surprising given that there is currently virtually no tourism in this part of Bhutan. Bumthang has the highest percentage of population engaged in cultural occupations (21%) and the lowest is in Chhukha (4.6%).[360] Thus, in order for Samdrup Jongkhar to be seen as a cultural destination and as a cultural magnet to bring tourists to the area, intensified efforts may be required to create the appropriate infrastructure for cultural occupations to increase.

According to Gup Dozang (Dewathang), the local people will only benefit from tourism if the tourists actually stay in the area. He says that if tourists simply travel through Samdrup Jongkhar Dzongkhag as a gateway from Guwahati, in order to get to Trashigang and beyond, then the people in Dewathang will not benefit. The only way to attract tourists to Dewathang is to let them know about what it has to offer:

> "We have so many religious, cultural, historical and politically important places, which we have to identify. A century ago, Dewathang was the place where one of

[358] *Bhutan Times*. "Cultural industries can help stave off poverty". http://www.bhutantimes.bt/index.php?option=com_content&task=view&id=1377&Itemid=79

[359] Address by Mr. Nicholas Rosellini, UN Resident Coordinator, at the 2009 Inception Workshop for "The Promotion of Culture-Based Creative Industry for Poverty Reduction and Community Vitalization." http://www.undp.org.bt/The-Promotion-of-Culture-Based-Creative-Industry.htm

[360] *Population and Housing Census Bhutan* (PHCB), 2005.National Statistics Bureau, Office of the Census Commissioner, Royal Government of Bhutan. http://www.nsb.gov.bt/pub/phcb/PHCB2005.pdf

the eminent Duar wars of Trongsa Penlop Jigme Namgyal took place. I think it was in 1865. There is a place just after the coal mining site, where all the enemies have jumped off from the cliff without any reason due to our local deities, so we can take the tourists there. Also, around half way in between Dewathang and Samdrup Jongkhar, a few minutes from the highway, there we can see a bulk of stones left by the enemies which they actually brought to count themselves and it shows how many of them did not return from the war. There we can make a tourist resting spot."

Masked dancers, Tsechu, Samdrup Jongkhar

Painting on the side of a drum, by Rinzin Dorji

The Gup says he is planning on writing a book about the historical significance of the area—information he believes will appeal to tourists coming here.

Field research revealed that in virtually all villages, there are villagers skilled in woodworking, mask-making, painting, and of course, weaving. In one community, Thanchugoenpa, near Bhangtar in Phuntshothang Gewog, there were several excellent painters—with as many as four highly skilled painters identified in this one community. One of these painters even studied at a professional painting school in Thimphu for five years.

Villagers suggested that in order to pass along the skills to the young, these painters could be paid to teach youth traditional painting. There is new construction planned in the area, and local painters could do all the painting work on these buildings.

Rinzin Dorji is an artist and the former principal of the Garpawoong Middle Secondary School in Dewathang.[361] His father was a highly skilled traditional artist, and Rinzin Dorji's own hand-carved and hand painted furniture, musical instruments, and masks adorned his home next to the school until he was recently transferred to Trashigang Dzongkhag. All his paintings are made with watercolours and then covered with a lacquer. He uses white glue tinted with paint to make the raised lines in his paintings. His Manjusri (Jambayang) depiction still presides over the school courtyard that is used for assemblies, and he ran an after school art class for the students who were interested. Two of his art students have gone on to paint professionally. People like Rinzin Dorji would be wonderful mentors for the youth in the area, to carry on the Bhutanese craft traditions.

The Chökyi Gyatso Institute for Buddhist Studies in Dewathang would also be a draw for tourists who are interested in the culture and dominant religion of Bhutan. Short courses in meditation, Buddhist teachings, and perhaps even yoga could be organized at the

[361] At the time of writing, Rinzin Dorji was being transferred to a school in Kanglung, in Trashigang Dzongkhag.

monastery. Also, tourists might be interested in the monastery's splendid architecture, carvings, sculptures, and paintings. At the time of writing, the monastery itself as well as guest houses and monks' quarters were still undergoing construction, all of which is expected to be complete by the end of 2013.

Chökyi Gyatsto Institute for Buddhist Studies, founded by Dzongsar Jamyang Khyentse Rinpoche, Dewathang, Samdrup Jongkhar Dzongkhag. Photo taken during the SJI Launch in December 2010.

5.4.4 Draft Ideas for SJI Cultural-Eco-Tourism Development

Just to experiment with the potential for cultural and ecological tourism in Samdrup Jongkhar, using the resources of the Chokyi Gyatso Institute and the Samdrup Jongkhar Initiative itself, the SJI in the fall of 2011 drew up a mock tourism 'teaser' and outline of a possible 2–3 week tourism package. This was done purely to generate discussion within the Samdrup Jongkhar Initiative team and beyond, with much more in-depth and detailed investigation required before any such plan is ready for implementation.

One explanatory note is needed here for contextual purposes: Early discussions on this subject leaned towards an initial application process, so that tourists would actually be screened before being accepted—quite an unusual approach to tourism. This was thought

necessary in the early stages of development to ensure that the first small batches of cultural tourists are sensitive, well-informed, motivated, and likely to be highly respectful of the local culture. These discussion documents, developed by Ella Milligan for the SJI, are reproduced below for illustrative purposes.

'Teaser' working title: Transformation through Genuine Development

As global markets teeter and the environment is increasingly threatened, creative and intelligent strategies are being developed and implemented that are based on cooperation, sustainability, and self-sufficiency. Those looking to explore local solutions for global problems are invited to apply for an educational and inspirational journey to the Kingdom of Bhutan that is based on genuine development from the inside out.

The first week of the visit will be spent building an inner foundation intended to cultivate and strengthen your own spiritual path. Participants will live at a Buddhist monastery and institute for advanced Buddhist studies in which they will learn about the philosophy and practice of a significant wisdom tradition that has the power to transform lives and the world.

The second week moves from the inner to the outer. Participants will stay in village homes where the focus will be towards joining spiritual understanding with principle, practice, and effective action. Participants will witness the Samdrup Jongkhar's transition to organic farming, appropriate use of technology, and more.

Finally for the tough and hardy, there is an optional six-day trek to sacred sites whose goal is the journey itself. You will go deep into old-growth forests, pass through remote Bhutanese villages, and visit holy sites that few outsiders have ever seen. This last week will be a raw experience untouched by modern influences—an opportunity that is rare in a world overcome by materialism.

Detailed Outline: 2–3 Week Package (3rd week optional):

Week One: Cultural Tourism

Arrival at Guwahati Airport, Assam, then 4 hours overland to Dewathang in Samdrup Jongkhar, Bhutan. Stay for one week at the Chokyi Gyatso Institute for Advanced Buddhist Studies in Dewathang, where visitors experience monastery and shedra life in a remote part of south-eastern Bhutan: —They rise at 5am with the monks, eat with the monks, share their food, receive genuine instruction in Buddhist philosophy (geared to beginners) from some of the learned khenpos and loppons there; learn and practice basic meditation; are introduced to the 'secret' symbolism in the thangkas, etc.

In short, the first week is an introduction to the INNER world of Buddhist mind training, compassion, wisdom, and understanding that motivates the Samdrup Jongkhar Initiative.

Week Two: Gross National Happiness in Action: The SJI

In the second week, we go from the inner to the outer, societal manifestation of Gross National Happiness in action. The visitors now stay in Samdrup Jongkhar villages—in home stays. We will ensure clean, safe surroundings as participants live and share lives with local villagers. We'll have translators.

Visitors will witness and learn about the SJI's transition to organic agriculture, zero waste, equitable improvement of living standards, the application of appropriate technologies, formation of organic farm and craft cooperatives, and more. They will also learn about the huge challenges facing the SJI, like a massive rural-urban migration tide among youth, for example. In short, participants will witness the SJI making every effort—in the face of major challenges and an increasing globalized world—to "build an enlightened society" that is more locally self-reliant, self-sustaining, self-governing, and sustainable.

Could this be a model for other developing nations and more broadly for a materialist world that has so lost its way that it is on the brink of self-destruction? In other words, the big questions will be raised from the visitors' practical on-the-ground experience. We will also not shy away from key controversial issues and debate on alternative views of development, so there will be ample opportunity for discussion, questioning, and contemplation.

This week will also have an eco-tourist quality, as visitors learn about the abundant flora, medicinal plants, fauna, and wildlife in the region (including wild elephants that wreak havoc on farmers' fields in the area).

Week Three: Optional — Pilgrimage/Trekking

Those happy with just the first two weeks would return to Guwahati for the trip home. Hardy souls willing to walk some distances from the nearest road-heads would be taken in Week Three to very sacred Bhutanese pilgrimage sites that foreigners never visit—including places where Guru Rinpoche (Padmasambhava) meditated.

Aside from the sheer physicality of this week, and the unspoiled beauty of nature—old-growth forests, waterfalls, spectacular views, and sleeping out in the open—this pilgrimage experience will tap into the deep cultural-symbolic roots of the region's ancient wisdom traditions. This week is for the more intrepid and daring—maybe not everyone!

A Different Kind of Tourism:

In sum, this type of tourism is not for everyone. But there ***is*** a growing group of tourists who are heartily tired of moving from one look-alike Hilton to the next, be it in Kolkata or Paris, and who want to come back from their holiday enriched, expanded, and deepened in knowledge and understanding.

This type of experience is intended to be life-changing, to lead visitors to ask real questions about their own culture and lives, to talk, discuss, contemplate, interact, observe, and experience!

Considerations in further investigation:

This kind of tourism also goes where other tourists have not been, and so it has to be handled with extraordinary care and sensitivity. We do not want to be a cause for undermining the wealth of local culture or unspoiled natural beauty. This kind of tourism will need to fit into and fully respect the local culture, traditions, and natural world, and certainly not create materialist temptations and expectations that will create discontent. On the contrary, such tourism should foster pride in the rich local assets and wisdom traditions of the region.

Another key consideration is equity, and, therefore, the financial structure of this form of tourism. The SJI does not want a few entrepreneurs to get rich from this. So we need to think of forming local cooperatives to ensure that benefits from this tourism are equitably brought back to the local communities.

All this will require research and careful planning over the course of at least a year, leading to practical and concrete recommendations. Then SJI will need to pilot and test this new cultural and ecological tourism in Samdrup Jongkhar in a small-scale way to assess impacts and to learn from experience. Most important, at this very sensitive preliminary planning stage, is to ensure that this new way of approaching tourism not be misused or exploited for material gain. The beneficiaries must be local communities and the natural world as well as the visitors.

PART 2

But we must not forget that those human solutions that we call organic are not natural. We are talking about organic artifacts, organic only by imitation or analogy. Our ability to make such artifacts depends on virtues that are specifically human: accurate memory, observation, insight, imagination, inventiveness, reverence, devotion, fidelity, and restraint. Restraint—for us, now—above all is the ability to live within limits; to resist changes that are merely novel or fashionable; to resist greed and pride; to resist the temptation to 'solve' problems by ignoring them, accepting them as trade-offs, or bequeathing them to posterity. A good solution, then, must be in harmony with good character, cultural value, and moral law.

—Wendell Berry[362]

[362] Chapter 9 in *The Gift of Good Land: Further Essays Cultural & Agricultural.* North Point Press, 1981. Originally published in the Rodale Press periodical *The New Farm*.

Chapter 6. Models

> *The seed of transformation emerges through relationships and through shared dreams, that flow through the awareness of abundance and the appreciation of the power of each one here and now, and they manifest in collective action that nourishes a better world with beauty, joy and pleasure.*
>
> —"Philosophy of Transformation," Instituto ELOS, Brazil[363]

> *The question is not the traditional versus the modern, but the right of free peoples to choose the components of their lives. The point is not to deny access, but rather to ensure that all peoples are able to benefit from the genius of modernity on their own terms, and without that engagement demanding the death of their ethnicity.*
>
> —Wade Davis.[364]

The foundations of social and environmental change are grounded in people's personal, everyday lives—this change is happening every day on a human scale. Developmental change, therefore, does not have to wait for top-down decisions, but can be realised through individual relationships and effective grassroots organising.

Since the Samdrup Jongkhar Initiative is a civil society organisation, any model employed to realise the visions of the Samdrup Jongkhar Initiative must therefore work on this human scale, honouring the relationships involved in positive community transformation, and demonstrating the power behind people finding solutions to their own problems. As a civil society organisation, the Samdrup Jongkhar Initiative has the unique opportunity to cultivate the beginnings of grassroots change, by drawing on the unique, traditional culture of the region and of the country, as well as by pushing the edges of that culture out into new historical frontiers.

The sample selection of models presented here is by no means complete but merely illustrative. There is no shortage of models — local, national, and international — relevant to the development aspirations of Samdrup Jongkhar. The following were selected as a very tiny beginning sample, in what hopefully will be an ongoing search for good examples worldwide of what we could be doing, and from which we can learn.

In the limited time available for our search, we do not claim that the samples that follow are even the best available or most applicable examples. But because holistic GNH-based development that seeks to join ecological, social, and economic objectives and benefits is quite unconventional by standard growth-based development standards, the working

---

[363] Instituto Elos Brasil. *ELOS Methodology*. n.d. http://awakeningplace.files.wordpress.com/2011/03/oc3a1sis-traning_english_-rede.pdf.

[364] Davis, Wade. 2009. *The Wayfinders. Why Ancient Wisdom Matters in the Modern World*. Anansi Press. Toronto, p. 193.

models we have chosen here are also very unconventional, simply to demonstrate that Samdrup Jongkhar and Bhutan are not alone in seeking a viable alternative to the current development norm. Time and space limitations did not permit a proper explication of each model, but websites for each are provided for readers to obtain fuller and more detailed information on models of potential interest.

We also wish to acknowledge frankly that, of all sections in this report, this chapter is our weakest and least satisfactory. Given time and resource constraints, the researchers chose to focus on developing as comprehensive a profile of Samdrup Jongkhar Dzongkhag as possible, drawing on both published data from a wide range of agencies and unpublished micro-data files from the National Statistics Bureau, as well as on field research and village interviews in seven of the eleven gewogs in the dzongkhag.

This chapter, contributed by one of our junior research assistants, was added rather quickly simply to illustrate that, in charting its innovative path forward, the Samdrup Jongkhar Initiative does not need to "reinvent the wheel," and can learn creatively from the experience and also errors of others worldwide who share the SJI's holistic, ecological, and people-oriented vision of development. This entire profile is intended to provide the evidence base and present 'ground reality' for forward movement. That primary purpose is served by careful study of the evidence presented to this point—i.e. through Chapter 5. This chapter and the next are added only to provide a transition to possible 'next steps,' which would include a more detailed investigation of existing best practices than can be provided here.

A few notes on the models presented this chapter:

- *They do not imply a hierarchical ordering*: These models will be most valuable if approached as inspirations rather than as external prescriptions that are necessarily better than local practices. The models, in other words, are presented with the intention of fostering creative energy, and should not be taken as implying that existing local initiatives as lacking or deficient.

- *Despite the use of the term 'development', the models presented here do not operate on a linear progress trajectory*: The models highlight positive developmental projects and practices, which have emerged out of individual sectors of a whole society. They do not assume that all development equals progress, nor that "developed" countries and societies are superior to those countries deemed "developing."

- *They focus on the translocal*: The term translocal is used here over "international" or "global" because it more accurately describes projects that are connected and networked around the world but which, significantly, are grounded in specific geographic and cultural space.

- *The models should not be uncritically adopted*: This chapter offers the opportunity for participatory deliberation on the models among people taking up

efforts for grassroots developmental change in Samdrup Jongkhar. They should spark discussion and debate about their applicability.

The chapter is organized into four sections corresponding to the four initial programs of the initiative: zero waste, appropriate technologies, organic agriculture, and youth. Each section is further subdivided into organisational models, model strategies/ methods/methodologies, and new innovations and applications. These subdivisions enable a presentation with a broad scope and variety of applicable resources. Organisations, for example, can serve as potential resources by functioning through partnerships, advisors, or trainers. Individual projects can serve as inspirations for SJI projects as well as potential networking opportunities, and methods and methodologies can offer a means by which SJI may grow in new directions.

Each section seeks to highlight both examples of successful projects, as well as examples of what hasn't worked or did not lead to overall positive developmental change. Within this framework each model has been selected based on its ability to function within the structure of a civil society organisation, and care has been taken to focus on models from the global South.

6.1 Zero Waste

> *Why does a material become a waste? It does so, because of various factors—wrong material use, bad and inefficient designs, and thoughtless, unethical practices, all of which then infiltrate the culture. The solution to the growing menace of waste begins with the principles of Zero Waste—one of the most profound ways that modern societal change is being envisaged in the world today.*
>
> *These principles are based on ethics, economy and efficiency.... Zero Waste is a total systems approach that goes beyond just segregate-reuse-reduce-recycling.... Zero waste is a simple goal with far reaching implications. It questions the view of nature as an endless source of materials and an endless dumping ground for waste.*
>
> *Zero Waste is hence a logical planning approach incorporating principles of effective human and material resource utilization to avoid the inefficient conversion of discards into waste in a manner that revitalizes the local economy.*
>
> —Thanal[365]

Global discourse around zero waste is a vibrant field wherein the wealthy and the poor, elite politicians and wastepickers alike, are contesting and renegotiating what it means to consume and be a consumer. Unlike other concepts, which are used so frequently as to have lost their meaning (such as the word 'sustainability,'), the term 'zero waste' is

365 Thanal. "Zero Waste", Thanal, 2010; available from www.thanal.co.in/index.php?option=com_content&view=article&id=23&Itemid=86.

producing lively discussions not only about good waste management practices but also about the very habits of consumption and about restructuring wasteful and inequitable social systems. In a world where plastic has made its way even to some of the most remote places in the world—such as villages in Samdrup Jongkhar that are not accessible by road—these conversations are more important than ever.

As Bhutan modernises rapidly, waste has already emerged as a developmental setback that has not come with easy solutions. In most villages around the world, the concept of waste did not even exist until the present so-called 'modern' era. History demonstrates that human needs can be effectively met and contained within systems set up as closed loops, where waste gets reintegrated into a regenerative cycle of resource. In most parts of Bhutan, the concept of waste has only recently emerged and is in many ways still in a very early developmental stage. As such, strategies for implementing a model of zero waste in Bhutan will still largely be preventative.

While many individuals in Samdrup Jongkhar may not currently be practicing a zero waste life style, most contemporary Bhutanese families and communities do collectively have the traditional wisdom of zero waste living. Thus, rather than importing zero waste models (especially from developed countries) into Bhutan, it is more appropriate to identify and revisit the ways in which Bhutanese culture was, only a few generations ago, a zero waste model itself. As Bhutanese people make decisions about the ways in which they wish to develop, an outlook informed by the best aspects of ancestral wisdom and best practices of an environmentally minded citizenry will be crucial to the vitality of the region's ecology.

6.1.1 Organisations

Deer Park, a fellow project of Dzongsar Jamyang Khyentse Rinpoche (founder of the Samdrup Jongkhar Initiative) and a member of Siddhartha's Intent, is an Institute that seeks to "re-create the spirit of Nalanda, a great university of ancient India in which all traditions of Buddhism were studied and practiced, alongside other schools of classical Indian philosophy, arts and sciences."[366]

In the fall of 2010, Deer Park hosted the Zero Waste for Zero Warming Himalayas Conference. Some of the outcomes of the conference included the drafting of "the 'Bir Declaration on Zero Waste Himalayas,' where the groups decided to work together for a Zero Waste Himalaya through concerted actions and setting up pilot projects in India, Nepal and Bhutan. It further decided to observe 8th August as 'Zero Waste Himalaya Day.'"[367]

---

[366] Deer Park. *Welcome to Deer Park Institute: The Spirit of Nalanda Continues*, Deer Park, 2010; available from www.deerpark.in.

[367] GAIA. "Find Spiritual Treasures, Not Trash: Groups from Himalaya Urge for Zero Waste for Zero Warming", Global Alliance for Incinerator Alternatives, 2010; available from: http://www.no-burn.org/find-spiritual-treasures-not-trash-groups-from-himalaya-urge-for-zero-waste-for-zero-warming.

Prashant Varma, Director of Deer Park, attended the Samdrup Jongkhar Initiative Launch in December 2010, and has pledged Deer Park's continuing support of and collaboration on future zero waste projects taken on by the SJI team.

Thanal is an organisation based in Kerala, India, and one of the leading zero waste organisations in South Asia. In collaboration with Deer Park, Thanal helped organise the Zero Waste for Zero Warming Himalayas Conference, and sent organisation founders Jayakumar Chelaton and Dr. Shibu Nair to the SJI Launch in December 2010 to give presentations and facilitate Zero Waste day.

As cited on the Thanal website, some of Thanal's programs include:

- "Campaigning and lobbying: Thanal is active in promoting Zero Waste as a solution to current issues of waste. As part of the campaign, we organize training and leadership programmes for students, volunteers, teachers, officials, elected representatives and public.
- Technical support and consultancy: We provide technical support and consultancy for private and government institutions, local self governments, Government and non governmental agencies in setting up training, planning, and setting up of discard handling systems etc. We also provide resource persons and faculties for Government and Non Government training institutions.
- Research: We do action research, case studies and fact finding on matters concerned with waste and zero waste, on our own and in support of other organizations.
- Networking: To promote Zero Waste and to build capacity in communities to establish zero waste systems, we do networking with individuals, experts and organizations for exchanging experiences and information."[368]

IZWA, The Institute for Zero Waste, Africa, is a South African organisation which is pioneering zero waste projects locally and sharing them globally. IZWA's vision for a zero waste world includes:

> redesign[ing] products and methods of production to eliminate waste by mimicking natural processes and developing closed-loops, convert[ing] waste to resources for the benefits of local production and the creation of a healthy and sustainable society, resist[ing] incineration and land filling in order to promote innovation in resource conservation and methods of production, [and] collaborat[ing] with others with common interests worldwide.[369]

One reason IZWA stands out as a model zero waste organisation is its integration of closed-loop food systems as integral to the zero waste concept.

---

[368] Thanal. "Zero Waste", Thanal, 2010; available from www.thanal.co.in/index.php?option=com_content&view=article&id=23&Itemid=86.

[369] Institute for Zero Waste Africa. "About IZWA", IZWA, 2009; available from: http://www.izwa.org.za/index.html.

Some of IZWA's projects, as cited on the IZWA website, include:

- Cato Manor Project: "IZWA designed and introduced the concept of Zero Waste Multiculture into the urban context. This is a system that uses all the local resources in food production – sewage to a biodigester to provide fuel and treat the sewage; to algae production for biodiesel and animal feed; to fish farming, organic vegetables, mushrooms, chickens and a Food Forest—a holistic and integrated system. There are two sites in Cato Manor."[370]

- National Zero Waste Training: IZWA was approached by South Africa's national Department of Environmental Affairs and Tourism to conduct trainings in four cities: Durban, Johannesburg, Cape Town, and East London.

- eThekwini Fresh Produce Market: "IZWA carried out research and produced a report on how the fresh produce market could reduce waste, and divert almost 100% of the waste away from landfill."

- Marikana: "IZWA developed a Zero Waste intervention for proposed community housing in Marikana."

- Saneri Centre for Civil Society (CSS) Project: "IZWA and the Centre for Civil Society (UKZN), formed a partnership in a project funded by the South African National Renewable Energy Initiative. This involved looking at electricity tariffs, and perverse subsidies; low cost energy appliances for the poor; a biodiesel from algae project with the Durban University of Technology and the city of Durban and research into the Polluter Pays principle."[371]

6.1.2 Strategies

Wastepicker Cooperatives:
Wastepickers provide vital services to cities. As informal waste collectors, they collect, sort, recycle and sell the leftover waste neglected by municipal waste collection systems. The benefits provided by this informal sector are many, especially in places that would otherwise be incapable of supporting segregation and recycling centres. One wastepicker cooperative in India reports that:

> Methane is an extremely powerful greenhouse gas emitted from dumpsites by organic (wet) waste decomposing under uncontrolled conditions. Wastepickers in these cities have solved the methane problem by setting up composting and biogas systems. Since organic/wet waste is the largest component of municipal waste, this also drastically reduces the cost of waste management to the municipality.[372]

[370] Ibid.
[371] Ibid.
[372] GDA (Global Day of Action) Latest News. "INDIA: Wastepickers Offer a Solution to Climate Change – Decry Waste-to-Energy and Privatisation". 30 November 2010. Global Alliance for Incinerator

As organic waste makes up nearly 60% of the waste stream in Samdrup Jongkhar, this model could be highly appropriate for this region.

WIEGO (Women in Informal Employment Globalizing and Organizing) is one of the leading international organisations supporting wastepickers by helping them organise into cooperatives and unions so that they may collectively make demands for more dignified, safe and secure work conditions and better living standards. In India, a network called The Alliance of Indian Wastepickers has been formed. This is a national alliance of 33 organisations working with wastepickers and itinerant buyers towards securing their right to livelihood and inclusion in mainstream waste management systems. As many comments in the SJI Launch breakout groups mentioned nurturing a stronger sense of 'dignity of labour' in Samdrup Jongkhar, this example from neighbouring India shows how such dignity can potentially be advanced through effective organisational efforts.

Organisational Efforts through Transnational Advocacy Networks (TANs):
Local Samdrup Jongkhar initiatives can also gain strength by joining existing relevant large organisations that already function on a global scale. Such organisations often have smaller chapters in local areas where people are implementing a global campaign within specific communities.

One example of an organisation of this scale working on the issue of zero waste is *GAIA: The Global Anti-Incinerator Alliance/The Global Alliance for Incinerator Alternatives*. GAIA designed the Zero Waste for Zero Warming campaign, which was the theme of the Deer Park conference referenced above. According to GAIA, this campaign "is strengthening community-driven movements that challenge the wasting and warming cycle, and fighting to make sure that not another dime of our taxpayer money goes to trashing the climate."[373]

In the Asia-Pacific region, GAIA reports, "the more than 200 regional GAIA members from 20 countries in this region face a whole gamut of public health, environmental justice and sustainability issues, and our members work on problems related to municipal solid waste, healthcare waste and toxic and hazardous waste, including electronic waste."[374]

One major benefit of joining or otherwise networking with TANs is the resources and international support they can provide to local initiatives, from providing reports and fact sheets to educate and mobilise local communities , to actual hands-on support in implementing a particular campaign at the local level. An emerging zero waste initiative

---

Alternatives.
http://gaia10.org/v1/index.php?option=com_content&view=category&layout=blog&id=51&Itemid=427&limitstart=8.

[373] GAIA. *Asia-Pacific*, Global Alliance for Incinerator Alternatives, 2010; available at: http://www.no-burn.org/section.php?id=79.

[374] Ibid

in Samdrup Jongkhar might therefore consider joining or collaborating with a reputable international umbrella group in the field like GAIA.

Zero Waste Legislation:
Many nations, states, cities, towns, and other communities are working towards implementing zero waste initiatives through lobbying for zero waste legislation. Every government that has ever passed a zero waste law has been influenced to do so by non-governmental organisations (NGOs), lobbyists, civil society organisations (CSOs), and concerned citizens. As Bhutan is a very new democracy, such a strategy may not take off easily in Samdrup Jongkhar. On the other hand, as one of the first grassroots CSOs in the country, the Samdrup Jongkhar Initiative could potentially pioneer the use of lobbying as a strategy not only for implementing zero waste policies, but also as a model of participatory democracy.

The tactic of lobbying has several shortfalls, however, and is most efficient if paired with other tactics and strategies. Thus lobbying often turns attention away from community action, and focuses attention on seeking external solutions to a problem. While there are many benefits that come with working to pass laws, experience elsewhere in the world demonstrates that it is critical that the grassroots work involving community relationships and generative actions does not get compromised in the process.

6.1.3 Innovations

Upcycling: Like recycling, upcyling concerns itself with removing items from the waste stream, but instead altering them in such a way that the items are given a new life. This is in contrast to recycled material which, after going through several different phases of life, often gets *downcycled*—i.e. it loses its original properties and breaks down, eventually making its way to a dump. Upcycling seeks to ensure that as products are re-used, their value and quality increase rather than decrease.

Upcycling can be found in contemporary cultures across the world, infiltrating crafting and do-it-yourself cultures all the way up to corporations such as Nike. Upcycling can be as simple as making arts and crafts out of household waste, and can be as complex as redesigning products so that they may be easily disassembled and turned into something else at the end of their lives.

Bhutan is no exception to this culture of waste reclamation. **VAST** (Voluntary Artists' Studio, Thimphu) is an organization that aims to provide "an opportunity to the Bhutanese youth to participate and develop their potential talents as well as share social responsibilities through artistic explorations and other socially useful and productive work."[375] The Young Zoom on Garbage art festival, which VAST hosted throughout 2009–2010, was a culmination of a year-long project inviting youth to think about and collect garbage to upcycle into art displayed at the festival. The festival also included exhibitions and demonstrations of various zero waste practices.

[375] Volunteer Artists' Studio, Thimphu. "What is VAST", VAST, 2009; available at: http://www.vast-bhutan.org/what-is-vast/.

Humanure and Composting Toilets: While not exactly a "new technology," composting toilets are one way people around the world have closed the loop of human waste and returned previously wasted nutrients back to the soil. Joseph Jenkins, author of *The Humanure Handbook*, explains that "humanure, unlike human waste, is not waste at all—it is an organic resource material rich in soil nutrients. Humanure originated from the soil and can be quite readily returned to the soil, especially if converted to humus through the composting process."[376]

Shifting from the common local practice of pit toilets to composting toilets is a small leap and involves very little work. In a pit toilet, "raw feces fall into a hole several feet deep in the ground and are not mixed with carbon. Because leachate from the feces does not pass through the most biologically active layer of soil, potential pathogens could find their way into groundwater."[377] By constrast, a composting toilet is set above the ground, and feces are mixed with carbonaceous materials (such as dry leaves or branches). When a composting toilet is filled, it is covered in more carbon-rich materials and allowed to rest undisturbed for a period of one year, after which it can be added to the soil. However, the first batch of compost in the humanure compost system will take approximately two years to complete before it can be used.

6.2 Appropriate Technologies

> *Appropriate technology is not about defining a particular technology as appropriate for all situations, but about principles for choosing the best technology for a given situation.*
>
> —Appropedia[378]

6.2.1 Introduction

The term *appropriate technology* refers to a wide range of ecologically-friendly and generally low-cost technical and socio-technical solutions which are compatible with the social, cultural, environmental, and economic conditions of the people they serve. In practice, the focus is usually, though not exclusively, on rural and agricultural populations, primarily because mainstream technological solutions are more likely to be out of reach financially, or otherwise impractical for them.

Technologies that are considered 'appropriate' generally embody the following characteristics: they do not create dependency, they maintain local control, they are easily maintained and repaired locally, they are environmentally benign and low-cost, and they cause little cultural disruption. It is important to note that whether or not a given

[376] Jenkins, Joseph C. 2005. *The Humanure Handbook: A Guide to Composting Human Manure*. Joseph Jenkins. Grove City, p. 8. http://humanurehandbook.com/manual.html.
[377] Kellogg, Scott T., Stacey Pettigrew. 2008. *Toolbox for Sustainable City Living*. South End Press. Cambridge.
[378] Appropedia; available from: http://www.appropedia.org/Portal:Appropriate_technology

technology could be considered appropriate depends heavily on the cultural, economic, social, and geographic context. Technologies which make sense in one area may be completely inappropriate in a different region or culture, so a thorough understanding of the local context is important.

Examples of technologies that have been proposed as potentially appropriate for Samdrup Jongkhar, and which require further exploration and investigation to assess appropriateness, feasibility, and capacity to contribute to local livelihoods and environmental conservation include:

- solar drying of fruits, vegetables, and herbs,
- wildlife deterrent devices,
- rainwater harvesting systems,
- solar powered water pumping systems to pump monsoon-stored water for year-round irrigation
- food storage and processing equipment,
- composting and biogas units, compost toilets, and other zero waste solutions,
- natural bamboo curing and preserving to support bamboo-based crafts industries,
- mud brick fabrication systems,
- natural cosmetic and soap-making equipment using local soap berries,
- processing devices for locally available medicinal herbs and other non-wood forest products,
- organic farming aids,
- hand-held citizen driven air quality monitoring devices (apparently available in India)

The new Centre for Appropriate Technology (CAT), as proposed by the Samdrup Jongkhar Initiative, became part of the existing JNP campus in the fall of 2011. In December 2011, the CAT successfully completed its first project in collaboration with SJI—the development and effective testing of prototype solar driers, which will now be widely disseminated in remote Lauri gewog.

The broad purpose of the CAT is to improve living standards in Samdrup Jongkhar Dzongkhag through the thorough analysis of challenges facing rural and agricultural communities and through the implementation of technical and/or social solutions which address them. As proposed, the centre would conduct research on an on-going basis to maintain a detailed knowledge base of key current practices, problems, and trends in the area, as well as of solutions that have been tried successfully elsewhere.

The Centre will also promote technology transfer and best-practice dissemination where appropriate, and act as a resource for rural communities, providing training sessions, advice, and support for new technologies, agricultural practices, and agro-enterprises. The Centre would also provide courses for students at JNP that would allow students to learn about and become involved in addressing problems facing rural and agricultural communities in Bhutan. In December 2011, a draft curriculum for JNP's first appropriate

technology course was reviewed and approved by faculty, and the first such dedicated appropriate technology course will be offered as an elective in 2013.[379]

6.2.2 Organisations

Engineers Without Borders is an international organisation with many chapters throughout the world. EWB International envisions "a world where ALL people have access to the knowledge and resources with which to meet their basic human needs and rise out of poverty."[380] The organisation works on grassroots projects solely through local chapters, including in Asian chapters in India and Nepal.

Projects designed and implemented by local and national EWB members are structured around common values: positive community change, grassroots and local decision making, local and global partnerships, sustainability in their projects, education that nurtures problem solving, and strong ethics grounded in human dignity.[381]

Projects from EWB-India include:

- The Briquettes Project: low emissions alternative cooking fuels made from agricultural and domestic waste.
- Solar Powered Pumping System: pumps water stored during monsoon for year round irrigation through solar technology.[382] Such technology would be highly applicable to Samdrup Jongkhar conditions and needs, and could potentially extend the growing season into the dry winter months when there are often severe water shortages. This has been identified as a potential project for the new Centre for Appropriate Technology at JNP, and could potentially be implemented with assistance from the EWB-India chapter that has already worked successfully in this field.

Projects from EWB-Nepal include:

- Lele (Shikharpa) School Building Project: built mostly for the children of families working at a nearby stone crushing site, the school is designed to be low cost and energy efficient.
- Siddhipur Village Project: transforming a pond, which as previously used as a garbage dumping ground into a Shanti Pokhari (Peace Pond) and community space, raising awareness about hygiene.[383]

---

[379] Introduction provided by Luke Raftis, and is from the Centre for Appropriate Technology Concept Paper, March 2011.
[380] Engineers Without Borders International, "About EWBI", EWBI, 2011; available from: www.ewb-international.org/about.htm.
[381] Ibid.
[382] Engineers Without Borders, India. "Projects", EWB-India, 2011; available from: http://ewb-india.org/node/45.
[383] Engineers Without Borders, Nepal. "Projects", EWB-Nepal, 2004; available from: www.ewb-nepal.org/.

Appropedia: "An encyclopedia incorporating elements of general encyclopedias, original research, specialized volumes, and field studies,"[384] Appropedia is an online database and community resource, which encourages the open source sharing of technical knowledge.

Appropedia's mission is to "provide the living resource library of individuals and organizations working towards a sustainable, healthier future, so that efforts can be spent evolving instead of duplicating past efforts."[385] As a database, the project seeks to compile information that is useful, honest, accurate, verifiable, and contextualised. It seeks to disseminate applied knowledge for service learning.

Appropedia's articles are organised into the following groups: Appropriate Technologies, Green Living, Food/Agriculture, Construction, Energy, Health/Safety, Transport, and Water. Within these categories there are pages which provide technical definitions, explain new technologies, and offer discussions.

The Appropriate Technologies portal offers pages based on a variety of different technologies related to issues including thermal mass, passive solar, water supply, and sanitation, and there are some pages devoted to informational resources, including appropriate technology organisations and events. A work in progress, this website has much to offer and many opportunities to continue growing.

Other online databases and resources in the appropriate technology field include: Approvideo; Humanitarian Engineers Registry; Howtopedia; Demotech; Gampinder; and Village Earth.

Practical Action is an international organisation, which works in over 100 sites worldwide to fight poverty through the use of small-scale, appropriate technologies. It works in the areas of energy, water and sanitation, food and agriculture, disaster reduction, climate change, shelter and urban poverty alleviation, transport, and ICTs (information and communication technologies). Practical Action has a strong presence in South East Asia, working primarily in Nepal and also in India, Bangladesh, Pakistan, and Afghanistan.

Practical Action organises with governmental, non-governmental, and private sector actors through four key areas:

- reducing vulnerability
- making markets work
- promoting infrastructure for the poor
- responding to new technologies.[386]

---

[384] Appropedia. *Vision and Mission*, Appropedia, 2011; available from: www.appropedia.org/Appropedia:Vision_and_mission.
[385] Ibid.
[386] Practical Action. "About Us", Practical Action International, 2010; available from: http://practicalaction.org/about-us

Practical Action Nepal has been working on appropriate technology projects since 1979. The vision of its New Technologies program is "a world where science-led new technologies deliver products which fulfill human needs rather than consumer wants."[387] Some of their current campaigns include:

- Aerial Ropeways: "In the mountainous regions, road-building is expensive. An affordable alternative is an electrically-powered aerial ropeway, to transport goods up the hillside."
- Bicycle Ambulances: "For remote communities in the plains, a bicycle ambulance provides a vital lifeline, enabling them to get the sick to medical centres quickly and in comfort."

6.2.3 Strategies

Around the world, **Centres for Appropriate Technologies** are being developed as incubators for local, sustainable technologies and supporting communities interested in using such technologies as a means to develop. Many centres around the world offer a wide range of services, including technical advice, project management, skills development, integrated services, product design, community engagement, and communications.

The Centre for Appropriate Technology (Australia) is a national organisation, which has been serving Indigenous peoples in Australia since 1980. As a well-established organisation, the CAT uses effective partnerships with government, non-governmental, and private actors "to support remote communities' livelihood and development aspirations through sustainable and appropriate technologies and foster connectedness of communities with each other and with wider economic and social networks."[388]

Its scale and historical precedence makes this Australian Centre a potential model for the Samdrup Jongkhar Initiative as it works with the Jigme Namgyel Polytechnic in establishing a structure, programs, and projects for the new Centre for Appropriate Technology in Dewathang.

One aspect of Australia's Centre for Appropriate Technology—and ideally for all such technology transfers—is its effort to question and explore the relationship between the givers and the recipients. By identifying any inequalities between the two actors, the Australian Centre seeks to ensure that those inequalities are not unintentionally exacerbated by a one-sided knowledge transfer.

The *Centre for Appropriate Rural Technologies (CART)* in Mysore, India was started by the National Institute of Engineering. Its primary activities are "to collect all the available information on rural technologies, compile them to form a resource center and find

[387] Practical Action, Nepal. *Responding to New Technologies*, Practical Action, 2010; available from: http://practicalaction.org/new-technologies/programme_aim4.
[388] Centre for Appropriate Technology, Australia. http://www.icat.org.au/

methods to disseminate them to various people needing technological assistance."[389] While CART does not work to implement the technologies, it partners with other people and organisations to realise projects on the ground. CART does, however, serve as an on-the-ground resource centre and demonstration centre.

As described on its website, "CART was started in 1991 as a project, it evolved into a department and today it stands as an independent center yet being attached to the National Institute of Engineering at Mysore, India."[390] Because of its relationship to a university centre, CART may also be a useful model for the SJI and for the new JNP Centre for Appropriate Technology, illustrating how a centre may effectively be organised and function through a relationship with a university.

Cradle to Cradle Design, popularised by the book *Cradle To Cradle* by William McDonough and Michael Braungart, is at the forefront of the environmental and technological movements that seek to push towards "the next worldwide industrial revolution." The cradle to cradle approach differs from many other appropriate technology models, which are often implemented on an ad hoc basis to suit particular conditions and circumstances, in that it is a systems-based approach which looks at the life span not just of a particular piece of technology but of the materials that make up that technology.

There are three principles behind the Cradle To Cradle philosophy:

- *Waste equals food:* "All materials can be designed as nutrients that flow through natural or designed metabolisms. While nature's nutrient cycles comprise the biological metabolism, the technical metabolism is designed to mirror them."

- *Use current solar income*: "Living things strive on the energy of the sun... Cradle-to-cradle systems—from buildings to manufacturing processes—tap into current solar income using direct solar energy collection or passive solar processes, such as daylighting, which makes effective use of natural light."

- *Celebrate Diversity*: "Nature's diversity provides many models for human designs.... Rather than offering the one-size-fits-all solutions of conventional engineering, designs that celebrate and support diversity and locality grow ever more effective and sustaining as they engage natural systems."[391]

As a business venture, Cradle To Cradle Design seeks to partner with clients from various industries, offering Cradle To Cradle certification as well as promoting the Cradle To Cradle philosophy in product life cycles and organisational operations and structures. But the philosophy of Cradle To Cradle Design, while highly innovative, is

[389] Centre for Appropriate Rural Technologies. "Background", CART; available from: http://archidev.org/mipaa/mission_presentation/cart/cart_about_back.htm.
[390] Ibid. available from: http://archidev.org/mipaa/mission_presentation/cart/cart_programmes.htm.
[391] McDonough, William and Michael Braungart. *Cradle to Cradle: Remaking the Way We Make Things*, North Point Press, 2002; available from: http://www.mcdonough.com/cradle_to_cradle.htm.

also based on age-old organic processes and systems in nature which reintegrate waste by reintegrating all resources back into a closed-loop model.

The *Cradle To Cradle* book itself serves as an example of a product which can easily be broken down and made into another product over and over again, without degenerating into waste:

> It is printed on a synthetic 'paper', made from plastic resins and inorganic fillers, designed to look and feel like top quality paper while also being waterproof and rugged. And the book can be easily recycled in localities with systems to collect polypropylene, like that in yogurt containers. This 'treeless' book points the way toward the day when synthetic books, like many other products, can be used, recycled, and used again without losing any material quality—in cradle to cradle cycles.[392]

In sum, Cradle to Cradle's philosophy is long-term and visionary, and may provide a strong basis for the Samdrup Jongkhar Initiative's economic diversification efforts. While many modern technologies may not be applicable or beneficial to the proposed GNH-based economy of Samdrup Jongkhar, the Cradle to Cradle methodology for product design may provide significant opportunities, especially as Samdrup Jongkhar and Bhutan develop new industries in line with the four pillars of Gross National Happiness.

6.2.4 Innovations

Bicycle Technologies: Around the world people are continuing to discover the power of bicycles as a means to efficiently harness human energy in more ways than just serving as an environmentally friendly mode of transportation.

Based in Guatemala, **Maya Pedal** describes itself as a Center for Bicycle Technology. The centre restores and re-sells bicycles donated from the United States and Canada, and it also builds "bicimaquinas" or cycle-powered machines. Many of these machines were designed in Maya Pedal's own workshop, have instructions posted online, and include a mill/thresher, rope pump, blender, washing machine, nut sheller, and a hand cycle for a disabled person.[393]

Bikes Not Bombs: As described on its website, "BNB provides community-based education and assists development projects with recycled bicycles, related technologies and technical assistance, as concrete alternatives to the militarism, over-consumption & inequality that breed war and environmental destruction."[394] The group supports a bicycle shop run by teenagers and ships over 4,000 bicycles per year to development projects around the world.

---

[392] Ibid.
[393] Maya Pedal. "What Are Bicimáquinas?", Maya Pedal Guatemala, 2010; available from: http://www.mayapedal.org/machines.html.
[394] Bikes Not Bombs. "About Bikes Not Bombs", Bikes Not Bombs; available from http://bikesnotbombs.org/about.

While Samdrup Jongkhar's very hilly terrain may not encourage the extensive use of bicycles in all locales, they may be very useful in low-lying border areas like Samdrup Jongkhar town and Bhangtar, while some of pedal-related technologies developed by Maya Pedal may provide useful low-cost labour-saving appliances at the household level. Certainly, the new JNP Centre for Appropriate Technology, initiated by the Samdrup Jongkhar Initiative, may be interested in investigating those pedal-related technologies with particular applicability to Samdrup Jongkhar conditions.

6.3 100% Organic Agriculture

> *Jatharas [biodiversity festivals] have become an expression of the deep emotional and spiritual relationship between the farmer and soil, agriculture and environment.... There have been instances where women have cried at the sight of these traditional seeds, which vividly bring back the rich past of their communities.*
>
> Deccan Development Society[395]

With many diligent and brilliant actors fighting for decades to keep chemicals out of our food, the organic movement has an extensive history filled with examples of highly successful organising, innovation, deepening understanding, and expansion. That history also has many examples of lessons learned from the limitations of past efforts.

The global organic movement today is made up of many intersecting agricultural-related movements, including those promoting food security, biodiversity, localization, and seed sovereignty, protecting ecological systems on land and water, slowing climate change, resisting biopiracy, promoting non-violence, and more.

The apex of many of these intersecting movements is the quest for greater self-reliance. That in turn generally leads organic movements to promote knowledge and resources as commons for the people using them to ensure they are not exploited by transnational corporations or large development agencies.

In other words, "going organic" means very much more than simply not using chemical pesticides and fertilisers. As the Navdanya farmer trainers who are assisting the Samdrup Jongkhar Initiative transition to organic point out, "organic" is an entire ***system*** of working harmoniously with nature and strengthening local communities.

As highlighted in Dr. Vandana Shiva's speech at the SJI Launch in December 2010, the congruity between Buddhism and organic agriculture in Bhutan adds an important dimension to the global organic movement. The spiritual connection to land is, for many

[395] Deccan Development Society. "About Us", Deccan Development Society, 2011; available from: www.ddsindia.com/www/default.asp.

farmers, inseparable from growing food. This spiritual aspect of farming—cultivating not only healthy food but also compassionate human beings and communities that peacefully co-exist with the ecosystem within which they live—puts the prayer to benefit all sentient beings into action. As such, spirituality is an important entry point and intersection between organic agriculture and Buddhist practice in Samdrup Jongkhar.

Sustainable, organic agriculture promises potential solutions for many of the challenges facing Samdrup Jongkhar, including marketing difficulties and the almost total present reliance of shops and institutions on imported, chemically-grown produce from India. Localisation is therefore an integral part of the planned shift to organic production. Localisation is an essential aspect of enhancing food sovereignty and removing Samdrup Jongkhar's present dependency on non-organic Indian produce.

This locally focussed organic system is relatively easy to start on a small scale—beginning with families producing enough organic produce to feed themselves, and then gradually expanding production to supply local institutions like monasteries, army bases, hospitals, schools, and the Polytechnic. The recent week-long Samdrup Jongkhar Initiative youth art camp in January 2012 set an example by serving only local organic vegetarian food to the 80 students and staff. The food was not only delicious, fresh, and nutritious, but was purchased from local farmers below existing market prices at rates that still benefited and profited farmers.

While organic certification in many countries has often helped promote environmental consciousness among consumers, this has not always correlated with greater equity or environmentally friendly practices. The expense of third-party certification and the frequent trend towards excessive packaging and long-distance transport of organic produce to niche markets have often made organic consumption a prerogative of the rich, generated waste, undermined localisation and food self-sufficiency, and produced excessive transport-related greenhouse gas and other pollutant emissions. According to one critic:

> Corporate promotion of fashionable "green" products makes life more difficult for small, local producers of everything from organic food to hand-sewn clothing. Further, as "natural" products have become a niche market for those affluent enough to pay for them, the goods available to everyone else are even shoddier and more toxic than before.[396]

Thus, an apparent shift to 'organic' may well make it possible for wealthy people to feel as though they are saving the environment by consuming "environmentally friendly" products, while at the same time making healthy food too costly for the poor.

These global trends, which now include mass 'organic' production in China for export to the west, illustrate some of the traps both Samdrup Jongkhar and Bhutan will wish to avoid in their intended transition to 100% organic agriculture. They also graphically

[396] Tokar, Brian. 1997. *Earth for Sale: Reclaiming Ecology in the Age of Corporate Greenwash*. South End Press. Cambridge, p.xiv.

illustrate the Navdanya argument that "organic" is an entire system of working with nature and communities that goes far beyond non-use of chemicals. That system includes local production for local markets, and enhanced ecological benefits, biodiversity, equity, self-reliance, and community resilience. It by no means excludes trade or organic food exports and imports when conducted fairly as a judicious and limited supplement to local supply that also accounts for full costs.

Although much of Samdrup Jongkhar, especially in more remote areas, is still "organic by default and by tradition," almost all regional and global trends (promoted by powerful and wealthy transnational actors) run counter to organic efforts, and are working to promote and sell more chemicals and so-called "high-yield" seeds that depend on synthetic fertiliser use. Countering this trend is a huge challenge for a small nation like Bhutan, but the efforts to go organic are also supported by a vast and resilient network of community organisations both at home and around the world. A very few examples are listed here for illustrative purposes.

6.3.1 Organisations

BioBhutan: A private company started in 1995, "Bio Bhutan is a pioneer enterprise that produces and markets natural and organic certified products from Bhutan for Bhutanese and international markets," including India, America, Singapore, Thailand, and Europe.[397] Bio Bhutan is the first Bhutanese enterprise to certify its products as organic, originally through third party organic certification and in the past year through the Indian certification organisation ADITI Organics.[398] BioBhutan products include herbal teas, turmeric, ginger, honey, and lemongrass oil.

Bio Bhutan's commitment to the farmers, producers, and consumers of the products, as well as to the ecology and image of the country, is illustrated in the company stated goals:

- Contribute to the sustainable use of natural resources of Bhutan;
- Improve income and employment opportunities of rural communities and private entrepreneurs;
- Create surplus value for final consumers through healthy and tasty natural and organic products from Bhutan; and
- Promote the image of Bhutan as a producer of pure and natural products.

In line with these goals, BioBhutan works with eight farmers' groups across six districts in Bhutan, including women's groups and community forestry management groups, and has supported and encouraged many of the groups to switch to organic production. The company also works with national and government organisations and agencies, including the Ministry of Agriculture's National Organic Program, the Council of Renewable

[397] Bio Bhutan. "Our Goals", Bio Bhutan, 2009; available from: http://www.biobhutan.com/about.php.
[398] See http://www.aditicert.net. Certification standards are equivalent to those recognized in the United States and Europe.

Natural Resources Research in Bhutan, Agricultural Marketing Services, and the National Women's Association of Bhutan.

Navdanya: A veteran of the organic movement, Navdanya's broad mission is "to promote peace and harmony, justice and sustainability.... through the conservation, renewal and rejuvenation of the gifts of biodiversity we have received from nature and our ancestors, and to defend these gifts as commons."[399] Navdanya defined and pioneered the movement for Earth Democracy, based on the following principles:

- All species, peoples and cultures have intrinsic worth
- Diversity in nature and culture must be defended
- Earth Democracy is based on living economies and economic democracy
- Living economies are built on local economies
- Earth Democracy is a living democracy
- Earth Democracy is based on living cultures
- Living cultures are life nourishing
- Earth Democracy globalizes peace, care and compassion

One of Navdanya's major projects is Bija Vidyapeeth, meaning 'school of the seed':

> The school promotes a vision of holistic solutions rooted in deep ecology and democracy as an alternative to the current world order that is characterized by blind policies guided by greed, destruction and war.[400]

The courses offered at Bija Vidyapeeth allow learners to interact with the world's leading social and environmental activists on the Dehradun farm, which is described on the Navdanya website as:

> a biodiverse and highly productive 8-acre farm [which] has rejuvenated the soil once left barren and desertified by years of eucalyptus monoculture and now produces more than 600 varieties of plants, including 250 rice varieties, 30 wheat varieties, and diverse varieties of millet, pulses, oilseeds, vegetables and medicinal plants.[401]

Other Navdanya campaigns include promoting Fair Trade, non-GMO food, fighting biopiracy, "Soil Not Oil," and many, many more localised projects.

Navdanya has committed to partnering with the Samdrup Jongkhar Initiative as well as with the Government of Bhutan, and offering its resources and expertise for three years to assist in the transition to organic agriculture. To that end, Navdanya regularly sends its top farmer trainers and scientists to Samdrup Jongkhar to train local farmers in organic methods, to advise on composting, seed saving, terracing, biological pest control, and

[399] Navdanya. "Our Mission", Navdanya, 2009; available from: www.navdanya.org/about-us/mission.
[400] Ibid; available from: www.navdanya.org/earth-university.
[401] Ibid.

other techniques, and to supervise the monitoring of the transition to organic methods. In all these ways and more, Navdanya has become an indispensable and highly valuable resource for the Samdrup Jongkhar Initiative.

As well, Navdanya generously hosted 20 Samdrup Jongkhar farmers as well as the Samdrup Jongkhar District Agriculture Officer and three Agriculture Extension Officers for an extensive in-depth training at Bija Vidyapeeth in Dehradun. As a prelude to this training, Dr. Vandana Shiva took the Samdrup Jongkhar farmers and agriculture officials to the Punjab to witness the effects of the 'Green (Chemical) Revolution' in India and to meet the families of Punjab farmers who had committed suicide. SJI's partnership with Navdanya illustrates the value and power of drawing on the kind of international examples and expertise described in this chapter.

La Via Campesina, or The International Peasants' Movement, is a transnational advocacy network comprised of "150 local and national organizations in 70 countries from Africa, Asia, Europe and the Americas. Altogether it represents about 200 million [20 crore] farmers."[402] Across this diverse global network, Via Campesina members, according to the movement's website, comprise "an autonomous, pluralist, and multicultural movement....defend[ing] small-scale sustainable agriculture as a way to promote social justice and dignity. [La Via Campesina] strongly opposes corporate driven agriculture and transnational companies that are destroying people and nature."[403]

La Via Campesina divides its work into the issue areas of agrarian reform, biodiversity and genetic resources, food sovereignty and trade, women, human rights, migrations and rural workers, sustainable peasant agriculture, and youth.

In 2009, La Via Campesina hosted a South Asian youth summit in Timor Leste, which focused on identifying problems rural youth face and on seeking youth-based solutions to these challenges. The youth groups in attendance pledged that:

- We commit ourselves to build alliances between youth and to organize exchanges among the youth in various countries in the region.

- We struggle to have access to agricultural land and to create jobs for youth to stay in the countryside in order to ensure food and the future of our planet.

- We reject all forms of neo-liberalism policies, which do not stand for the people.

[402] La Via Campesina, available at: http://www.viacampesina.org/en/
[403] Ibid.

Other Organic Agriculture Organisations in Asia

ADARSA, [Alliance for Democratising Agricultural Research in South Asia]
Andhra Pradesh Alliance for Food Sovereignty in 2005
Genetic Resources International [GRAIN]
Millet Network of India [MINI]
Organic Farming Association of India [OFAI]
South Against Genetic Engineering, SAGE
South Asia Network on Food, Ecology and Culture [SANFEC]

6.3.2 Strategies

Biodiversity Registers and Festivals:

Over the years Navdanya's biodiversity registers and festivals have been key aspects of its promotion of Earth Democracy. Navdanya has several campaigns for the promotion of biodiversity, including the Grandmothers' University, which "is both a programme of Bija Vidyapeeth as well as a grassroots movement documenting traditional knowledge and the use of biodiversity through Community Biodiversity Registers."[404]

In 1997 Navdanya started the first biodiversity register in the village of Pattuvam, Kerala, and has since been promoting these registers as an integral part of the seed saving and localisation process. "To date Navdanya has formed more than 5,000 Jaiv Panchayats [Living Democracy Movements] in different parts of the country. They have their own Community Biodiversity Registers (CBRs) wherein they register the diversity and knowledge that exist in their village."[405]

Navdanya also supports many local biodiversity festivals through the Bija Satyagraha and Jaiv Panchayat campaigns. Last year, "as a commemoration to Gandhi's birthday, Navdanya in partnership with the India International Centre organized "Bhoomi, The Earth Festival," a daylong celebration of the Seed and Land, Nature and Culture, Arts and Music."[406] This festival brought together politicians, activists, and community leaders from across the world to celebrate and discuss the importance of reconnecting with Mother Earth.

Since 1998, the Deccan Development Society (DDS) has also hosted annual Biodiversity Festivals that have brought together more than 150,000 farmers in India to discuss and

[404] Navdanya. "Grand Mother's University", Navdanya, 2009; available from: www.navdanya.org/diverse-women-for-diversity/grandmothers-university
[405] Navdanya. "Navdanya", Navdanya. 2009; available from: http://www.navdanya.org/home.
[406] Ibid. available from: www.navdanya.org/component/k2/item/135-bhoomi-the-earth-festival-2010.

celebrate local protection of biodiversity and local control over organic agriculture, seeds, and markets. According to the DDS website description of these festivals:

> They have refrained from taking the shape of simple awareness programmes. Instead, the jatharas have become an expression of the deep emotional and spiritual relationship between the farmer and soil, agriculture and environment. Farmers have repeatedly made strong statements that agriculture for them is not simply a means of livelihood but it embodies an entire way of life, culture, rituals and traditions.[407]

According to DDS, "The NBSAP (National Biodiversity Strategy and Action Plan), of the Ministry of Environment and Forests, Government of India has accepted biodiversity festivals as the most important community cultural campaign on the issue."[408]

Seed Banks:

Navdanya has established "54 Community Seed Banks (CSBs) in 16 States across India. Navdanya's own seed bank in Dehradun preserves hundreds of seed varieties, including:

- 500 land races of paddy,
- 80 land races of wheat
- 11 land races of barley
- 5 varieties of barnyard millet
- 10 varieties of oats
- 6 varieties of finger millet
- 3 varieties of foxtail millet
- 7 varieties of mustard.

According to the Deccan Development Society, "over 1500 women farmers of DDS sanghams, by growing diverse crops on their marginalised lands, have established village level Community Gene Funds in 60 villages and have retrieved over 80 land races, which had been obliterated by so-called modern agricultural practices."[409]

Empowerment of Women:

The following organisations work on organic agriculture initiatives in ways specifically designed to empower women. They recognise that initiatives frequently produce different impacts on women than men due to the different types of work they often undertake. The following organisations use different strategies to address such gender differences and to enhance gender equity:

---

[407] Deccan Development Society. "About Us", Deccan Development Society, 2011; available from: www.ddsindia.com/www/default.asp.
[408] Ibid.
[409] Ibid.

- Women play a crucial role in *La Via Campesina* work. La Via Campesina asserts that "according to the FAO, women produce 70% of the food on earth but they are marginalized and oppressed by neoliberalism and patriarchy. The movement defends women rights and gender equality at all levels. It struggles against all forms of violence against women."[410]

- *Navdanya* proclaims the organisation as "a woman-centred movement for the protection of biological and cultural diversity." Navdanya argues that "women are the custodians of biodiversity, the providers of food security, the preservers and processors of food, the conservers of the cultural diversity of food traditions. The future of food depends on keeping women's food knowledge and expertise alive."[411] Navdanya's "Diverse Women for Diversity" movement is integral to the mission of Navdanya to protect and defend biodiversity.

- *Bio Bhutan* works with many farmers groups across Bhutan but also specifically supports women's groups, including "twenty five women of Dakpai, Tama and Takhabi in Zhemgang district of Zhemgang in South-Central Bhutan supply[ing] turmeric." Bio Bhutan has helped the group convert from conventional agriculture to organic turmeric cultivation since 2009.[412]

- According to the *Deccan Development Society* website:

> The programmes initiated by the Deccan Development Society have evolved over the years into a strong political movement for rural women.... The conscious integration of various activities the Society has helped is intended to retrieve women's natural leadership positions in their communities, and to fight the lack of access and control over their own resources. These activities, alongside ensuring earthcare, are also resulting in human care by giving the women a new-found dignity and profile in their village communities.[413]

6.3.3 Innovations

System Rice Intensification (SRI):[414] Despite the global trend towards use of pest-resistant, high-yield varieties, rice production is not keeping pace with demand, and in many parts of the world, access to water to grow this water-intensive crop is becoming a food security issue. To meet such challenges, SRI has been developed as a holistic, organic technique that focuses on enhancing soil health through improving biodiversity and promoting strong plant root growth.

---

[410] La Via Campesina, available at: http://www.viacampesina.org/en/
[411] Navdanya. "Our Mission", Navdanya, 2009; available from: www.navdanya.org/about-us/mission.
[412] Bio Bhutan. "Farmers Groups, Bio Bhutan, 2009; available from: www.biobhutan.com/farmer.php.
[413] Deccan Development Society. "About Us", Deccan Development Society 2011; available from: www.ddsindia.com/www.default.asp.
[414] More information on SRI can be found at the following sites: www.ciifad.cornell.edu/sri; www.wassan.org/sri; www.indg.in; www.svaindia.org/sri.html; www.echotech.org; www.betterufoundation.org; www.lotusfoods.com.

While being developed and adapted across the world to local conditions, SRI essentially involves:

- carefully planting single, young seedlings (8–12 days old) at a wide spacing (25 cm or more)
- keeping soil moist but well-drained and aerated
- adding compost or other organic material to the soil when possible.[415]

According to researchers at Cornell University, "the benefits of SRI, which have been demonstrated in over 40 countries include: increased yield (50-100% or more), a reduction in required seed (up to 90%) and water savings (50% or more). Many SRI users also report a reduction in pests, diseases, grain shattering, unfilled grains and lodging." Further the environmental benefits of growing rice organically include avoidance of the adverse impacts of chemical fertilisers and pesticides, conservation of water, and reduced methane emissions (which contribute to climate change).

6.4 Education and youth

> *The highest education is that which does not merely give us information but makes our life in harmony with all existence. But we find that this education of sympathy is not only systematically ignored in schools, but it is severely repressed. From our very childhood, habits are formed and knowledge is imparted in such a manner that our life is weaned away from nature and our mind and the world are set in opposition from the beginning of our days.*
>
> —Rabindranath Tagore[416]

> *With little guidance, encouragement and space to grow and exhibit their talent and abilities, people who have been considered 'very ordinary' and written off by society, are doing extraordinary things that defy description.*
>
> —Barefoot College[417]

Unlike the other key goals of the Samdrup Jongkhar Initiative, which have tangible outcomes and materially achievable targets and goals, the pillar of youth and educational development is less amenable to quantification. This does not mean it is less important. On the contrary, Dzongsar Khyentse Rinpoche stated baldly in his address to the launch of the Samdrup Jongkhar Initiative, that "education is the key" to the initiative's success, and he saw the creation of opportunities for youth as key to stemming the tide of rural-urban migration.

---

[415] SRI International Network and Resources Center. "About SRI", Cornell International Institute for Food, Agriculture, and Development, 2011; available from: http://sri.ciifad.cornell.edu/index.html.

[416] Tagore (1861–1941) was a Bengali poet, novelist, and painter, who was awarded the Nobel Prize for Literature in 1913. This quote on education can be found on: http://www.infed.org/thinkers/tagore.htm and is from his essay titled "A Poet's School."

[417] Barefoot College. Available at: www.barefootcollege.org

Indeed, knowledge underpins all other SJI objectives. Without knowledge of nature's functions, of ecosystem services, of the adverse impacts of industrial / chemical agriculture, and of good farming practices, farmers cannot make the transition to organic agriculture. Without knowledge of adverse waste impacts and zero waste alternatives, communities will not take action to minimise waste. And the new Centre for Appropriate Technology is intended to function as a knowledge base for the Samdrup Jongkhar Initiative.

As well, the initial research for this Samdrup Jongkhar Profile pointed to youth mobilisation as key to SJI success in all areas. As noted early in this report, one of the greatest challenges faced by farmers is the shortage of hardy labour occasioned by the departure of youth for urban areas. The average age of farmers in Samdrup Jongkhar is steadily increasing. And one of the key purposes of the Centre for Appropriate Technology is to provide interesting, meaningful, and innovative opportunities for youth in the region, thereby encouraging them to stay. In sum, youth and educational development is key to SJI success and both embraces and penetrates all other objectives.

In the field research interviews conducted in 2010–11, it quickly became clear that the topic of education is one on which few people agreed: For some, schools were seen as the starting place for change, for others, schools themselves were a part of the problem. Thus, when we speak above of education as a key avenue through which all SJI objectives may be implemented, we must go beyond the conventional equation of education with schooling, and take a much broader view that includes a wide range of non-formal and informal learning forms and venues.

In this broader sense, education involves people teaching and learning from each other in all contexts, and as a lifelong community process and responsibility. Here we provide a few examples of communities where education is being effectively used as a vehicle to bring about other community development initiatives.

6.4.1 Organisations

Shikshantar: The People's Institute for Rethinking Education and Development. Based out of a community centre and library in Udaipur, Rajasthan, Shikshantar is part of a movement that seeks to:

> move beyond NGO/Government institutional boundaries and agendas and directly involve local artists, organic farmers, artisans, businesses, healers, etc. in questions and experiments related to regenerating... life. We encourage people to reclaim their own learning processes by building their own learning webs (diverse networks of co-learners and spaces).[418]

[418] Shikshantar. "Udaipur as a Learning City", Shikshantar, 2005; available from: www.swaraj.org/shikshantar/udaipur.

As described on the institute's website, some tools and methods used at Shikshantar include the following:

- *Unlearning* is about recognizing that much of what gets constructed as 'the way things are', is actually socially constructed and has much potential to be changed. Unlearning is about finding aspects of those systems, institutions, and social structures that do not serve us, and deprogramming and rewiring our brains to think differently. Rather than passively accepting (or consuming) reality, the invitation of unlearning is to become a co-creator of reality and to be an active agent of change in the world.

- *Gift Culture*: The co-learners at Shikshantar "have come to understand that the ideas and practices of deep learning, self-organizing learning communities and vibrant learning ecosystems are predicated on a culture of generosity, care and mutuality. The gift culture is critical to decommodifying our collective intelligence and underlying diverse human learning processes." Framing the sharing of knowledge and wisdom as an exchange of gifts ensures that, whatever models are employed to implement an educational initiative, education starts at a human level.[419]

- Udaipur as a Learning City (ULC): "All of ULC's processes are geared towards regenerating the local learning ecology. This means that the city is a living organism and people are active co-creators of meaning, relationships, and knowledge. The learning ecology approach recognizes that an infinite knowledge exists within people and contexts far beyond what can be documented and stored." While the concept of Learning Cities is being applied in communities all over the world, Shikshantar uniquely uses the ULC model to fill in the spaces where development and education programs have not served the community.[420]

Most of Shikshantar's publications and many more publications relating to alternative education, organic agriculture, sustainable living, appropriate technologies, and more, are posted on the institute's website, which emphasises publications from the Global South.

Barefoot College: This is a learning institute based in Tilonia, Rajasthan, which was established exclusively for the poor. While involved in many rural development projects, all of the initiatives at Barefoot College focus on education.

Through trainings and other learning activities, community members are engaged in programs that are "focussed on arousing awareness about the environment and the social-economic and political forces that dominate development. Achievement skills that guarantee sustainable development in rural communities as well as literacy are considered important for an individual's development."[421] An education program

[419] Jain, Manish, ed. 2005. *Reclaiming the Gift Culture*. Shikshantar, Udaipur.
[420] Shikshantar. "Udaipur as a Learning City", Shikshantar, 2005; available from: www.swaraj.org/shikshantar/udaipur.htm.
[421] Barefoot College. "Education Approach". Barefoot College; available at: www.barefootcollege.org.

specifically designed for youth encourages the cultivation of self-reliant individuals who serve their communities, without regard for caste, religion, gender, or economic status.

Some Barefoot College education initiatives include:

- *Night Schools*: Established for children who work or do chores during the day, the night schools implement a program designed to "equip rural children with the right balance of literacy and education, so that in the long run each child voluntarily chooses to stay in the village and work for its development instead of looking to move out."

- *Children's Parliament:* This process aims to "provide students with the opportunity to actively participate in the management of their schools through a democratic process." The students elect a Prime Minister and a cabinet, all of whom have responsibilities of running the Night Schools and overseeing all the administrative sections of Barefoot College as a whole.

- *Balwadis*: Centres that provide daycare for working mothers, the balwadis look after children between six months and five years, providing health and hygiene screenings, healthy meals, and a fun and educational learning environment.

- *Village Education Committees*: These involve community members in active engagement in the education initiatives within their village. They are "responsible for selecting sites for schools, monitoring the education initiatives, participating in selection of teachers for night schools and *balwadi* as well as dispensing their salaries."

- *Barefoot Teachers*: Selected by members of a village, teachers are usually unemployed, educated youth. The new teachers go through a training period wherein they learn teaching methods and child psychology and other skills to effectively guide rural children. They are motivated to interact positively with children and colleagues and share a spirit of volunteerism.[422]

From March to October 2011, the Samdrup Jongkhar Initiative sent six illiterate village women from remote Lauri Gewog in Samdrup Jongkhar for six months' solar engineering training at Barefoot College, followed by 15 days additional solar drying training at the Barli Development Institute for Rural Women in Madhya Pradesh. These six women are now actively involved in the SJI solar drier project in Lauri Gewog, and in March-May 2012 will have responsibility both for helping fabricate 24 additional solar driers and thereafter for training villagers in their correct use, and maintaining and repairing the solar panels and other equipment.

[422] Ibid.

SECMOL: The Student's Educational and Cultural Movement of Ladakh.
Founded in 1998, SECMOL is and has always been run by youth seeking educational reform in Ladakh, where failure rates have consistently been very high. SECMOL adopts innovative ecological methods, and many its initiatives, including the SECMOL secondary school, are powered by solar technology.

As reported on the SECMOL website:

- The SECMOL Campus is located "near the village of Phey, 18 km from Leh. The solar heated campus is home to about 40 students from remote villages,"[423] and includes an organic vegetable garden, composting toilets, and livestock. The students democratically run the administration of the school.

- Youth Camps: "SECMOL's annual youth camps are enormously popular among rural students. They learn Ladakhi history and geography, English, and solar energy, alongside Ladakhi dancing and games, and more."

- Ecotourism: "SECMOL's eco-friendly travel agency, *Around Ladakh with Students* (ALS), specialises in cultural exchange for student groups and organises homestays, interactions with Ladakhi students, monastery and historical visits, treks and village tours."

- Educational Reform: "One of SECMOL's main objectives has always been to improve the education system. From 1994 to 2007, we collaborated with the local government in a massive movement to improve education in Leh District."[424]

6.4.2 Strategies

Please see the proceedings of the December 2009 *Educating for GNH* workshop held in Thimphu for discussion of a wide range of learning approaches and methods relevant to GNH-based education.[425] Here we simply cite, by way of illustration, a few sample learning strategies and techniques that have been used by different organisations in contexts that may be relevant to community deliberations in Samdrup Jongkhar.

Cultivating Learning Societies / Ecologies:

The Oasis Game: As described by Instituto ELOS Brazil, The Oasis Game "involves inviting the community to make a project and to build in a cooperative way a challenging project chosen by people living in the area according to their needs, like a square, a park, a day care centre, or a cultural centre. For that the game takes into consideration a broad

[423] The Students' Educational and Cultural Movement of Ladakh. "What is SECMOL?" SECMOL, 2006; available at: www.secmol.org/whatis/index.php.
[424] Ibid.
[425] The proceedings are available on the GPI Atlantic website at www.gpiatlantic.org.

definition of community and involves representatives of the different sectors of society—NGOs, local government, and people who live in other neighborhoods."

Some of the principles of *Oasis* activities include:

- Utopia – Dreaming without borders
- Accuracy – Having a systemic view in the development of appropriate solutions
- Pleasure - Encouraging lightness, enthusiasm and fun.
- Trust – Establishing relations of exchange, transparency and respect
- Exemplary – Inspiring transformation through giving examples.

According to Instituto ELOS Brazil, The *Oasis Game* methodology has become an international movement with people developing Oasis projects on every continent.[426]

The World Cafe: The creators of the *World Cafe* see it "as a *conversational process* based on a set of *integrated design principles* that reveal a deeper *living network pattern* through which we co-evolve our collective future."[427] The World Cafe is a simple but effective tool to bring community members together to start the process of an on-going dialogue about any issue or topic which people wish to discuss.

The *World Cafe* Design Principles are:

- Set the Context
- Create Hospitable Space
- Explore Questions that Matter
- Encourage Everyone's Contributions
- Connect Diverse Perspectives
- Listen Together for Insights
- Share Collective Discoveries

The World Cafe website also offers many types of resources, including a reading list, translations of texts, The World Cafe book (for purchase), and an active online community.[428]

Participatory Research Methodology:
After this initial research phase creating a basic Profile of Samdrup Jongkhar, there will be a need for on-going research within villages throughout the dzongkhag to consult and involve the citizenry actively in SJI activities, so that no SJI initiative is seen or felt as being 'imposed'. Every SJI action must respond to actual needs, which can only be ascertained through participatory research methods.

Participatory research is a strategy "based on the assumption that indigenous peoples, no matter how uneducated, have the skills and knowledge to define and solve their own

[426] Instituto ELOS Brazil. *Elos Methodology*, available from http://www.institutoelos.org/
[427] The World Café. http://www.theworldcafe.com/.
[428] http://www.theworldcafe.com/.

developmental problems."[429] Participatory research is an evolving field, with researchers improving upon the methodology as they experiment and practice with on-the-ground projects.

One of the fundamental objectives of participatory research is to enable local people to know and understand their own communities better—both their strengths on which they can build, and their weaknesses which they can strive to overcome. Participatory research can also help local communities discover external challenges and constraints to development at the local level.

6.4.3 Innovations

Swaraj University, located in Udaipur, Rajasthan, India "is a two-year learning program that creates opportunities for young learners to develop the knowledge, skills and perspectives they need to create viable green-collar enterprises and to support healthy and resilient local communities."[430]

The Swaraj University website describes the program as a higher education initiative that accommodates all learners. While the program is self-directed, learners are "placed one-on-one with mentors who share both a range of practical skills as well as personal philosophies/wisdom. These mentors have been carefully selected to ensure that, in addition to being cutting edge leaders in their respective fields, they are able to engage with youth in a true spirit of co-learning and friendship."[431]

In addition to these mentorships, the learners also have opportunities to explore their interests through:

- Learners' gatherings
- Individualised self-study programs
- Skill workshops
- Service projects
- Organisational internships
- International Dialogues
- Learning journeys

The Swaraj University website outlines the differences between its own philosophy, approach, and methods and those of regular universities in the following way:

[429] Parpart, Jane and Kriemild Saunders, ed. 2004. "Lessons from the Field: Rethinking Empowerment, Gender and Development from a Post-Development Perspective". *Feminist Post-Development Thought.* Zubaan. New Delhi, p. 46.
[430] Swaraj University. "Vision". Swaraj University, 2010; available from: www.swarajuniversity.org.
[431] Ibid.

Regular Universities	Self-Design University
Compulsory learning- individual interests and learning styles are not taken into account	Self-directed learning where individual interests and styles are the foundation of the program
Evaluation based on testing which creates fears, inferiority complexes and a sense of competition with others	Learners carry out self and peer evaluation as well as develop their own learning portfolios
Grooming of learners so that they become spectators, producers and consumers for the state and corporations	Grooming of learners so that they question the current state of society and develop the commitment and practice of sustainable action
Hierarchical and authoritarian learning environment	A sense of community and democratic co-learning environment
Larger class size, so lack of individual attention	Each learner will have a mentor in his area of interest and a mitra to guide him in his learning process
Teaching done in English	Hindi and local languages are used in the learning process to bring out feelings and nuances

SJI learning activities and GNH curriculum development:

The SJI is actively engaged in fostering innovative and GNH-based learning activities in the dzongkhag. At the level of non-formal education, the SJI in January 2012 organised a very successful week-long art camp for 63 local students, held at the Dewathang Primary School, and taught by top staff from the Voluntary Artists Studio, Thimphu (VAST). At the more formal level, the SJI has already developed a sample five-lesson set of GNH-based science classes, which have now been recorded by the Bhutan Broadcasting Service in the form of radio plays, and which will be made available in 2012 to Samdrup Jongkhar schools.

Currently, a GNH-based, secular curriculum is also being developed for the students at the Chokyi Gyatso Institute of Buddhist Studies in Dewathang, Samdrup Jongkhar. As well, GNH-based curricula will be developed in 2012–13 for the proposed new GNH Centre in Bumthang, and will yield materials that can certainly be used in Samdrup Jongkhar.

Chapter 7. Recommendations

> *The kind of thinking that has gotten us into this situation is not the kind of thinking that will get us out of it.*
>
> —Albert Einstein

> *So why then do we need a Samdrup Jongkhar Initiative? Well, we are now a democracy and so our people and all Bhutanese citizens have a responsibility. The meaning of the word "initiative" includes carrying or shouldering responsibility. It means carrying our responsibility without someone else having to tell us what to do and without the prodding of a cowherd. It is us fulfilling our responsibilities for ourselves, for our children, and for future wellbeing. Taking such an initiative and to be concerned in this way — that is the main aim of the Samdrup Jongkhar Initiative.*
>
> —Dzongsar Jamyang Khyentse Rinpoche

In December 2010, Samdrup Jongkhar Dzongkhag became the focal point for Bhutan's first ever civil society-based development initiative—the Samdrup Jongkhar Inititative (SJI). The SJI aims to raise living standards in the dzongkhag and improve food security, while fully protecting the natural environment, strengthening communities, promoting Bhutan's unique culture, stemming the rural-urban tide, and fostering a cooperative, productive, entrepreneurial, and self-reliant spirit.

Needless to say, this is an ambitious task, particularly given the global realities facing all countries of the world, Bhutan included, and the powerfully dominant, materialist, growth-based development model that presently holds sway. However, relative to the rest of the world, the pressures of modernisation are late in coming to Bhutan. Because of this, Bhutan is in the enviable position of being able to learn from the mistakes that have already been made elsewhere.

As well, Bhutan is gifted with a holistic development philosophy deeply grounded in its ancient wisdom traditions, an approach first expressed by His Majesty the Fourth King three decades ago in his now famous proclamation that "Gross National Happiness is more important than Gross National Product." The Samdrup Jongkhar Initiative simply seeks to realise that alternative development vision on the ground and to put it into practice.

If the key goals of the SJI are realised—including food security, self-reliance, and ecological sustainability—then the people of Samdrup Jongkhar may well be partially insulated from some of the global hazards that lie ahead, such as economic and financial collapse and cuts to once secure food and fuel supply lines. However, in order to create a flourishing and self-reliant Samdrup Jongkhar one needs to know not only what the goal

is, but what the obstacles and challenges are on the path, as well as some of the ways to overcome those obstacles and attain the SJI objectives.

In this *Profile of Samdrup Jongkhar* we have tried to reference some of the challenging global trends, juxtaposed with the local realities in the dzongkhag, as expressed through both existing statistics and the human voices of villagers.

While self-reliance—where citizens take the initiative, both as individuals and collectively, to better their lives—is the main goal of the Samdrup Jongkhar Initiative, this does not mean that the role and responsibility of government are diminished in any way. Indeed, the very purpose and function of good government—one of the four core pillars of Gross National Happiness—is to represent the interests of present and future generations and to act for the public good.

In this regard, Bhutan's development paradigm has a unique advantage. While conventional development models worldwide stress economic growth as the ultimate objective, Bhutan's GNH development paradigm is based on the premise that true development of human society takes place when the public good is paramount.

That public good, in turn, is reflected in the increased wellbeing of the people and the natural environment on which they ultimately depend for survival, as assessed by the nine measured domains of GNH—health, education, living standards, ecological resilience, culture, community vitality, time use, good governance, and psychological wellbeing .

Thus, it is intended that the goals of the SJI are fully aligned with those of Bhutan's government, particularly in its commitment to GNH-based development. This synchrony was expressed in the Honourable Prime Minister's keynote address to the Samdrup Jongkhar Initiative launch, and in the GNH Commission Secretary's welcoming of the SJI with the words that "government cannot do it alone" and needs civil society partners in building a GNH society.

With these broad objectives in mind, we have presented below key recommendations that appear to emerge naturally and clearly from the statistical and field research evidence presented in this Profile of Samdrup Jongkhar. Many recommendations were also directly expressed by Samdrup Jongkhar residents during several months of visiting villages in the dzongkhag and interviewing villagers and farmers, shopkeepers, educators, and elected village leaders and local officials. The recommendations that follow are also informed by already existing quantitative data on Samdrup Jongkhar, as well as by best practices and models that exist elsewhere at the community, national, and international levels.

The research dimension of the SJI is seen as essential to the success of the initiative itself in order to provide a solid basis and ground for well-founded GNH-based regional development and to ensure its success over time. For example, it is important to know how each gewog is faring, so that any benefits of the SJI initiative over the long term will be equitably distributed throughout the dzongkhag. It is also important to know the

specific needs and challenges facing the dzongkhag so that development and technologies are appropriate to local conditions. Good information therefore ensures that development initiatives are not out of touch with reality but reflect and are based firmly in existing conditions. As well, good ongoing research can provide early warning signals of potential problems and challenges and enable timely course corrections.

Cornerstone to the Samdrup Jongkhar Initiative, and tied in with many of the recommendations listed below, is the further development of the Centre for Appropriate Technology (CAT) as part of the Jigme Namgyel Polytechnic in Dewathang. The Centre, first researched and proposed by the SJI, is now officially part of JNP, and has received formal approval from the Royal University of Bhutan, and strong personal encouragement from the RUB Vice-Chancellor. The CAT is intended to become a key knowledge base for the SJI, along with on-going research and existing local wisdom and traditional knowledge, and is therefore key to implementing many recommendations listed below.

One final note regarding the Recommendations that follow: they are by no means comprehensive or aimed at covering all possible aspects of eco-friendly development in the dzongkhag. Rather these particular recommendations have been chosen for illustrative purposes, as examples of possible ways forward in one particular area, with all the following ultimately aimed at increasing food sovereignty and self-sufficiency, which Dzongsar Khyentse Rinpoche announced as a key concrete objective in launching the Samdrup Jongkhar Initiative.

This focus in the present chapter does not mean that other pertinent and beneficial actions cannot be undertaken, but it is seen as helpful at this early research stage to focus recommendations on one concrete objective that in turn can provide a firm basis for forward movement in other dimensions. In fact, it might be argued that without a high degree of food sovereignty in Samdrup Jongkhar, which is so vital to basic self-reliance and long-term survival, other development objectives will be correspondingly difficult to realise.

Another reason for this initial focus on food sovereignty is simply to provide focus to SJI activities in its early phases in those areas that affect most residents very directly on a daily basis. It was determined that, since agriculture is the predominant foundation of the Samdrup Jongkhar economy and the source of livelihood for the vast majority of residents, it is the logical starting point for the Samdrup Jongkhar Initiative. Exploring opportunities for greater economic diversity is a key intention of subsequent phases of the SJI.

To illustrate the primacy of agricultural health and self-sufficiency, Dr. Vandana Shiva tells the story of the Punjab in India. Farmer after farmer there has taken his life because of the burden of debt from buying machinery, seeds, and chemical inputs his family could not afford. In this case, says Dr. Shiva, growth was a “false measure of prosperity.” This tragic outcome came to countless numbers of farm families who lost control over their

farming enterprise and who mortgaged their own survival and future to outside suppliers of farm inputs.

In this process, these farmers completely lost their ability to decide the direction they wanted to go in—a far more diversified direction in line with past practices, which would have ultimately been far better for their wellbeing. Instead, the direction of their farms was determined by what Dr. Shiva calls "globally integrated and industrially organized agriculture," in which she says there is no relationship between price and the cost of production.[432] The new industrial model also forced farmers to focus on single crops, the market price of which was subsequently depressed by over-abundance at peak harvest periods. Dr. Shiva says cheap farm produce is "totally a result of exploitation, not a result of efficiency." In this system, she says, monopoly control of the market robs farmers of control and allows them to be exploited by traders.

While the tragedy of the Punjab is fortunately not yet the plight facing farmers in Bhutan today, the pressures are still there to mechanize, to grow monoculture cash crops, to apply pesticides and artificial fertilisers, to use high yield varieties of seeds, and to go into debt to do all these things. As well, Bhutan and Samdrup Jongkhar are already not immune from the destructive trends described by Dr. Shiva. Almost all food currently bought and sold in Samdrup Jongkhar is low-priced pesticide-laden industrially produced produce from India. Already this reality is undermining the local capacity for greater food self-reliance and sovereignty.

In sum, a key goal of the SJI is to increase food sovereignty, which is essentially the right of farmers to produce food, on their own terms and with their own wellbeing in mind, and the right of consumers to be able to decide what they consume, and how, and by whom it is produced. Making available fresh, nutritious, healthy, local produce is therefore a primary SJI objective.

As Dzongsar Khyentse Rinpoche notes: "Education is the key." In keeping with this, a commitment to building awareness and educating the public is essential for the long-term success and implementation of the goals of the SJI. For this reason, recommendations for education and awareness building are part of each section below. The fact that there is overlap between the education sections that follow is also testimony to the integrative importance of education as the key to the SJI.

In general, when we talk about education here, we are not only focusing on formal schooling—which often may be teaching the wrong paradigm—but we are including the vital contribution of non-formal and informal learning processes and contexts, including the roles of the family, community, television, the Internet, and other media. Specifically, there is a significant role in Samdrup Jongkhar for inclusion and respect of traditional indigenous knowledge and local wisdom. Thus, when we discuss ways to build awareness below, it includes the myriad ways in which people learn including through the oral traditions of village life.

[432] From speech given by Dr. Vandana Shiva at the Samdrup Jongkhar Initiative Launch held in December 2010, Dewathang.

Please note: The list of *Recommendations* below reflects the Chapter structure of this *Profile of Samdrup Jongkhar* report. Therefore, for a detailed rationale or for background information on any of the key recommendations that follow, please refer to the corresponding Chapter in the main report.

7.1 Food security

a) First, grow food for the family and then for the local market: On the advice of both the Navdanya and Organic Farming Association of India (OFAI) farmer trainers, focus should first be given to families growing food for themselves, to reduce their own dependency on the market and to increase the variety, diversity, and nutritional content of crops grown for their own consumption. Once family needs are met, farmers can focus on local markets, and then after that, the region, nation, or further afield.

Thus, a second step, which can begin simultaneously with farmers improving their own capacity to feed their families, is supply to local institutions like monasteries, army bases, hospitals, JNP, schools, and local shopkeepers. To set an example, the week-long January 2012 SJI art camp in Dewathang bought the fresh vegetables needed to feed its 80 students and staff from local organic growers. In direct response to SJI activity, there are now moves to set up a local farm produce stall in the Dewathang market area and to create a Dewathang vegetable growers' cooperative.

b) Adoption of soil conservation practices such as terracing: The risk of soil erosion on cultivated land in Samdrup Jongkhar is high, due to the nature of the soils and topography, coupled with the very high rates of precipitation during the monsoon season (5,000+ mm/yr). Maintaining soil organic matter (SOM), reducing the speed of water movement over the land, and increasing water infiltration, can reduce soil erosion. This can be accomplished by incorporating forage crops into a row crop rotation and reducing the number of bare soil days, and by applications of manure—all to increase SOM, as well as by using contour farming or terracing.

Despite Samdrup Jongkhar's steep slopes, terracing is not traditionally done in the area. As Navdanya's farmer trainers have demonstrated during their trainings, lack of terracing allows soil nutrients to run off, often resulting in far healthier plants at the bottom of slope than on the slope itself.

The use of soil conserving practices is clearly cost-effective for farmers, as the short term expense and time investment will be more than offset by the reductions in damage costs due to soil loss and reduced productivity. For example, the implementation of terracing represents a one-time investment for the farmer, which will pay off in the long term with reduced soil erosion and improved soil quality. As a result of the SJI-Navdanya trainings in 2010–11, several farmers have now been constructing terraces, and they are already expressing satisfaction at results.

According to Miguel Braganza of the Organic Farming Association of India, the process of terracing is critical to the sustainability of the cropping system in Samdrup Jongkhar Dzongkhag.[433] Braganza remarked that evidence of no-cost methods of terracing were observed in Wooling village in Orong Gewog whereby farmers would:

> drive wooden pegs at about every metre length across the slope at regular intervals of say 10 metres. The dry maize stalks are laid on the soil surface above the pegs to trap the soil that is washed down by the rain water run-off. The level gradually rises giving rise to terraces every ten metres along the slope. The dry straw in summer was unsuitable for fodder, directly or as silage, and hence this soil conservation measure was cost free. Soil conservation led to gradual reduction of gradient of the field plots along the hill slope and led to moisture conservation for the crops as well as recharge of mountain streams during the post monsoon period.

c) Adoption of soil building practices: Soil is the foundation of any agricultural system. It is vital to maintain healthy and productive soil if our agricultural system is to continue to function optimally. An increase in soil organic matter, through addition of farmyard manure, compost, mulches, etc. will result in increased productivity without having to use expensive imported fertiliser inputs or even to increase water inputs, as organic matter retains moisture in the soil.

In other words, soil enriched with organic matter is the best way to ensure the soil's moisture content during the dry season. This is particularly significant in Samdrup Jongkhar where the winter months are extremely dry. Building soil organically will also eliminate the need for costly inputs of artificial fertilisers, which destroy soil organisms—the real source of soil fertility—and are based on non-renewable resources.

d) Harvest rainwater to extend growing season*:* One of the primary reasons cited by villagers about why they buy vegetables and produce from India is because they do not have sufficient water to grow such produce themselves in the winter, when vegetables could grow well. A reliable water source would be a significant step towards enhanced food security, and many villagers speculate this would also enable them to produce a surplus of vegetables to sell as cash crops.

Given the unanimous complaint about lack of water during the dry season, rainwater harvesting seems to be an obvious solution. Water could potentially be collected during the monsoon season for later small-scale use for cash crops and vegetable production. Consultations were conducted with Bunker Roy of Barefoot College during his visit to Samdrup Jongkhar on the potential for rainwater harvesting. As a result, it is intended to build a model of a concrete underground rain harvesting tank at the Chokyi Gyatso

[433] Miguel Braganza. Additional Director OFAI Central Secretariat, Goa, and Convener-South Asia for IFOAM's Intercontinental Network of Organic Farmers' Organizations [INOFO], Goa, India.

Institute monastery in Dewathang, as well as pilot rooftop rainwater harvesting systems at five community primary schools in Lauri Gewog.

Other, smaller scale rain harvesting systems can be developed using trenches and bamboo pipes in order to conserve water and lengthen the growing season. One Samdrup Jongkhar farmer, Ata Daza, who took part in the March–April 2011 SJI organic farming study tour to India and who has been greatly inspired by the Navdanya trainings, intends to construct such a small-scale rainwater harvesting system on his own farm in Dewathang in early 2012.Also during the SJI March–April 2011 India study tour, the 24 Samdrup Jongkhar farmers and agriculture officers visited a cooperative in Ranikhet, India, that specialises in value-added organic production. Low-cost rain harvesting techniques in use there were observed, in which rainwater is caught in constructed hill-top ponds during monsoon season, and then channelled down the mountain side for dry season winter irrigation. This method was also thought to be transferable and adaptable to the conditions present in Samdrup Jongkhar.

e) Adopt practices that facilitate summer cultivation of vegetables: Heavy monsoon rains (5,000+ mm/yr) make cultivation in the summer months challenging in Samdrup Jongkhar. It has therefore been recommended by our visiting farmer trainers that summer cultivation can be facilitated with the use of a combination of well-ventilated greenhouses and row/tunnel covers. On-going consultations with farmer trainers from Navdanya and the Organic Farming Association of India will be beneficial as some of these methods are implemented.

f) Create a Samdrup Jongkhar annual crop calendar: With the assistance of the Navdanya farmer trainers, crop calendars can be developed specifically for each gewog of Samdrup Jongkhar. Please refer to Appendix 5 for Navdanya's annual crop calendar, which can be a useful model.

g) Confirm presence of citrus greening disease and attend to issues facing citrus growers: There is an urgent need to attend to the citrus problems plaguing the region: fruit drop, die back, and citrus greening disease. In particular, if Samdrup Jongkhar is going to "go organic," then it must effectively deal with present citrus problems, which is where the bulk of the pesticides are currently applied.

- Citrus greening disease is suspected to be the cause of the decline of many of the mandarin orchards in the dzongkhag in the past year. To confirm the presence of the disease in Martshala, for instance, officials from the National Plant Protection Centre analysed samples, and training for spraying was provided for the farmers.

  Like many other crops, citrus is plagued with a host of diseases caused by different etiological agents such as fungi, bacteria, viruses, and phytoplasmas. Of all diseases of citrus described to date, citrus greening disease, also known as Huanglongbing or Likubin in Chinese, is considered probably the most destructive and lethal disease afflicting citrus.

These diseases are easily transmitted and can spread throughout an orchard, either by insect vectors or by propagating infected seedlings, thus becoming highly infectious and incurable. Once an orchard is infected, it can only be rehabilitated by clearing the infected trees and replanting pathogen-free healthy seedlings.

- Trees that are in poor condition are more susceptible to disease. Attention should therefore be given to training citrus growers in techniques that maintain good tree condition and, once a tree is afflicted, alternatives to chemical pesticides should be provided. Miguel Braganza, a farmer trainer from the Organic Farming Association of India, who helped lead several farmer training workshops in February 2011 in a number of Samdrup Jongkhar villages, observed that "insect pests and diseases management were not a priority of the farmers."

  Braganza recommends it would be better to "directly focus on plant health management to prevent insect infestation and disease infections rather than to deal with curative measures after such incidence. Preparing basins at the base of plants, crescent trenches upslope of the trees for soil and water conservation, use of Panchagavya, Sanjivak and of Cow Pat Peat [CPP] sprays, and use of plant-based insect-repellent extracts, may be ideal for Bhutan."[434]

- According to an Australian study of citrus production in Bhutan, a high percentage of Samdrup Jongkhar citrus trees are considered to be beyond peak productivity (> 20 years of age). Among 5,165 trees examined, 47% were >20 years of age; 30% were between 10-20 years; and only 23% were less than 10 years of age.[435] It is recommended that farmers be trained in how to deal with aging orchards and provided guidance on how to incorporate another crop into the aging orange orchard (i.e. shade grown coffee) or how to ensure steady production of citrus fruit by incorporating new uninfected plantings into their orchards.

h) Adoption of System of Rice Intensification (SRI): SRI is an important holistic method of rice cultivation particularly applicable to regions where rice productivity is a main concern for food security. SRI has been investigated by Bhutan's Ministry of Agriculture in collaboration with the Royal University of Bhutan's College of Natural Resources and has been endorsed by the National Organic Program (NOP) of Bhutan. Tests have yielded successful results, and SRI has been found to be particularly advantageous for small and marginal farmers in both economic and environmental benefits as compared to the conventional method of cultivation.

---

[434] Miguel Braganza, Gupta, Ashish and Vikram Rawat. A Report on OFAI and Samdrup Jongkhar Initiative Organic Farming, PGS and Farmer Cooperative Workshops, Feb. 17–28, 2011. Submitted to Organic Farming Association of India and Samdrup Jongkhar Initiative. Report is available in Volume 2: Appendix 6 of this *Profile* Report. The visit by these three farmer trainers from the Organic Farming Association of India (OFAI) yielded practical advice on farming practices that can strengthen and shield not-yet-afflicted orange trees from the threat of such citrus-related diseases.

[435] Australian Centre for International Agriculture Research. 2008. *Results of a Survey of Citrus Farmers in Bhutan 2007*. Australian Government. Age data were based on a total of 5,165 trees. Figure 4d.

SRI is an organic practice that does not involve chemicals and significantly increases rice yield, reduces grain maturity time, and enables farmers to save seeds (80–90% saving) and water (25–50% saving). At the same time, grain quality improves, and there is increased pest and disease resistance and more tolerance for drought conditions. Research has also shown positive results in the application of the method to other crops as well.

i) Conduct research and development on animal deterrent equipment: Crop raiding by wild animals is a major problem in the area, and research has shown that equipment such as sirens, physical barriers, and electric fences can be part of the solution if used effectively as part of a comprehensive strategy. Currently, farmers spend large amounts of time guarding crops from wildlife, and losses are still as high as 50% and in some cases higher.

In 2008, the Department of Forests developed the Bhutan National Human-Wildlife Conflicts Management Strategy, which outlines plans to study and remedy wildlife conflict for various types of wildlife, including elephant, boar, deer, primates, and wild carnivores.[436] This plan is being executed by various national and dzongkhag-level government agencies, so any research done in Samdrup Jongkhar, for example in the new Centre for Appropriate Technology, should involve liaising with officials to ensure the work is complementary. For wild boar (as well as deer, porcupine, monkey), this could involve assisting in the prototype development and testing of deterrent systems, expanding on the work done by the National Post-Harvest Centre.

j) Assist in the development and implementation of an *Elephant Management Plan*: Crop raiding by elephants is a serious issue for farmers in the southern gewogs of the dzongkhag. Because these animals are not as easily scared off as other animals by normal deterrent devices, a different approach is needed. The 2008 *Bhutan National Human-Wildlife Conflicts Management Strategy* plans to study the changing migration patterns of elephant herds in the region and to develop a broad strategy accordingly. Thus, any actions by SJI should again be done in collaboration with the government agencies already working on the project.

Fortunately, experience in Assam, India, adjoining Samdrup Jongkhar, demonstrates that effective approaches to human-elephant conflict in the region can be developed if specific deterrent techniques are combined with a coordinated community-based approach to conflict mitigation. For example, in Sonitpur, Assam, the World Wildlife Fund (WWF) is currently working to mitigate human-elephant conflict by helping to organize and train community-scale anti-depradation squads in the use of non-violent means such as use of drums, firecrackers, and searchlights. The key to the program's success to date in reducing conflict with wild elephants lies not in the use of particular deterrent techniques, but in the community-level organised approach, which reduces the burden on individual farmers.

---

[436] Department of Forests. 2008. *Bhutan National Human-Wildlife Conflicts Management Strategy*. Ministry of Agriculture and Forests. Royal Government of Bhutan, Thimphu. Available from http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload5lv1595os.pdf

The SJI could contribute by networking with such neighbouring Assam programs, and could bring in trainers from the WWF in Sonitpur, Assam, and other locations in India, to conduct workshops on this community-scale approach with both local officials and farmers in affected areas of Samdrup Jongkhar.

k) Employ traditional methods to protect against human-wildlife conflict: When consulted on traditional methods to reduce the harm done by wild animals to crops, farmer trainers from Navdanya—Dr. Vinod Kumar Bhatt and D.S. Negi—concurred that coexisting with wild animals certainly does pose a major on-going challenge to food security, but that traditional methods employed by Indian farmers could be effective in Bhutan.[437] They suggested the following:

- Planting cactus fencing at the perimeter of the field
- Planting undesirable crops at the perimeter of the field at a depth of approximately 4 feet to deter wild animals from entering cultivated fields
- Solar electric fencing to deter wild boars
- Spread animal dung on crops.

However, they acknowledged that far-flung fields will still likely have to be protected by communal effort, either by rotating field watchers or by hiring people to protect the fields that are far away from homes.

l) Application of low-cost solar drying technologies: This is one recommendation that is already being implemented, with training undertaken at the Barli Development Institute in September–October 2011, a prototype developed and field-tested from November 2011 to January 2012, and dissemination of 24 solar driers in Lauri Gewog to take place in March–May 2012. The research, training, prototype development, and testing were funded by the International Development Research Centre, and the dissemination will be funded by the GNH Commission. Please see the SJI solar drying proposal in the Appendix, on the basis of which this implementation is currently taking place.

The solar driers being fabricated in Samdrup Jongkhar are based on the low-cost solar drying technologies developed at the Barli Development Institute for Rural Woman in Indore, Madhya Pradesh. In February 2011, the directors of the Institute made an initial visit to Samdrup Jongkhar to present their work both to Polytechnic faculty and to villagers and farmers from throughout the dzongkhag in presentations both in Dewathang and in the Bhangtar area. They also assessed local needs and conditions and extended an invitation for more extensive training in the drying technologies at the Barli Institute itself.

According to Dr. Janak Palta McGilligan and Jimmy McGilligan, the low-cost drying technologies can help overcome food storage challenges. Thus, at the Barli Institute, surplus from the garden is solar dried, using both tunnel driers and chimney driers,

[437] Personal communication with Dr. Vinod Kumar Bhatt and D.S. Negi, by Linda Pannozzo, December 23, 2010.

thereby providing the institute with ample fruit and vegetables during the dry season. According to Jimmy McGilligan, large solar driers (serving several households/farms) cost about Nu. 40,000 to make, and smaller units can be constructed for even less (as little as Nu. 4,000) using local materials, and will last for 15–20 years with low maintenance and no operation costs.

As well, application of such appropriate technologies has the potential to provide good jobs and training for local youth and students. Thus, three JNP students joined SJI staff and a representative of the National Post-Harvest Centre in fabricating and field-testing two solar driers in Lauri Gewog in the winter of 2011–12, and in training villagers in their use.

The driers have the potential to enhance the income of farmers in Lauri Gewog, which is presently Samdrup Jongkhar's poorest gewog, with a 60% poverty rate. Since dehydration maintains the nutritional value of foods, it can provide a unique set of high-end products with a wide range of market demand. The head of the Ministry of Agriculture's National Post-Harvest Centre, Pema Dakpa, who came to Samdrup Jongkhar to test the SJI-JNP prototype drier, expressed the hope that successful application of the technology in Samdrup Jongkhar would lead to its wider dissemination in other parts of Bhutan.

See related recommendation #3c below: *Develop and promote value added products*.

m) Promote mixed farming systems: Based on the farmer trainings to date, and observations by farmer trainers, Samdrup Jongkhar farmers already tend to have diversified kitchen gardens. But this diversity does not generally extend to marketing. As local markets are developed, therefore, farmers should be encouraged to shift away from growing only one or two main crops and towards more diversified, or mixed, systems. Farmers can be encouraged to do this by identifying market linkages, encouraging and integrating the consumption of traditional crops of high nutritive value, and reintroducing and marketing these lesser known but high value foods not only locally at the dinner table but also on hotel or restaurant menus.

During his 25–27 February visit to Samdrup Jongkhar, Bhutan's Prime Minister, Jigmi Y. Thinley, noted that several hotels in the Bumthang area will henceforth serve only organic, locally grown food, thus providing a potential market for local organic growers in Samdrup Jongkhar. More locally, supplying the needs of bazaar shopkeepers, as well as institutions like the Chokyi Gyatso Institute, JNP, army base, and hospital, will also require diversification of farming systems to meet such local market demands.

n) Adopt methods that extend life of stored grains: Field research indicated that the storage or accumulation of grains was a challenge due to lack of dry storage, very high levels of humidity, and competition with insects. Villagers noted they had to consume their grains before they were lost, and often converted them to alcohol.

According to Dr. Vinod Kumar Bhatt and D.S. Negi, the two Navdanya farmer trainers actively working with the SJI, it is possible to make simple storage structures at almost no cost that can withstand both the humidity and rain. Traditional grain containers can be constructed using local bamboo woven tightly into baskets and then covered with an animal dung/mud plaster. Also, pine cone powder, turmeric, and chilli can be used as natural pest control agents during storage of grains to protect grains against insect infestation. Using this method, the Navdanya trainers said that 5–10 quintals[438] of grain could be stored inside the home in one drum.

o) Adopt appropriate labour-saving technologies: The new JNP Centre for Appropriate Technology can potentially help to build simple machinery for villages—to process maize or extract mustard oil, for example, and villagers can then be trained to maintain and fix these machines and equipment. Given the shortage of farm labour resulting from youth rural-urban migration, as well as the potential for income-generation from value-added production, such labour-saving technology has the potential to enhance farm economic viability and reduce farm work drudgery, and may even make the difference between a viable and un-viable farm operation.

During his visit to Samdrup Jongkhar, Bunker Roy, founder of the Barefoot College, noted three stipulations about introducing new technologies:

- Technology should not deny people jobs
- Technology should not lead to dependency (i.e. people should be able to maintain and repair the equipment themselves)
- Technology should lead to local control.

The wisdom of Bunker Roy's simple and straightforward advice has been demonstrated in far too many development projects. In Lauri Gewog, in Samdrup Jongkhar, for example, villagers reported that in 1999 the first solar drying unit for Chirata was provided for Zangthi village by a small UNDP funded project. The drying unit was handed over to the community, but no one was given clear responsibility or training for its maintenance, and today the unit no longer functions. Bunker Roy's six-month training of the six female Lauri village solar engineers at his Barefoot College is designed to ensure that the SJI solar drying project does not fall in that same trap, and that the new solar driers will be properly maintained and repaired when necessary.

p) Consolidate water lines in Dewathang town: Interviews with villagers and officials indicate that the water shortage problem experienced in Dewathang town, in the winter months in particular, has been incredibly long-lived—news reports say for as long as twenty years. The DANTAK road widening project, which damaged some pipes, seems to be the latest reason for lack of water, but clearly the problem predates this.

The lack of water is not only causing discomfort, but unfortunately lack of sufficient water also results in poor sanitation and hygiene, which can lead to diseases and their

[438] One quintal is equivalent to 100 kilograms.

spread. The milk producers are advised by the Agriculture Extension Officer to wash their cows regularly in order to prevent contamination of the milk supply, which is sold unpasteurized.

In Dewathang town, there are currently 5 separate water lines for the Jigme Namgyel Polytechnic (JNP), the Chokyi Gyatso Institute (CGI), the military base, and two separate ones for the town itself. One secure, consolidated line, avoiding or reducing duplication and potential problems with pipe damage, has been discussed as a potential solution to this problem. At the time of writing, a major town meeting was being called on this very issue.

q) Explore cost-benefit analysis of Jersey cow: Issues around the manageability of grain input costs (in an emerging fossil-fuel depleted world) need to be explored further as they relate to cow fodder. While there is no doubt that Jersey cows, given certain conditions, produce substantially more milk than local cows, a full cost-benefit comparison of Jersey and local cow benefits and costs would be helpful.

During field research interviews, some serious questions were raised on the profitability of the Jersey cow. Aside from the higher purchase cost for Jerseys, farmers noted their higher feed requirements (i.e. higher input costs of grain), and the increased indebtedness some of the farmers who own them. Other farmers remarked that the Jerseys were unable to handle steep slopes or forage like local cows, were more prone to disease, required much more maintenance and cleaning than local cows, and produced milk of lesser quality. The use of agricultural land to grow feed, suggested by some of the farmers interviewed, rather than human food, can also be controversial.

At the same time, farmers noted that the Jerseys produced five or six times the quantity of milk of local cows, and therefore provided cash income from milk sales that local cows could not match. The information received indicates that the trend of phasing out local cows in favour of Jerseys merits a proper study comparing input costs and output benefits of both breeds, including the value of subsidies provided.

r) Build awareness of food security through education:

- All schools could have organic vegetable gardens, with students trained in the best organic farming methods. There are 5 agriculture programs currently offered in schools in Orong, Martshala, and Serthi gewogs. Field research in Orong revealed that the villagers felt the school agricultural program was very valuable, and villagers remarked that many of the students practiced what they learned at school in their own kitchen gardens. These existing agricultural programs could be used as models for other schools in the dzongkhag.

- Creative use of school vegetable gardens as a science teaching tool can seamlessly integrate GNH values with science learning and desired curricular outcomes in biology, chemistry, physics, and other fields. Organic farming methods can also nurture respect for traditional cultural norms and indigenous knowledge.

- As a way to deal with chronic farm labour shortages, as well as to incorporate organic farming techniques into school curricula, it is recommended that an internship program be created that runs particularly during the winter months. Such an internship program could enable students (starting in Class 8) either to get paid for farm work during their winter vacation, or to have their work count towards academic credit.

  Given the present shortage of farm labour, this program could be used to enhance farm infrastructure, and to assist with pruning, manuring, banking of citrus trees, terracing, building small-scale rainwater harvesting systems, and other tasks that can help enhance farm economic viability in the region. The program could also be offered and promoted as a way for students to receive academic credit for socially productive work contributed to the local community. In the longer term, such a program could also potentially address the rural-urban migration problem and build community.

- Awareness of food security issues can also be directly integrated into school curricular and extracurricular programs. For example, one aspect of Navdanya's biodiversity campaign seeks to preserve ancestral agricultural knowledge through intergenerational dialogue. The project involves inviting literate youth to reconnect with their elders to develop a biodiversity register together, charting and preserving a family's farming wisdom, and affirming non-formal agricultural education as valuable. [See agriculture section of the previous Models chapter].

7.2 Agricultural diversity

a) Increase the number of domestic and wild plant species grown on farms: If the diversity of crops increases, then there will be more items in the farmers' kitchens from their fields. This is a very important indicator in terms of increasing food security and reducing dependence on the market for food.

In this process, Navdanya recommends that special emphasis be placed on increasing the cultivation of "landraces" (i.e. traditional farmers' varieties), such as finger millet, foxtail millet, and buckwheat. These are also referred to in this *Profile* as "forgotten foods," since their cultivation has been rapidly declining in Samdrup Jongkhar and elsewhere. This shift toward local varieties for local use will result in growing food that best fits local conditions rather than moving in the conventional direction of cash crop monocultures, which are highly susceptible to devastation by disease, pests, and weeds.

In the recommended system, farms would become more diverse, complex, and stable. For example, diversity could be added to paddy fields by growing turmeric, vegetables, and spices, increasing the diversity of rice, chillies, ginger, fenugreek, and coriander—many of which are very valuable. (See related Recommendation #1m: *Promote mixed farming systems*).

In furthering this recommendation, the SJI could very fruitfully link with the National Biodiversity Centre of Bhutan (NBC). The NBC has done extensive work in the field of genetic biodiversity as it pertains to agriculture in Bhutan, including compiling an inventory of plant genetic resources in the country, documenting where they exist and to what extent, and setting up a base line for genetic erosion assessment in order to monitor these trends at the community level. Efforts in Samdrup Jongkhar to increase crop diversity based on the re-introduction of traditional crops and landraces could therefore very productively be done in collaboration with the NBC.

b) Creation of community seed banks: It is recommended that the proposed seed saving initiative at the Chokyi Gyatso Institute (CGI) also work in collaboration with the National Biodiversity Centre of Bhutan, which has an extensive Plant Genetic Resources Gene bank. That gene bank holds samples of diverse landraces / traditional crops of Bhutan for both immediate use by researchers but also for long term conservation and crop improvement programmes in the future.

Because micro-climatic and topographical conditions differ by gewog, and to ensure ease of access for farmers, community seed banks should ideally be set up in all gewogs. Samdrup Jongkhar's first community seed banks have recently been set up in Pemathang and Gomdar Gewogs. During Dr. Vinod Bhatt's December 2011 training visit to Samdrup Jongkhar, he dedicated one extensive session for the Samdrup Jongkhar Initiative's three farmer liaisons specifically to seed saving and seed storage methods. The intention is for these SJI farmer liaisons to transmit this training to farmers throughout the dzongkhag. According to Dr. Bhatt, everything begins with seeds, and the creation of community seed banks is therefore an integral first step in the systemic transition to organic farming.

The intention to make CGI the central community seed bank for the whole dzongkhag also brings in the spiritual dimension, because the farmers would make the seeds as an offering to the monastery, and the monks would bless the seeds. The seed bank at CGI could be started under the expert supervision of D.S. Negi, Navdanya's National Program Coordinaor and leading farmer trainer, who will visit Dewathang again in April 2012. In charge of the project implementation and proper seed storage can be Sherab Dorji, former CGI monk and now lead farmer liaison for the SJI.

c) Link with National Organic Program (NOP): Teaching materials, the NOP organic handbook, leaflets, and charts from the NOP can be stocked at the SJI office in Dewathang and distributed to farmers through the three SJI farmer liaisons. Since NOP training programs have not yet reached Samdrup Jongkhar, SJI can therefore act as a distribution channel for these NOP materials, along with Agriculture Extension Officers. These already existing, well-designed, and very informative NOP materials can therefore be used in SJI / Navdanya organic farming trainings in Samdrup Jongkhar as one form of on-going close collaboration with the NOP.

d) Provision of training and technical support to farmers involved in the shift to organic: Consultations with Navdanya's farmer trainers indicate that what farmers require most in the first two years of the transition period to organic methods is training and technical support.

For example, when Navdanya trains farmers in India, it generally selects five farmers in the particular village where training is conducted and provides them with seed (free if they can't pay for it), so that these farmers can become the "seed keepers" in their own village. It then becomes the duty of each of these farmers to plant these seeds, and the next year to collect them and provide seed to two more farmers—so ten more farmers become seed keepers in the second year, and so on. In this way, within four years there can be more than a hundred seed keepers, which is how a community seed bank is developed.

Further, Navdanya and its selected farmers share information about organic farming with an ever wider circle of farmers. The Samdrup Jongkhar Initiative could develop a similar information outreach strategy, ideally in close collaboration with local agriculture extension officers, particularly to ensure that the information reaching the farmers from official sources is not contradictory to what is being transmitted by the SJI. It is with that intended synchrony in mind that the SJI, with IDRC funding, included the Samdrup Jongkhar District Agriculture Officer and three Agriculture Extension Officers in its three-week organic study tour to India in March–April 2011.

Also, farmers who are currently using chemical pesticides and artificial fertilisers must continue to be trained and provided with information about alternative biological and non-toxic insect repellents. This work has begun with farmer trainings conducted by Navdanya and the Organic Farming Association of India. It is extremely important that these initial trainings be followed up and extended to farmers and villages not reached in this initial phase. Books and materials on the flora of Bhutan and low-altitude medicinal plants are being despatched in March 2012 to Dr. Vinod Bhatt of Navdanya, who will identify which local plants are effective pest control agents.

One of the key goals of the March–April 2011 farmer training at the Navdanya training farm and in Ranikhet in India, was that those trained eventually become the trainers of other Samdrup Jongkhar farmers. It is also intended that their farms will become models of good organic practices for others to emulate. In these ways the benefits of each farmer training session can potentially be extended and multiplied.

e) Ensure on-going consultations with the Navdanya and OFAI farmer trainers: By agreement with Navdanya, its farmer trainers will visit Samdrup Jongkhar every three to four months for three years in order to assist farmers in the region, teaching and training them in agroecology and organic farming methods, and monitoring their progress. As well, OFAI conducted a training in February 2011 in organic cooperative formation and management, and has offered to continue advising that process.

f) Build awareness of agricultural diversity through education:

- In a number of locales worldwide where farmers adopted organic methods instead of industrial agriculture, farmer-run schools have sprung up to help spread new low-impact techniques that increase productivity without the use of chemical pesticides or fertilisers. Shifts away from industrial agriculture are typically preceded by increased awareness among farmers and consumers of the adverse impacts of industrial farming techniques and products, including unbearable debt loads due to dependency on expensive inputs, and pesticide-induced illnesses. Education, in the formal, non-formal, and informal systems is an important aspect of this shift in awareness and practice.

- In line with the overall GNH-based holistic approach outlined in this *Profile*, a joint SJI-Navdanya project could develop holistic teaching modules for farmers, schools, and non-formal education based on Dr. Vandana Shiva's speech to the SJI Launch and other Navdanya materials. This project could include existing materials from the Center for Ecoliteracy and other organisations that have already done work in the area of educating for sustainability.

7.3 Markets that work for farmers

a) Develop local markets for food grown in Samdrup Jongkhar: One of the key stated objectives of the SJI is to develop a suitable system in which farmers are guaranteed local buyers for their crops (so that their surplus production is not wasted), and produce is purchased by local institutions with guarantees of reliable and adequate supplies.

Strong local food networks, once developed, do not require a middleman, thereby increasing benefits to local farmers. In other words, food bought directly from farmers should be less expensive than buying from merchants, with farmers reaping a higher share of the purchase price. In other words, there is a huge margin of added cost that could potentially be eliminated, making it possible for local food to work for both supplier and buyer. Marketing models therefore need to be established in Samdrup Jongkhar that encourage consumers to rebuild links to their local sources of food.

There is, therefore, a strong economic argument for localised economies. Farmers can potentially benefit more from small-scale farming and direct local sales of surplus produce, keeping most of the sale price. In industrial systems, by contrast, farmers typically keep only a small fraction of the produce sale price, with middlemen, transporters, wholesalers, and retailers between them making most of the profit.

There is also a strong multiplier effect in local economies, where money spent locally typically re-circulates in the community, thereby potentially strengthening the local Samdrup Jongkhar economy and benefitting the local community far more than when produce is imported from India. In addition, locally grown food will almost certainly be

fresher, have fewer chemical residues, and be healthier and more nutritious than the imported food.

In February 2011, initial meetings were held to explore the potential for local farmers to partner with the four large institutions in Dewathang town: the Chokyi Gyatso Institute of Buddhist Studies, the Jigme Namgyel Polytechnic, the Hospital, and the Army base.[439] Supply to local bazaar shopkeepers was also explored. These initial meetings, attended and led by three farmer trainers from the Organic Farming Association of India—Miguel Braganza, Ashish Gupta, and Vikram Rawat—were very promising, and generated considerable enthusiasm among farmers for forming organic cooperatives to supply local markets.[440]

However, it is very important that these initial trainings be followed up. For instance, based on the names of interested farmers already collected, self-help groups can be formed, as well as an umbrella organic cooperative federation for Samdrup Jongkhar, which can help ensure adequate supply to local markets by coordinating among smaller farmer groups. For example, a shortage of supply in one area might be made up in another area through effective coordination.

Follow-up steps from the February 2011 cooperative trainings also include a number of practical and logistic steps: identifying suitable fallow land for cultivation to increase supply, establishing bank accounts for new self-help groups, deciding delivery points for organic produce, procuring a delivery vehicle or negotiating with the Dewathang Milk Marketing Cooperative (DMMC) for access to its vehicle, and pricing produce accurately to include intermediate costs to farmers. Contact and ordering procedures between the producers and the buyers must also be facilitated for a local supply system to work effectively. Follow-up is also needed with local vendors to ensure they set aside a well-marked area in their shops for organic local produce.

---

[439] Table 12 in the *Profile of Samdrup Jongkhar Dzongkhag* presents some preliminary data collected through an informal survey on the quantities and types of produce currently purchased from India by the four large institutions situated in Dewathang town and by the largest vegetable vendor in Samdrup Jongkhar town. At the time of writing, it was revealed that additional, more comprehensive data exist with the Ministry of Agriculture's Department of Agricultural Marketing and Cooperatives, which collected baseline data in order to create a supply chain between farmers and vendors in the region. The SJI should access these data in order to move forward in this area and to monitor progress in moving from imported to local food sources.

[440] On February 18, 2011, SJI began a ten day programme of linking organic farmers to potential buyers, both institutional and individual, as well as upgrading marketing skills through collective action. The resource people present at these meetings were Miguel Braganza, Ashish Gupta, and Vikram Rawat, all from the Organic Farming Association of India, whose core competencies was in organic cultivation of fruits and vegetables in mountainous locations, collection and marketing of the organic fruits and vegetables, and capacity building and networking among farmer groups in India. Farmers from the three eastern Samdrup Jongkhar gewogs of Lauri, Serthi, and Langchenphu joined local farmers at the day-long sensitisation and question/answer programme at the Jigme Namgyel Polytechnic in Dewathang. Additional trainings in cooperative formation and management were conducted in Pemathang, Phuntshothang, Dewathang, and Orong Gewogs. Miguel Braganza is the Additional Director, OFAI Central Secretariat, Goa, and Convener-South Asia for IFOAM's Intercontinental Network of Organic Farmers' Organizations [INOFO] in Goa, India. Ashish Gupta is the OFAI National Steering Committee member from Delhi, and Vikram Rawat is the OFAI State Coordinator and farmer representative from Himachal Pradesh.

Realistic targets could be set without delay. Currently, Dewathang vegetable vendors and the institutions listed above purchase virtually all their produce from India. A target of 10% local organic purchases within a year's time would be a feasible goal. That is, within a year, 10% of produce purchased and served by local institutions and sold by local stores would be locally procured organic produce.

Following a series of extensive meetings and interviews, Miguel Braganza of OFAI concluded that there is substantial potential demand and willingness on the part of the large institutions and vendors in Dewathang and Samdrup Jongkhar to source their vegetables locally if "the prices are competitive, the quality is better and the supply of required quantities are assured on a bi-weekly basis at a single delivery point." He says that meeting these requirements "is the challenge before the Samdrup Jongkhar Initiative."

According to Braganza, the following series of steps and interventions are required to create and form effective organic growing and marketing cooperatives, and to develop local markets that work for both producers and buyers:

1. While growing a diverse variety of crops for home consumption, the initial focus for local marketing purposes should be on a select few crops that have the best potential to make farming profitable. Based on the observations of the OFAI group, Braganza recommends an initial focus on improvement of orange cultivation among those farmers with orchards. The OFAI group also saw potential in banana and potato cultivation for local marketing purposes, and recommended that farmers intercrop vegetables to create sufficient supply to a cooperative for marketing.

2. The OFAI group recommended that SJI work as a facilitator in providing literature, training, and items such as worms for vermicompost, etc. It should also liaise with various stake holders such as the Ministry of Agriculture's National Organic Program and local agriculture officers to promote organic farming and conduct outreach among villages.

3. Farming practices must be gradually improved to provide adequate supply for local markets. For example, slope farming on the mountains requires contouring for soil conservation and water retention. This, says Braganza, must be encouraged as a best practice amongst farmers. As a service to its members, each cooperative should have a 'Best Practices' manual chronicling local experiences and practices such as basin management, compost methods etc., which the SJI farmer liaisons can also use to communicate this information to illiterate farmers unable to use the manual directly.

4. To create effective marketing cooperatives, the OFAI group recommends starting with the creation of small cooperative groups in Dewathang Gewog, which may leverage the existing cooperative infrastructure of the Dewathang Milk Marketing

Cooperative (DMMC) to start marketing produce. If a suitable arrangement can be made with DMMC, its milk collection and delivery vehicle might possibly be used for initial vegetable marketing, for example. Building on such existing infrastructure will provide the means for a gradual expansion of scale without having to reinvent and reinvest in new schemes for marketing. Such initial leverage of existing infrastructure, as a model for further development, and creation of small cooperatives in its home base of Dewathang, can be a logical next steps for SJI in encouraging formation of organic cooperatives.

5. Braganza recommends that SJI consider adopting a set of farms for two to three years to model organic farming techniques to which other farmers can refer. Produce from these farms can be sold under a cooperative umbrella to support these farmers and to reward their initiative in modelling best farming practices. The modelling must be planned in a fair and sustainable manner so as not to create jealousies, but rather to encourage and reward other farmers who wish to come on board.

6. Braganza recommends identifying farmers to be organised into Participatory Guarantee System (PGS) 'Local Groups' (LGs) in different villages of each Gewog for organic certification purposes, with SJI assisting the process of setting up these LGs.

7. OFAI also recommends continued protection of forest cover, since these forests will provide lifelines for water, timber, and herbs. If forests were to shrink, the first casualty would be availability of perennial water sources, with such shrinkage highly detrimental to agriculture in the long run.

8. Based on its cooperative marketing experience, the OFAI group also recommends twinning the PGS Local Groups at higher and lower elevations in order to grow and market cooperatively the widest range of vegetables and cereals required locally.

9. Begin by setting up one cooperative [with a minimum of 15 members as per Bhutan's Cooperative Act requirements], preferably from among the members of the 'Local Groups' of famers, but including persons with some accounting, management, and administration skills, to market the vegetables to the local institutions and/or vendors, preferably starting with one institution or vendor to ensure adequate and consistent supply.

10. Among the services provided to its members by the cooperative, OFAI recommends identifying sources of crop seeds and other inputs necessary to cultivate crops organically, and creating seed banks (see above).

11. Since effective cooperative marketing requires consistency in supply over time, OFAI recommends planning a planting schedule among cooperative members, as

well as a suitable crop mix and agreement on quantities to be grown and supplied by each farmer, depending on his/her land holding and ability to grow.

12. As a further service provided by the cooperative, Braganza further recommends training the farmers in growing the selected crops using the best practices for soil preparation, nursery, transplanting, covered cultivation, etc. To coordinate with the Bhutan Ministry of Agriculture and Forests, he recommends using the National Organic Program's books, brochures, posters, and other materials where available and suitable. He notes that SJI can play a useful intermediary role in making this literature available to the Samdrup Jongkhar Agriculture officials who, based on discussions with the visiting OFAI trainers, appear not to be familiar with these NOP materials.

13. As a further service offered by cooperatives to members, OFAI recommends identifying potential farmer-leaders to create a cadre of local trainers through a training of trainers [TOT] program.

14. Again to assist cooperative members, OFAI recommends trouble-shooting in all phases of the process, including the pre-sowing, nursery, transplanting, crop growth, harvesting, sorting, grading, packing, transportation and marketing phases.

15. Braganza notes that effective cooperative management also requires monitoring, data analysis, and periodic course correction based on the data analysed.

16. At the end of each growing season, he further recommends that the cooperative review the quantity and quality of different crops grown and marketed, chronicle its successes and failures, undertake an economic and financial review, and plan for remedial action as well as up-scaling if the potential for expansion and new markets exists.

17. OFAI also recommends that the cooperatives not operate in isolation but link the SJI project farmers and cooperatives with existing government schemes and subsidies, where available, including availing of services offered by the Ministry of Agriculture's marketing division.

18. Finally, OFAI recommends enhancing consumer awareness through flyers/hand-outs, publicity for success stories, newspaper reports, and other means.[441]

b) Careful monitoring of pilot projects during transition to organic: Very careful monitoring of the pilot organic cooperative and marketing projects, and a fail-safe set of farmer supports and market guarantees in collaboration with Bhutan's Ministry of

[441] Miguel Braganza, Gupta, Ashish and Vikram Rawat. *A Report on OFAI and Samdrup Jongkhar Initiative Organic Farming, PGS, and Farmer Cooperative Workshops*, Feb. 17–28, 2011. Submitted to Organic Farming Association of India and Samdrup Jongkhar Initiative. Report is available in Volume 2: Appendix 6 of *Profile* Report.

Agriculture and its National Organic Programme, are seen as essential particularly during the initial transition period, with gradually increased farmer self-reliance and reduced dependence on supports in the longer-term. This is clearly an area of priority concern in the Samdrup Jongkhar Initiative research program, which is being conducted under Navdanya supervision, and indicates the vital practical importance of careful monitoring and assessment. For example, it will be crucial to detect any drop in yields to trigger timely remedial action before a farmer suffers any economic loss.

c) Government support through incentives and supports: There needs to be support for the farmer pioneers who are trying to build a food system that not only builds on local wisdom and strengthens community, but that is ecologically possible and economically viable. This support needs to come from government in terms of supports or incentives and also from the local community itself in willingness to purchase from local farmers.

Government policy in "going organic" must also be aligned with the efforts of the SJI. Contradictory advice from agriculture extension officers—who are often trained in conventional methods—will only serve to confuse farmers and inhibit progress toward the shift to a sustainable organic agricultural system. For this reason, SJI included the Samdrup Jongkhar District Agriculture Officer, three agriculture extension officers, and two national representatives of the National Organic Program in its three-week organic study visit to India, including 11 days of training at the Navdanya farm in Dehradun, in March–April 2011. This kind of collaboration should be deepened, strengthened, and expanded.

In the first one or two years of the shift towards organic cultivation, there is an increase in labour requirements due to the implementation of various techniques, (terracing or contouring, building compost pits, collecting compost, creating rain water storage structures, building tunnel covers for summer crops etc.), which in the long run will result in less labour input.

Because many dzongkhag farmers are older, we recommend involving youth and school-age students during their winter vacation, as either paid internships (for school leavers) or as counting toward academic credit (for school-goers), as a way of dealing with this initial labour-input requirement, particularly to create essential but labour-intensive farm infrastructure. This active youth participation will also build awareness among youth about food security and organic agriculture techniques, strengthen family and community bonds, and potentially help stem the tide of rural-urban migration.

See recommendation #1q) above: *Build awareness of food security through education.*

d) Develop and promote value added products: The SJI is taking a three-pronged approach in its farmer trainings focussing on organic methods, value added/processing, and cooperatives/marketing. All three of these methods are designed to enhance the economic viability of farming when practiced together.

Value-added is therefore part of "the package" reflected in the trainings provided by SJI,

Navdanya, and OFAI in 2010–2011. Learning first-hand about value-added processing was one of the key reasons for the select Samdrup Jongkhar farmers from all 11 gewogs visiting Ranikhet, India, in April 2011. During this visit, farmers from SJ witnessed the operation of a cooperative that successfully engages in value-added processing (i.e. jams, juices, preserves, pickles) of organic produce.

The basic purpose of value-added production is to extract the greatest economic and social value from every unit of product harvested, with the least amount of resource depletion or damage to the environment. Farmers in Samdrup Jongkhar currently engage in very little value-added production, but if they move in this direction, they can potentially sell low volume but high value products. After catering first to the local market, where local institutions will hopefully commit to "buy local," then attention can be paid to providing products for a national and perhaps international market. The new Centre for Appropriate Technology, initiated by SJI and now part of JNP, can potentially play an extremely useful role in innovating and fabricating low-cost equipment for value-added processing by local farmers.

Value-added items should be as non-perishable as possible to avoid the higher transportation costs and spoilage losses involved in getting perishables quickly to market. Beginning possibilities are nuts, fruit preserves (i.e. orange marmalade), dried fruits and vegetables, pickles, spices, and fruit squashes. For example, farmer trainer Miguel Braganza observed that no juices or concentrates of orange are currently produced in Samdrup Jongkhar, despite its ample citrus production (mostly for export to Bangladesh), whereas synthetic flavoured RTD 'fruit' juices imported from Bangladesh are sold extensively.[442]

As previously noted, drying of produce is one way to add value to produce and help overcome some major agricultural marketing challenges like poor transport and storage infrastructure. Proper drying not only retains most food nutrients, but can significantly extend shelf life, particularly of many fruits and vegetables that are not currently fully utilized in the dzongkhag.

To this end, low-cost solar drying technologies in use at the Barli Development Institute for Rural Woman are now being applied in remote Lauri Gewog in Samdrup Jongkhar. In February 2011, two experts from the Institute in Indore, Madhya Pradesh, made an initial visit to Samdrup Jongkhar to present their work both to Polytechnic faculty and to villagers and farmers from throughout the dzongkhag in both Dewathang town and the Bhangtar area, and to assess conditions and potential needs for more extensive training.

In September–October 2011, SJI sent a JNP faculty member and six Lauri village women for training at the Barli Institute, after which a prototype solar drier was built and tested at JNP in November–December 2011. SJI and JNP, with assistance from the National Post-Harvest Centre, then successfully field tested two more driers made from local materials in Lauri Gewog in the winter of 2011–12, and 24 solar driers will be fabricated

[442] Ibid.

in Lauri Gewog in March–May 2012, with training in their use provided to villagers.

In November–December 2011, SJI also undertook an initial study on which fruits and vegetables, either currently grown or potentially grown, would be most suitable for drying in Lauri Gewog, and further studies need to be undertaken on which fruits, vegetables, and herbs would most effectively meet the criteria of "low volume but high value products" throughout the dzongkhag. Initial observations and field interviews have noted that there are many fruits, not currently fully utilised (such as bananas, oranges, mangoes, and more) as well as cucumbers, pumpkins, and non-wood forest products like chirata that could be dried more efficiently using low-cost technologies.

The Royal Government of Bhutan has supported many villages by providing labour-saving technologies, such as rice hulling machines, oil extractors, etc. This kind of support for value-added production—through the provision of processing equipment or processing supplies such as jars, and solar panels and other equipment for solar drying units will be very beneficial in jump-starting value-added production in the dzongkhag.

e) Promote wise use of non-wood forest products (NWFP): Three herbs that are already bringing benefit and have great potential for further sustainable commercialisation in Samdrup Jongkhar are Chirata (Swertia chirayita), Rubia cordifolia, and Illicum griffithii. Community-based approaches to forestry and natural resource management have been promoted in order to strengthen the link between protecting such valuable natural resources and developing rural communities.

Thus, there are already a number of groups formed in Samdrup Jongkhar for the purpose of harvesting and marketing such NWFPs, the most important one being the Community Forestry group in Lauri Gewog, which includes all villages in the gewog. That group is presently focused on managing and marketing Chirata (Swertia chirayita), an important medicinal plant. However, the Lauri Gewog farmers who participated in SJI training and information sessions in 2011 reported that most Chirata profits are not presently made by the collectors in Lauri but by middlemen. There are two other NWFP groups formed in Martshala Gewog focused on management and marketing of Rubia cordifolia (mostly used as dye).

According to Miguel Braganza of the Organic Farming Association of India, "there is no regulated market for NWFP in Bhutan. There are also no standards for eco-certification for preventing over-exploitation and sustaining the production of NWFP." He recommends that Bhutan look to the standards and procedures currently being developed for India and other Asian countries through the 'PGS-Wild', Keystone Foundation, and Government of India appointed committee on NWFP development.[443]

One potential model for further developing NWFP in Samdrup Jongkhar can be found in India's Uttaranchal State—where topography and climate are similar to some parts of Samdrup Jongkhar. Here, the indigenous knowledge of *Vaidyas* (traditional healers) was

[443] Ibid.

studied. A survey interviewed 60 *Vaidyas* and compiled an inventory of 135 herbal drugs, which were used by the *Vaidyas* for curing 55 types of ailments. This study might provide a relevant point of reference regarding medicinal herb potential in the dzongkhag.[444] Please see the Appendix of this *Profile* for an initial proposal by Amy Jennings, prepared for SJI, on medicinal plant development in Samdrup Jongkhar.

It is recommended that SJI also liaise on this subject with the Director of the Cabinet Secretariat, Phuntsho Namgyel, who did his PhD on the subject of NWFP, and with resident Bhutan experts like Rebecca Pradhan of RSPN and Irmela Krug-Harz of BioBhutan, to identify other potential medicinal plants and NWFP in Samdrup Jongkhar, as well as to ensure plants are not over-exploited.

f) Promote the cooperative model of community development: Individually, small farmers may be weak in accessing resources and information and marketing their products. But together they can potentially be very strong. Cooperatives have a number of social, economic and environmental benefits, but for the most part they are set up by groups of individuals in order to achieve something collectively—provide a service or market a product—that they could not ordinarily do on their own. Marketing collectives also help farmers get fair returns.

Forming groups and working together for the collective good has always been an essential component of traditional Bhutanese society (e.g. household labour sharing, communal management of grazing land, protection and sharing of water sources and irrigation, etc). Forming farmers' groups therefore not only builds on traditional organisational and management patterns, but are also a way to enhance rural development in the modern era. There are currently 480 farmers' groups in the country, of which 17 are in Samdrup Jongkhar.

One notable example is the Dewathang Milk Marketing Cooperative (DMMC), the oldest farmers' group in Bhutan. Over the years, it has achieved considerable benefit for its farmer members, who would not otherwise have had the means or financial capacity to market their milk. For these farmers, the benefits of being part of a collective or group are very tangible, including subsidised pick-up and transport of milk from Dewathang farmers to Samdrup Jongkhar town, fair pricing per litre, a community office for monthly meetings, assistance with managing debt payments, and support and advice provided by other milk-producing members.

It is recommended that the cooperative model also be used in potential cultural and ecological tourism development, handicrafts such as weaving and bamboo, medicinal plant development, and in value-added production. This model can ensure not only economic efficiency and high standards, but also protect resource health, guard against exploitation, promote equitable distribution of benefits, provide services to members, and

[444] Chandra Prakash Kala, Nehal A. Farooquee, and B.S. Majila. 2005. *Indigenous Knowledge and Medicinal Plants used by Vaidyas in Uttaranchal, India*. G.B. Pant Institute of Himalayan Environment and Development. Available online.

promote community solidarity.

g) Explore potential and economic viability of weaving centre in Dewathang: A weaving and handicraft cooperative could be very beneficial for the women weavers of Samdrup Jongkhar, particularly if the area opens up to tourism. Such a cooperative would eliminate the need for a middleman, provide the weavers with better bargaining power to fetch a better price, and ensure that more of the money from the sale of the textiles would be returned to the group.

In addition, one idea that arose in several of the communities visited during field research was the creation of a weaving centre where men and women would be trained as weavers and tailors to supply the school uniforms for Bhutanese school students, who are all required to purchase uniforms. Currently, villagers report that nearly all such uniform requirements in Bhutan are apparently outsourced to India.

If this school uniform production were to be brought home, one key issue that would have to be addressed is cost, to ensure that producing these uniforms in Bhutan will not create higher costs for students. This could partly be addressed by the use of machine (imported) looms that make the production much less time consuming than use of traditional back strap looms. Another possibility is to subsidise the cost of the school uniforms through the sale of higher-end items to tourists.

Further study is required to assess the economic feasibility of such a weaving centre, with the linked goals of providing meaningful work based largely on already existing skills, and increasing self-reliance in the dzongkhag.

h) Build awareness about markets through education: To date, training workshops held by the SJI about composting and other organic farming methods, value-added processing, and forming self-help groups and cooperatives, have reached several hundred farmers in the region. On-going consultations with Navdanya farmer trainers and trainers in cooperative formation and management from the Organic Farming Association of India will ensure that information and advice will continue to flow to the SJI and to farmers in the region.

After their 11-day training at the Navdanya farm in Dehradun, 20 Samdrup Jongkhar farmers from all 11 gewogs, together with the District Agriculture Officer and three Agriculture Extension Officers and two National Organic Program representatives, undertook an additional short study tour hosted by the Pan Himalayan Grassroots Development Foundation (Grassroots India) in Ranikhet, in Uttarakhand, India. Grassroots India, founded by Kalyan and Anita Paul, focuses on value-added processing using organic produce, and has also had considerable success with rainwater harvesting for irrigation. The crucial step now is to turn the intensive training from some of India's top organic farmers and cooperative managers into practice in Samdrup Jongkhar.

7.4 Living standards and wellbeing

a) Measure household and farmer debt: Given the serious debt problems that have arisen just south of the border in India, and elsewhere in the world, with farmers amassing unmanageable debt burdens, it would be wise to monitor the levels of indebtedness in Samdrup Jongkhar (and indeed in all of Bhutan) to ensure that this troubling trend does not emerge here. On-going research in this area, particularly by the National Statistics Bureau, can provide early warning signals of potential problems and challenges, and enable timely course corrections. Field research interviews indicate there may already be some warning signs with regard to farmer debt in the dzongkhag

According to the Dasho Dzongdag of Samdrup Jongkhar, Phub Tshering, there is already a debt repayment problem in the district, particularly among rural people whose income may be insufficient to service their debt. He says that the head of each gewog—the Gup—is now responsible to help the Bhutan Development Finance Corporation (BDFC) collect money from borrowers.

According to Tashi Tobgyel, the Chairman of the Dewathang Milk Marketing Cooperative (DMMC), many of the farmers are "very poor," and the cost of purchasing Jersey cows and their upkeep is steep, so they have to take out loans. He says they get loans from the BDFC to purchase the cows at a rate of 10% interest/year, and that currently the loans are quite manageable for the farmers. He says that, thus far, the farmers do not have any problems with defaulting, and their payments (every three months) are managed by the DMMC by subtracting debt payments from the reliable income source of milk revenues. This indicates that absence of such guaranteed income likely renders other farmers without such cooperative assistance more vulnerable. About 40 farmers (out of the 80 active DMMC members) have loans.

The DMMC example therefore provides a potential model of successful credit and debt servicing management. In light of the Dasho Dzongdag's warnings, however, it is clear that careful monitoring of rural debt in Samdrup Jongkhar is essential to help ensure that extreme farm debt problems of the kind that have plagued India do not emerge here.

b) Promote community-based ecological and cultural tourism: Cultural knowledge and traditional knowledge and skills are prevalent among large numbers of Bhutanese, and the country is gifted with pristine, unspoiled protected landscapes as well as rich ancient wisdom traditions from which visitors to the country can readily learn. The wide spread of traditional knowledge and skills means that rural and less-educated Bhutanese can participate in cultural industries as well as in eco-tourism in order to achieve sustainable livelihoods.

Tourism development in the dzongkhag must take particular care to generate decent work and right livelihoods for local residents and to avoid widening the income gap, which is often an unintended result of tourism endeavours. Please see the end of Chapter 5 above

for initial ideas generated by SJI on potential cultural and ecological tourism endeavours for the dzongkhag.

c) Undertake on-going field research to ensure benefits of SJI are equitably and optimally distributed: During field research in 2010–11, it was not possible for the SJI research team to visit Lauri, Serthi, Langchenphu, or Samrang Gewogs, all of which are remote, lack roads, and have high poverty rates.[445] As well, the field research results reported in this *Profile,* even for the seven gewogs visited, should be regarded as preliminary and illustrative rather than definitive or comprehensive.

However, it is important to know in greater depth how each gewog is faring, not just based on statistics, but by visiting the villages and speaking directly with villagers. A great deal of information is gleaned through observation. In order to ensure that the benefits of the SJI are equitably distributed throughout the dzongkhag, therefore, it is important to undertake further and on-going field research over time to ascertain the specific needs and challenges facing each gewog, so that development and technologies are appropriate to local conditions. Good information also ensures that development initiatives are not out of touch with reality but reflect and are based firmly in existing conditions.

d) Development in accord with balanced and integrated approach of GNH: All new forms of economic diversification and potential livelihood improvement in Samdrup Jongkhar should simultaneously strengthen communities, enhance self-reliance, conserve the local environment, and promote the local culture. Please see section below on whether mining conforms to these criteria.

The goals of the SJI are fully synchronous with the integrated and holistic GNH development approach of the Royal Government of Bhutan. Development strategies currently being pursued by the SJI are also in line with the following statement by Bhutan's National Environment Commission (NEC):

> "The potential for future industrial development in the country lies in the development of a network of small-scale and cottage industries based on sustainable management of cultural and natural endowments, especially focusing on niche products such as hand-woven textiles using natural dye and organically produced food and medicinal products."[446]

e) Projects with Centre of Appropriate Technology (CAT) at the JNP campus:[447]

The term *appropriate technology* refers to a wide range of ecologically-friendly and

[445] For a detailed discussion please see *Objectives and Methodology of Field Research* in the Appendix of the main report.
[446] National Environment Commission. 2008. *Bhutan Environment Outlook*. Royal Government of Bhutan, Thimphu, p. 18.
[447] The following is taken from "SJ Centre for Appropriate Technology—Concept Paper," prepared by Luke Raftis for the Jigme Namgyel Polytechnic and the Samdrup Jongkhar Initiative, March 6, 2011.

generally low-cost technical and socio-technical solutions, which are compatible with the social, cultural, environmental, and economic conditions of the people they serve. In practice, the focus is usually, though not exclusively, on rural and agricultural populations, primarily because mainstream technological solutions are more likely to be out of reach financially, or otherwise impractical for these populations.

Technologies that are considered 'appropriate' generally embody the following characteristics: they do not create dependency, they maintain local control, they are easily maintained and repaired locally, they are environmentally benign and low-cost, and they cause little cultural disruption. It is important to note that whether or not a given technology could be considered appropriate depends heavily on the cultural, economic, social, and geographic context. Technologies that make sense in one area may be completely inappropriate in a different region or culture, so a thorough understanding of the local context is important.

The following are examples of technologies that have been proposed as potentially appropriate for Samdrup Jongkhar. Further exploration and investigation to determine appropriateness, feasibility, and capacity to contribute to local livelihoods and environmental conservation is required:

- solar drying of fruits, vegetables, and herbs
- wildlife deterrent devices
- rainwater harvesting systems
- food storage and processing equipment
- composting and biogas units, compost toilets, and other zero waste solutions
- natural bamboo curing and preserving to support bamboo-based crafts industries
- mud brick fabrication systems
- natural cosmetic and soap-making equipment using local soap berries
- processing devices for locally available medicinal herbs and other non-wood forest products
- organic farming aids
- hand-held citizen driven air quality monitoring devices (of the kind apparently available in India)

The CAT would conduct research on an on-going basis to maintain a detailed knowledge base of the current practices, problems and trends in the area as well as solutions that have been tried successfully elsewhere. It will promote technology transfer and best-practice dissemination where appropriate, and act as a resource for the rural community, providing training sessions, advice, and support for new technologies, agricultural practices, and agro-enterprises. The Centre will also provide courses for students at JNP that will address problems facing rural and agricultural communities in Bhutan, with the first such course scheduled to be offered in 2013.

At a meeting held at JNP on 25th February 2012, the JNP Director indicated that development of rainwater harvesting systems could be an excellent upcoming priority for the new Centre for Appropriate Technology—a project that would be right in line with SJI priorities, and which would lend itself to further collaboration with the Barefoot

College that has first-rate expertise in this area.

f) Build awareness of wellbeing through education and youth mobilisation:

Initial efforts in education and youth development are being taken in the non-formal, informal, and formal spheres.

For example, the study tours arranged by the SJI to date are truly a combination of formal, non-formal and informal education. Farmers from each Samdrup Jongkhar gewog visited the Punjab in March 2011, for instance, to learn the perils of farm debt and chemical farming, and thereby how to avoid falling into the trap of amassing unmanageable debt from farm inputs. They then undertook 11 days of more formal training at the Navdanya training farm and then took went to the Ranikhet region of Uttaranchal to observe organic cooperative functioning, rainwater harvesting systems, and terracing methods.

When these farmers returned to their villages in Samdrup Jongkhar in April 2011, they informed other farmers, in an informal way, of what they learned. Follow-up visits to these farms are intended to assist farmers in implementing effectively what they have learned, and further trainings are planned for other villages in the dzongkhag that were not able to participate in the 2011 SJI trainings. In short, these trainings combine formal, non-formal, and informal efforts.

As well, trainings in solar drying, value-added processing, rain water harvesting, have also combined all three of these elements, with primary focus on non-formal education designed to enhance livelihood. This has been combined with the more formal educational training of six Lauri village women at the Barefoot College for six months, and three JNP students working with the SJI solar drier project as part of their on-the-job training component of their formal diploma requirements. At the same time, Lauri villagers are learning about solar drying informally through actual use of the new SJI-installed equipment. In short, SJI education is occurring in formal, non-formal, and informal ways.

The JNP Centre for Appropriate Technology is also intended to act as a knowledge base for the SJI as a whole, with the particular goal of improving livelihoods in the dzongkhag. Based on consultations with JNP staff, appropriate technology components will be incorporated into existing JNP courses and curricular units, into a new overview Introduction to Appropriate Technology course to be offered in 2013, and particularly into the 5th semester practicum projects presently required by the JNP. JNP faculty suggest that such practicums can already be readily geared to the design, fabrication, field testing, implementation, and improvement of appropriate technologies of direct use to local communities.

As well, the SJI has embarked on its first direct youth outreach and mobilisation activity with a highly successful week-long youth art camp offered in Dewathang in January 2012, taught by the director and highly trained instructors from the Voluntary Artists'

Studio, Thimphu. Sixty-three local youth, four SJI staff, and 15 instructors and students from Thimphu focussed their week-long artistic activities on zero waste art, ate organically grown food supplied by local farmers, and are now carrying their activities forward into monthly gatherings. On 26th February, local youth gathered at the Chokyi Gyatso Institute under SJI auspices to make cushions from waste materials for presentation to the Institute.

7.5 Environmental quality and wise development

Environmental conservation is one of the four core pillars of Gross National Happiness, and also a cornerstone of all SJI activities. In first announcing the Samdrup Jongkhar Initiative in March 2010, Dzongsar Khyentse Rinpoche described it as 'ecologically-friendly development.' Monitoring environmental quality is one of the key ways of assessing and ensuring that development activities are in harmony with nature. This monitoring includes the following actions:

a) Measure soil quality: In order to measure any changes in soil quality, soil samples should be tested before the transition to organic agriculture, and then again afterward to ascertain changes. Quality can be measured by soil organic matter or soil organic carbon. Quality can also be measured by soil structure; soil conservation; and soil foodweb health. For each of these indicators, measurement methods are presented and sustainability objectives are proposed in the GPI Soils and Agriculture Accounts. Please refer to Chapter 8 of this *Profile* report for more details on soil quality indicators.

The first steps in this direction were taken in the spring and summer of 2011, when two SJI researchers, Emily Green-Tracewicz and Chisato Maeda, took extensive soil samples from several farms and had them tested at the Ministry of Agriculture's National Soil Science Centre in Thimphu. Results will be presented in the organic agriculture monitoring report to be produced in 2012.

b) Measure ambient air quality: Ambient air quality refers to pollutant concentrations to which the general population is exposed. Currently, data are not available on the quality of air in Samdrup Jongkhar. However, there is reason to believe that human health is being compromised by both transboundary pollution from India as well as, on a local level, the transport of coal from the open pit coal mine (S.D. Eastern Bhutan Coal Company) in Rishore to the town of Samdrup Jongkhar, the transport and storage of gypsum, the ferro-silicon plant near Samdrup Jongkhar town, and other point sources.

During field research, from November until March, the research team was stationed in the town of Dewathang, approximately 18 km from the border with India. On most days, a pale band of haze obscured not only the view of the plains of Assam but more alarmingly, the sun. These "brown clouds" as they are called, are known to affect human health and are now suspected in India to reduce rice productivity.

In addition, truck transport of coal between Rishore village, through the town of

Dewathang, to Samdrup Jongkhar results in often high levels of exhaust and dust (road dust combined with coal dust) in the air. Some residents of Dewathang town wear face masks to avoid inhaling the pollution. Complaints about the dust created by the coal-carrying trucks during the dry season lead the coal mining company to water the roads daily to keep the dust down. However, in many places, the result may be as hazardous to health. The water when mixed with the spilled coal from the trucks leaves an iridescent slurry coating the roads and filling the potholes. Invariably, this mixture washes down the hills, potentially polluting agricultural fields, streams, and water sources.

It is recommended that the National Environment Commission undertake a full in-depth test of air quality in various parts of Samdrup Jongkhar. As well, it is recommended that SJI explore the use of hand-held air quality monitors with Jayakumar Chelaton of Thanal, who reported their use in India to SJI staff as useful citizen-based monitoring devices.

c) Conduct a full cost assessment of coal mining in Samdrup Jongkhar:
This is clearly a sensitive issue politically and economically. But SJI researchers felt compelled to recommend such an investigation since pursuit of GNH-based ecologically-friendly development must not only recommend what types of development are consonant with this objective, but also honestly assess whether some forms of development may detract from GNH objectives.

A comprehensive cost benefit study, including both short and long-term costs, should therefore be conducted to assess the full costs of coal mining in Samdrup Jongkhar against the revenues to the state and employment, including the proportion of workers who are nationals. Since SJI has the specific goal of fostering ecologically-friendly GNH-based development, the coal mine operation near Dewathang town should particularly be assessed for its compatibility with GNH principles and SJI objectives. A similar assessment in terms of health and environmental impacts, including the number of nationals in the factory workforce, should also be conducted for its sister plant – S.D. Eastern Bhutan Ferro Silicon Ltd., located approximately 7 km from Samdrup Jongkhar town.

As discussed in the *Profile* report, global warming, which is scientifically linked to the combustion of fossil fuels like coal and oil, has serious implications for Bhutan in terms of potentially devastating glacial lake outburst flooding. Thus, from this larger global perspective, it is also highly questionable whether the country wishes to be mining one of the greatest contributors to this global as well as national calamity.

In the interim, it is recommended that an alternate route for the coal-carrying trucks be explored, possibly one directly linking the coal mining pit to the Samdrup Jongkhar road, thus by-passing the villages of Rishore, Khorpan, Chennari, Samdrupgatshel, and Dewathang. Tata trucks carrying coal from S.D. Eastern Bhutan Coal Company travel daily, day and night along the 6 km stretch between Rishore and Dewathang village, carrying coal to Samdrup Jongkhar, about 18 km away, where the coal is unloaded, next to the S.D. Eastern Bhutan Ferro Silicon Ltd. plant.

Based on several months of observation, the authors of this report considered that the heavy volume of large truck traffic through the small town, in very close proximity to people's homes, a hospital, and a primary school, is compromising the wellbeing of the villagers. Villagers, particularly young children, are continuously exposed to very high levels of exhaust, dust, noise, and danger, particularly since many of the trucks travel through the village at high speeds.

Such a full-cost-benefit analysis should also be undertaken before work begins on a proposed new coal mine in Bhangtar, also to be operated by the S.D. Eastern Bhutan Coal Company.

d) Halt consideration of oil extraction in Phuntshothang Gewog: News reports indicate that Bhutan's Department of Geology and Mines has expressed interest in a proposal by an American mining company to explore the potential for oil in Bhangtar, in Phuntshothang Gewog of Samdrup Jongkhar.[448] In fact, according to *Kuensel,* the U.S-based Cline Group is trying to gain mineral exploration rights for the entire country.[449]

The goals of the SJI are aligned with the following statement by Bhutan's National Environment Commission (NEC): "[T]he concept of large-scale industrial development is in direct conflict with the country's policy of environmentally sustainable development especially when bearing in mind the country's fragile mountain ecosystem and limited usable land."[450]

In line with this NEC statement and seen through a GNH lens, large-scale mineral extraction may well be highly deleterious for Bhutan, and for Samdrup Jongkhar in particular, both in terms of costs to the environment and in terms of community health and wellbeing. The costs associated with mining go far beyond the costs involved in exploration and extraction, because many of the short and long-term costs of mining are externalized. That is, they are not paid for by the company but by future generations. For example, the removal of forest ecosystems, environmental destruction, contamination of water bodies, the lowering of water tables affecting rivers and streams, the creation of waste tailings, and the displacement of people, are just some of the hidden but well-documented costs of mining worldwide that are most likely to apply to Bhutan as well.

Furthermore, recent news reports out of the U.S. raise a red flag regarding the Cline Group's past environmental record in that country. Concerns have been expressed at public meetings by residents and environmental groups over a highly contentious proposal by the company for an open-pit iron mine, slated to destroy an ancient mountain range in Ashland Counties, Wisconsin. Thus, before inviting this U.S.-based

[448] Also of interest are traces of gold, silver, and copper in the Black Mountains, and tungsten in Sarpang Dzongkhag.
[449] *Kuensel*. August 29, 2009. "American Interest in Mining Rights". Available online.
[450] *Bhutan Environment Outlook*. 2008, p. 18.

conglomerate into Samdrup Jongkhar and Bhutan generally, its past record should be carefully scrutinised for adherence to GNH-relevant principles and practices.[451]

e) Build awareness and conduct education about sustainable waste management and zero waste: It is recommended that SJI develop educational materials, starting at the primary level, to discourage burning of plastics and the purchase of heavily packaged, processed foodstuffs. The January 2012 week-long SJI youth art camp focussed on this zero waste theme. As well, initial consultations with the tshogpa (village head) and leading members of Wooling Village in Orong Gewog, held on 24th February 2012, will lead to a dedicated zero waste program in that village in 2012.

In addition, the SJI has developed a five-lesson science radio based series with teachers' guides about backyard composting and vegetable gardens that will be available to Samdrup Jongkhar schools on a pilot basis in 2012. Recorded by BBS (the Bhutan Broadcasting Service), this series of radio dramas integrates science objectives with practical hands-on composting and vegetable gardening to be undertaken in schools.

There are currently no wastepicker or non-governmental collection, waste sorting, and recycling organisations in Samdrup Jongkhar. SJI could collaborate with or seek support from *Greener Way,* a youth-founded business based in Thimphu, which collects waste paper and other recyclables from schools, offices, and households in Thimphu, which it then sells to a recycling firm in India. *Greener Way* is an active community member and is engaged in various waste reduction initiatives in Bhutan's capital. According to news reports *Greener Way* is considering setting up branch offices in Gelephu, Samdrup Jongkhar, Samtse, and Chhukha. Its experience could be valuable in the initial phase of awareness building in Samdrup Jongkhar, and *Greener Way* will certainly find a willing partner in the Samdrup Jongkhar Initiative.

The SJI could also join with other groups that are working toward similar ends, such as the Global Alliance for Incinerator Alternatives (GAIA). While these types of organisations generally only provide material resources for local projects that support a campaign they are running globally, they provide members with the opportunity to network both regionally and globally.

Investigation into sustainable waste management—composting, biogas units, compost toilets, and other zero waste solutions—is one of the areas that have been proposed by the SJI for collaboration with JNP's new Centre of Appropriate Technology that was initiated by the SJI.

[451] Kaeding, Danielle. December 30, 2010. "Pondering Environmental Impacts of Potential Mine". *Ashland Daily Press*. Wisconsin. Available online. Also, Duncan, Casey. January 2, 2011. "Public Meeting Held on Proposed Penokee Iron Mine. Headwaters". *Community Journalism for the Great Lakes*. Available Online.

f) Explore community-based cultural and eco-tourism:[452] The Nabji Trail in the Jigme Singye Wangchuck National Park in Zhemgang Dzongkhag is a model of this kind of tourism. The idea behind "community-based tourism" is that specific activities are developed for each village to generate revenue for the community. The community as a whole is involved in organising camping sites, cultural programs, and providing meal service. On a rotating basis, individuals from different villages can also generate additional income through portering baggage from village to village, and assisting as cooks, kitchen staff or village guides.

Other Nabji Trail activities that generate income for community members are construction and maintenance work for campsites, viewpoints, and trails, along with sales of crafts, vegetables, and other agricultural products. A percentage of the revenue is collected in a "Village Tourism Fund" aimed at generating benefits for those not directly involved in tourism activities, such as children and the elderly. Distribution of this fund is decided upon by each village. This kind of tourism is ideal as a form of income generation during non-farming seasons.

Education-based tourism, such as the *Around Ladakh with Students (ALS)* program, could also be implemented in Samdrup Jongkhar. This program, run by SECMOL, involves cultural exchanges among students, and small scale tours facilitated by school partnerships. As there is very little tourism infrastructure at present in Samdrup Jongkhar, this model could be a viable way to begin building such infrastructure.

Please see the *Models* chapter of this report—Chapter 6—for more on this program, and see an initial SJI proposal for a 2–3 week cultural and ecological tourism program for Samdrup Jongkhar at the end of Chapter 5 of this report.

Despite this undoubted potential, which is certainly worth investigating in Samdrup Jongkhar, it must also be acknowledged, as noted earlier that, unless very carefully developed, eco-tourism may not always be beneficial when full costs are considered. In a 2002 study of effects of eco-tourism in the Seychelles—where, like Bhutan, efforts have been made to attract "high value" tourists—a footprint analysis concluded that:

- success was based on a significant ecological trade-off because a large ecological hinterland is needed to maintain the system;
- high value tourists are also characterized by the highest resource use per capita;

[452] At the May 21, 2011, presentation of the draft SJI profile results to key government officials and NGOs in Thimphu, the point was raised that eco-tourism may not be beneficial when viewed from a full-cost ecological economics perspective. Sonam Tashi from CNR, who was present at the presentation, referred to a report on eco-tourism viewed from this perspective that is very relevant to our analysis here: Gossling, Stefan, Carina Borgstrom Hansson, Oliver Horstmeier, and Stefan Saggel. 2002. "Ecological Footprint Analysis as a tool to assess tourism sustainability". 2002. *Ecological Economics*, 43:199–211. Available from http://webs.uvigo.es/maxose/pdf/gossling.pdf. Any plan to move forward with cultural and ecological tourism development in Samdrup Jongkhar should carefully consider the lessons learned from this investigation by Gossling et al. to ensure that the SJI avoids these potential traps.

- development of high end resorts and creation of a destination for high end tourism has significantly increased the ecological footprint of the Seychelles;
- environmental conservation based on funds derived from long-distance tourism is problematic, and can at best be seen as a short-term solution to safeguard threatened ecosystems; and
- from a global perspective, including generation of greenhouse gas emissions, there are significant environmental impacts to long-distance travel.[453]

Since investigation of eco-tourism potential is still in its infancy in Samdrup Jongkhar and neighbouring dzongkhags, the opportunity exists to give careful consideration to these wider impacts, to avoid errors made elsewhere, and to develop new models that are particularly suitable to the region.

g) Explore bamboo handicraft potential: Currently, bamboo is an abundant and renewable resource in Samdrup Jongkhar. Using it to make handicrafts, including cups and plates, could therefore help support the local economy and local craftsmen.

However, a key problem with bamboo is that it warps when wet, absorbs odours from food, and is often disposed after only one or few uses, which is not sustainable. The SJI should continue to explore the ways in which bamboo could be treated in non-chemical ways to avoid these problems and to enable bamboo products (which can be very elegant and beautiful) to be used for long periods. Such an investigation is another potential project for the new JNP Centre for Appropriate Technology, entirely in line with SJI objectives and community interests.

Based on initial discussions and investigations, it will be worth exploring this question further with Jayakumar Chelaton of Thanal in Kerala, who is aware of such non-chemical bamboo curing processes, and with Arief Rabik's Environmental Bamboo Foundation[454] in Bali, which also has experience in natural and non-toxic methods of preserving and curing bamboo. The SJI might also explore ways to bring Arief Rabik or other bamboo experts to Samdrup Jongkhar as an advisor on the development of bamboo handicraft potential.

h) Explore potential for using the Chokyi Gyatso Institute for Advanced Buddhist Studies: The Chökyi Gyatso Institute for Advanced Buddhist Studies in Dewathang would also be a natural draw for tourists who are interested in the culture and dominant religion of Bhutan. Short courses in meditation, Buddhist teachings, and perhaps even yoga, could be organised at the monastery. Also, tourists might be interested in the monastery's outstanding architecture, carvings, sculptures, and paintings (thangkas). At the time of writing, the monastery itself as well as guest houses and monks' quarters were still undergoing construction, with all construction there scheduled for completion by the

[453] Gossling, Stefan, Carina Borgstrom Hansson, Oliver Horstmeier, and Stefan Saggel. 2002. "Ecological Footprint Analysis as a tool to assess tourism sustainability". 2002. *Ecological Economics*, 43: 199–211. Available from http://webs.uvigo.es/maxose/pdf/gossling.pdf

[454] For more information see: http://www.bamboocentral.org/index1.htm

end of 2013.

Abundant evidence indicates that there is a growing class of international tourists who are increasingly searching for culturally and ecologically interesting and inspiring experiences. Although Bhutan has experienced a surge of such tourists, this has not yet penetrated the eastern region in general to any significant extent and has hardly touched Samdrup Jongkhar at all. However, the region's relative proximity to Guwahati airport, less than three hours from Samdrup Jongkhar once the present highway is completed, and its function as a gateway to eastern Bhutan, indicate significant tourism potential for the future.

Tourism home stays in villages are a model to be explored as an alternative to the usual hotel accommodations. Such a home stay model might require appropriate modifications to meet current tourism standards for sanitation, water supply, etc. But the authenticity of village life—the warmth, openness, and hospitality—still exists in Samdrup Jongkhar and could provide an experience that a tourist would never find in a conventional tourism package. As well, Bhutan's ancient wisdom traditions may be more relevant to the world today than ever before, so some understanding of and even immersion in the teachings of that tradition could potentially be transformative and life-changing for visitors.

This is the kind of development, which, if carefully managed, could be completely in line with the GNH-based model of development and aligned with SJI objectives. For a preliminary outline of an initial SJI proposal in this area, please see the end of Chapter 5 above.

i) Explore potential to develop already existing trails for trekking and bird-watching: On a global scale, Bhutan is recognized as forming a major part of an area of especially high biological diversity known as the Eastern Himalayan 'conservation hotspot.' A total of 14 bird species recorded in Bhutan have been identified as globally threatened, and nine of them can be seen in the forests of Samdrup Jongkhar Dzongkhag. Samdrup Jongkhar is also home to a number of protected species such as the Asian Elephant, Leopard, and Himalayan Black Bear. Common wildlife species in the area include langurs, leopards, bears, wild pigs, barking deer, and sambar. It is recommended that eco-tourism be sensitively developed around pre-existing and well-established trails (used by villagers to access markets and other villages). Several have been identified and are discussed in the main *Profile* report.

j) Build awareness about environmental quality and wise development through education: In March 2010, Dzongsar Jamyang Khyentse Rinpoche offered his Chokyi Gyatso Institute for Buddhist Studies in Dewathang, Samdrup Jongkhar, in south-eastern Bhutan, as a laboratory for GNH-based education for the country and beyond. Since GNH principles are so consistent with Buddhist values and traditions, Rinpoche felt that the Institute could now become the first monastery in the country to introduce a full secular curriculum of language, math, science, computer science, and social studies alongside and integrated with the traditional monastic curriculum.

Thus, a GNH-infused curriculum is currently being developed as a pilot project designed for implementation at the Chokyi Gyatsho Institute (CGI) in Dewathang. The objective is to create a set of twenty-four comprehensive secular educational units that can be used as a model for GNH-infused education and implemented in monasteries and possibly other schools and institutions in Bhutan.

These integrated units will incorporate many of the learning objectives found in the standard Bhutanese educational system (i.e. math, science, social science, technology, health) but will be offered in ways that give prominence to GNH values, principles, and practices, and that are consistent with Buddhist educational principles. For example, rather than treat common everyday objects as 'products' for consumption, lessons will explore the societal and ecological conditions and processes under which these products came into existence, and also how they are disposed after use. This method of analysis naturally conveys the holistic GNH approach and teaches the Buddhist approach to cause, condition, and result, which deconstructs the tendency to assign identity to appearances.

An English language course will be developed and taught separately. The first set of six thematic units is being prepared for CGI's incoming class of April 2013. For more information, the *Druk 3020 Curriculum Framework and Map* is available on the Lho Mon Education website.

As noted above, SJI has also developed a five-lesson radio based series of science lessons about composting and vegetable gardens, which will be available to Samdrup Jongkhar schools on a pilot basis in 2012. These radio dramas integrate science objectives with practical lessons in composting and vegetable gardening and convey a deep respect for ancient cultural traditions and ecological processes.

Chapter 8: Monitoring the Transition to Organic Agriculture: Assessing, evaluating, and monitoring progress

In Samdrup Jongkhar, agriculture is the foundation of the economy and the way of life for nearly all the villages sampled in the interview process. The Samdrup Jongkhar Initiative (SJI) is not simply visionary in an abstract sense, but is also very practically ambitious, and requires a clear and systematic way of assessing, evaluating, and monitoring progress. Particularly in an era when the pressures of modernisation and globalisation are pushing in very different directions, it will be essential to demonstrate the viability of the SJI path in empirical terms

One key goal of the SJI is that the dzongkhag will become Bhutan's first relatively populous region to become fully (100%) organic, thereby creating new development, marketing, and economic opportunities for local farmers and other agriculture-related workers, and taking the lead in the country's national conversion to organic farming. In this vision, the label "produced (grown, or processed) in Samdrup Jongkhar" is intended to become synonymous with "organically produced."

Many remote districts of Samdrup Jongkhar are already "organic by default" simply because chemicals have not penetrated there. Overall, the dzongkhag presently has the fifth lowest agricultural chemical use among Bhutan's 20 dzongkhags. While some literature on composting and other techniques is available through Agriculture Extension Officers, the Ministry of Agriculture's National Organic Programme has so far not penetrated Samdrup Jongkhar nor has NOP conducted any trainings or activities there.

It is therefore important not only to monitor the transition to organic methods systematically and carefully in its own right, but also to know what changes on all fronts in Samdrup Jongkhar are attributable to Samdrup Jongkhar Initiative actions rather than caused by other, external, or extraneous circumstances. It is also important to know what to actually measure – what needs to be paid attention to – in order to be able to assess whether the Samdrup Jongkhar Initiative is progressing as intended and whether the wellbeing of farmers and farm communities is improving.

8.1 Agricultural research and monitoring agricultural activities

The shift to sustainable agricultural methods is one of the two major substantive development initiatives begun in the first project year from the very inception of the Samdrup Jongkhar Initiative. The second is the creation of a new Centre for Appropriate Technology at the Jigme Namgyel Polytechnic in Dewathang, and implementation of the Centre's first project fabricating solar driers and bringing them to remote Lauri Gewog.

Because the shift to sustainable farming began with a Navdanya training of three different farmer groups in December, 2010, the agricultural monitoring and evaluation process also began in the first project year with the collection of baseline data from April through September 2011. Thus, a key priority of the first SJI project year has been the formulation of a systematic monitoring plan for this sector. Monitoring will focus on crop output, farm economic viability, soil quality assessments, market access, and other indicators, which are presented in more detail below.

Following the collection of baseline data in 2011, extensive revisions were undertaken in the survey instruments, based both on field experience from April to September 2011 and on a very careful and systematic review of initial results and survey tools under the skilled guidance of Dr. Vinod Bhatt, Navdanya's top scientist and SJI agricultural research supervisor. The revised survey tool, which will be used in on-going monitoring in 2012 and 2013 is attached as an Appendix to this report.

Some of the key variables and measures of progress for the SJI monitoring of the transition to organic farming in Samdrup Jongkhar are described here. It should be noted that not all the following are reflected in the survey tool, with some indicators to be assessed through soil sample testing, observational diaries, and other means.

What is clear in the following indicators, as repeatedly emphasised by Navdanya's farmer trainers, is that "going organic" means far more than weaning production off artificial fertilisers, pesticides, and other chemicals. Rather 'organic' refers to a whole system of working harmoniously with nature and with communities. It is that systemic shift which the SJI agricultural documentation and monitoring process seeks to assess, and towards which the following indicators point.

8.2 Initial set of agriculture indicators

1. Total biomass or output: Similar to conventional forestry systems, conventional agriculture systems only value or measure *yield*—the quantity of grain or other crop produced. However, what is actually important to measure is *output* or *total biomass,* which includes all the parts of the crop, including the parts that will go to feed the livestock (fodder) and the parts that will be returned to the earth as compost. In traditional crops, the yield is about equal to the straw/fodder, but in modern seeds, such as the so-called 'high-yield varieties,' the product is mostly grain, and there is very little left as fodder or compost, even though the latter is crucially important for long-term soil fertility and quality.

2. Cropping patterns: In conventional agricultural systems, only the crop planted for the market is valued. However, in a traditional and organic system there is a variety of crops planted, and attention is paid not only to market crops but also to what is growing nearby, which might be highly useful to control pests and diseases. This is referred to as a "cropping pattern." In the SJI assessment, therefore, the agricultural system is viewed as

an ecosystem (i.e. agro-ecology), and cropping patterns as a whole are examined in any monitoring regime.

3. Mixed farming and intercropping regimes: Traditional farming systems are based on mixed or rotational cropping systems characterised by a diversity of crops: cereals, pulses, oilseeds, and more, and with diverse varieties of each crop. In monitoring the health of an agricultural system, therefore, attention is paid not only to current crops, but also to what was previously planted in one location and which crop will follow the present one. For example, for soil and agro-ecological health, care is taken not to plant the same crop in succession in the same location, as this can drain the soil of certain nutrients.

Rather, in a healthy system, a variety of crops is often planted together because their interaction will be mutually beneficial. For example, lentil might be planted with maize because lentil will fix the nitrogen in the soil while maize will provide the structure on which the lentil will climb. The lentil will also provide good leaf cover to keep moisture in the soil. Similarly, maize and sweet potato might be grown together, because the harmful insects attracted to one crop are driven away by those attracted to the other. By comparison, industrial agriculture is based on monoculture. As previously stated, this mixed farming and intercropping system minimises risks and maximises productivity, and at the same time decreases food insecurity for families. It is therefore a key indicator of agro-ecological health, resilience, and productivity.

4. Agricultural biodiversity: This indicator measures the diversity of domestic and wild plant species on farms. If the diversity of crops increases, then there will be more items in the farmers' kitchens from their fields. This is a very important indicator in terms of increasing food security and reducing dependence on the market for food. Special emphasis will be placed on increasing the cultivation of landraces (farmers' varieties).

5. Soil quality: Soil is the natural capital asset upon which any agricultural system is based. It is vital to maintain healthy and productive soil if an agricultural system is to continue to function optimally. Soil is currently undervalued in our food production system and in conventional agriculture monitoring regimes. On the contrary, methods of agriculture that degrade the soil are profitable in the short term under our current system of accounting. This is because the losses of natural capital due to soil erosion or degradation are invisible in conventional economic accounts and assessment systems, and are not included directly in the costs of food production.

Here, soil quality is defined as more than the sustained capability of a soil to accept, store, and recycle water, nutrients, and energy, although that is certainly a desired outcome of healthy soil. But defined more broadly, soil quality is the capacity of soil to sustain *ecological productivity*, maintain *environmental quality*, and *promote plant and animal health*.

In order to measure any changes in soil quality, soil samples should be systematically tested before the transition to organic, and then again afterwards to ascertain changes.

Quality can be measured by soil organic matter or soil organic carbon. Quality can also be measured by *soil structure*; *soil conservation*; and *soil foodweb health*. For each of these indicators, measurement methods are presented, sustainability objectives are proposed, trends are highlighted, and preliminary monetary values are estimated in the GPI Soils and Agriculture Accounts. Soil samples were indeed taken from several farms by SJI agriculture researchers in 2011, and baseline results will be reported in the first monitoring report in 2012.

Overall, according to Navdanya farmer trainers, soil quality can be measured by looking at texture, pH, electric connectivity (or heavy metal content), and soil organic matter. According to Dr. Vandana Shiva, an increase in soil organic matter will result in increased productivity without having to increase water inputs—as organic matter naturally retains moisture in the soil. In other words, soil enriched with organic matter is the best way to ensure the soil's moisture content during the long dry season. This is particularly significant in Samdrup Jongkhar where the winter months are extremely dry.

Good soil structure is also an indicator of soil quality. Soils with good structure are more productive due to better root penetration, more efficient uptake of water and nutrients, resistance to soil erosion, and a reduced need for energy during cultivation. Soil compaction is sometimes a result of soil structure deterioration. Inputs of soil organic matter are part of a comprehensive management strategy to reduce or prevent soil compaction.

6. Soil cover days: One highly indicative measure—soil cover days—has been chosen here, since the number of soil cover days has been well documented as an effective measure for indirectly tracking both soil and water quality. The more a soil is covered—either by a crop or sod or mulch—the more likely that the soil will be conserved, and that water quality will be protected. Due to the very high risk of soil erosion due to high rainfall during the summer monsoon season and the rugged topography in the Samdrup Jonghkar district, a steady reduction in bare soil days would indicate progress in this area.

7. Per unit production (kg / square metre): If the agriculture system is more diverse, then per unit production should also increase, not just in terms of yield or total output but also in terms of nutritional content and value. For example, as Dr. Shiva points out, if you only grow rice then all you have is rice, but if you also grow oil seed, then you have some fat with it as well, and have increased the overall nutritional quantity and quality of production. This is an innovative but vitally important indicator of progress that goes back to the ultimate purpose of human agriculture and of food altogether, which is to provide nutrition.

***8. Labour input*:** This is a measure of how many hours farmers spend in the fields over time. According to highly experienced Navdanya farmer trainers, organic techniques, when practiced over time, can reduce labour inputs by half, simply by working in harmony with nature and letting nature do its part of the work. In the first one to two years of the transition to organic methods, the labour costs might be higher due to the manual work required to replace the activities done by chemicals and herbicides in a

conventional system, but once organic techniques like mulching, manuring, and green manuring have been properly utilised, an organic system will result in less work.

Mechanisation initially promises to save time, but in fact the opposite is generally true: First, in economic terms alone, the cost of production increases because the farmer has to pay for fuel and for the machines themselves, and he then has pressure to produce more in order to pay these costs. In the end, the evidence shows, no time is generally saved. Second, mechanisation often produces hidden long-term costs, like soil compaction that in turn reduces productivity.

In short, when labour input is measured, the farmer has to look at years 5 and 10, not only year 1, in order to make a valid comparison of time and cost inputs. Abundant evidence shows that apparent short-term gains often result in longer-term losses, and that true cost and labour savings are achieved by working harmoniously with nature's own processes. In that regard, labour inputs will also vary depending on soil conditions. Soils that are more degraded will require more initial labour inputs to restore soil quality. Once that quality is restored, labour inputs will decrease.

9. Farm viability: Farm economic viability can be measured by a suite of indicators like net farm income, expense to income ratio, debt to income ratio, and solvency ratio. On a global level, one of the key causes of declining farm viability is depressed farm product prices. Often, farm input costs and food prices have gone up much faster than farm product prices, so it is costing farmers considerably more to farm without a commensurate gain in income. Yet, remarkably, depressed farm product prices are not reflected in cheaper food prices for consumers, indicating that profit-taking is happening in other parts of the food supply chain rather than at the farm gate.

Please see the GPI Soils and Agriculture Accounts for information on how to measure these components of farm viability. The key point here is that farm cash receipts (as measured in conventional GDP-based accounts) can provide a highly distorted and inaccurate picture of farm health unless they are balanced against farm input costs. For the purposes of assessing farm economic viability in Samdrup Jongkhar, therefore, we shall assess ***net*** farm income, which accounts for the expenses of farming as well as receipts, and farm debt in relation to farm assets and capacity to service the debt. These indicators will provide far more accurate assessments of economic viability than conventional measures.

10. Social indicators: There is a wide range of social indicators of vital relevance to both agricultural health and rural wellbeing. These include social capital variables like the degree of cooperation among farmers, sharing of machinery, equipment, and labour, and cooperative management and marketing.

It is also possible to assess, both by interview and observation, whether organic methods are gaining widespread acceptance, or conversely whether the shift is causing any confusion or conflict within communities. For example, pesticide and seed companies might try to dissuade farmers from going organic, and Agriculture Extension Officers might offer advice that is contrary to that of the organic farmer trainers.

***11. Self-sufficiency*:** By examining the food basket of farmers, it is possible to assess whether the amount of food grown to feed the family has increased over time. Local institutions and bazaar vendors can also be interviewed and monitored to assess the degree of shift from imported Indian produce (the current norm) to locally grown produce.

12. Seed collection / Community seed bank: A healthy agricultural system is based on and starts from good seeds. A key indicator of progress in "going organic" from a systemic perspective, therefore, is whether local villages are saving an increasing variety of seeds, particularly the landraces (farmers' seeds), and whether methods of storing these seeds are improving over time. As described earlier, seeds can be collected and stored in air tight containers, and kept in a dark place with no windows or ventilation. Seed storage methods are best assessed by researcher observation.

13. Intensity of synthetic input use: "Habitat" is a term used to describe the place and conditions for an organism to live, or to have a home. Whether it is hawks that control rodents, insect-eating birds in orchards, beneficial bacteria and fungi that maintain soil health, or the lowly dung-beetle that takes care of breaking down manure from grazing animals, an important part of land stewardship is to make sure there is adequate habitat for organisms beneficial to the farm.

The existence of habitat for species that have a vital role in ensuring crop productivity is therefore a key indicator of food security, farm viability, and a healthy agro-ecology. Therefore, it is important to reduce the use of inputs that contribute to the loss of biodiversity. Synthetic fertiliser and pesticide use reduce habitat quality, species diversity, and ecosystem services, and is often lethal to a wide range of beneficial micro-organisms. From that systemic perspective, reduced synthetic input use is a positive indicator of improved agro-ecological farm health.

14. Local procurement of fruits and vegetables: Using the baseline data collected during field research and presented in the chapter on Markets above, the local procurement of fruits and vegetables will be carefully monitored. There are currently five large institutions in Dewathang, including the shop-keepers in the market, which buy large quantities of vegetables and fruits on a weekly or bi-weekly basis directly from India. Preliminary investigation revealed that these institutions are open to purchasing more of their food needs locally. Thus, as the SJI evolves, the quantities and types of fruits and vegetables purchased locally will be measured to assess whether there is progress in this area. This indicator is closely related to the self-sufficiency indicator (#11 above).

8.3 Key issues raised by reviewers of the SJI project

Reviewers of the SJI project proposal have also raised a number of key issues—all of which have been carefully considered in the first project phase in the construction of an effective and rigorous monitoring regime. These issues include:

1. Identification of controls against which to compare project initiative results. One approach would be to designate villages and districts with socio-demographic, climatic, soil, crop variety, and other conditions that are highly comparable to target districts. While the latter would take a lead in shifting to more sustainable methods and cropping systems, reducing chemical applications, and targeting new markets, the control districts will continue conventional agricultural patterns at least for the first two project years. Such designation of comparable controls would enable researchers to assess the degree to which changes in yields, farm economic viability, living standards, soil conditions, and other key factors are attributable to shifts in farming methods and marketing strategies or to conditions like weather patterns that are extraneous to the project.

Ideal though such case control studies would be, the first year's baseline research has indicated that this approach is not viable for the SJI monitoring process. In consultation with Navdanya's leading scientist and farmer trainers, it has been decided instead to use controls within a select group of farmers who have all received the organic trainings offered by SJI during the first year.

Not only will individual farmers' performances be compared from year to year, but the SJI researchers have now divided the farmers being monitored into three groups— (a) those who received the training and are actively and enthusiastically implementing what they have learned, (b) those who were trained but who are hesitating to implement what they learned either out of uncertainty or confusion or fear of risks, but who are potentially willing to implement with assistance and guidance, and (c) those who really do not seem interested in implementing what they learned. Performance on a wide range of indicators will be compared among these three groups.

For all groups, there will be comparison between each farmer's year to year performance. For example, researchers will observe what was growing in each farmer's field in each of the three comparison years and how this changed. This observation and interviewing will also indicate whether diversity has increased, and if so, how many more crops and what types are now being grown. Interviews will also show changes in the quantity variety of these crops now used for food by comparison with earlier years to indicate how much diversity has been brought back to the family farm. In sum, there will be comparisons both within the monitoring group of trained farmers and over time among the same farmers. The longitudinal aspect of the study is expected to be very revealing.

2. Transition regime. One of the first and most important project tasks of the SJI has been designation of the precise regime to be employed in shifting from conventional to more sustainable farming methods. This has been essential both to facilitate the actual success of the development initiative, and to identify appropriate indicators for effective

monitoring and evaluation.

For the former, as indicated above, the systemic approach used by Navdanya has been adopted by the Samdrup Jongkhar Initiative, seeing the shift to organic as much more than weaning off chemicals but rather moving towards an integrated system of working in harmony with nature's own processes. For the latter monitoring component of the process, GPI Atlantic's extensive Soils and Agriculture Accounts, developed in depth for Nova Scotia over a period of 13 years from 1997 to 2010, have provided some guidance in designating key indicators of progress.

A preliminary investigation of Ministry of Agriculture reports and inquiries with Ministry officials indicate that no previous work been conducted in Samdrup Jongkhar to assess the potential for shifts to more sustainable farming methods, and Samdrup Jongkhar is one of the few dzongkhags in Bhutan where the country's National Organic Programme has so far had no presence and has conducted no trainings. On the contrary, chemical use has often been encouraged.

Despite the adoption of Navdanya's overall definition of organic farming, further in-depth site-specific work will be required over time, as the Samdrup Jongkhar Initiative progresses, to designate the precise management regimes to be adopted in different parts of the dzongkhag to suit particular local conditions. This is essential particularly to identify the particular crops to be promoted and grown in accord with local soil and climatic conditions—whether currently or historically grown locally or introduced—the appropriate diverse cropping systems to be adopted, the short-term interim yield and output changes expected during the transition period for different crops, and the anticipated length of time required to stabilise the new systems. Such site-specific investigation is required in light of the wide range of micro-climatic and soil conditions in the dzongkhag, which ranges in altitude from just 200 metres in low-lying rice paddy border regions to much higher altitude regions in Orong, Gomdar, and other gewogs.

Based on consultations to date and prior preparatory research, it is clear that more than a single transition regime will be adopted in the Samdrup Jongkhar Initiative depending on crops, slope of land, soil and climatic conditions, and present practices in the dzongkhag. For example, some more remote parts of Samdrup Jongkhar are already 'organic by default,' simply because chemicals have not yet penetrated those regions, while rice, maize, potatoes, and citrus are particularly subject to different kinds of chemical application—including weedicides (rice), fungicides (maize), fertiliser (potatoes), and pesticides (citrus).

It is therefore anticipated that direct transition to organic farming will be more possible in some districts, particularly where mixed vegetable production is dominant, while transitional management regimes from conventional to low-input farming may be more appropriate in districts in regions more dependent on cash crops. Navdanya's initial farmer trainings in Samdrup Jongkhar, with a highly trained scientist and designated farmer trainer, have included careful investigation of these issues, and some of their preliminary findings are included in this report, along with the clear recommendation to

continue such site-specific analysis over time.

3. Incentives. A third key area of investigation is whether incentives are required to encourage local farmers to shift to more sustainable farming methods. Preliminary consultations with the Coordinator of Bhutan's National Organic Program and with Dr. Vandana Shiva indicate that a proven method of encouragement in the Himalayan region to date is an emphasis on "low-cost" farming and savings realised through reduction of expenditures on agricultural inputs like chemical fertilisers and pesticides, and substitution of 'free' inputs like compost and manure.

As well, to encourage farmers to make the shift, Dr. Shiva and her Navdanya organisation rely on development of local seed banks (which in their terms advance "seed sovereignty") and consequent reduction in input costs compared to reliance on purchase of the so-called "high yield" seeds.

They also explain to farmers the long-term losses incurred when soil quality deteriorates due to high chemical inputs and consequent reliance on increased quantities of expensive fertilisers. Navdanya has developed India's largest organic fair trade network to assist farmers in marketing their organic produce. In sum, these methods constitute non-monetary incentives along with net accounting mechanisms that show farmers the reduced input costs associated with organic methods.

Consultations with Navdanya's farmer trainers have also indicated that what farmers require in the first two years of the transition period is training and technical support, rather than financial support. Providing them with money breeds dependency, they say, and therefore the best support is 'in kind' support.

For example, as noted earlier, in villages where Navdanya conducts trainings, its trainers often select five farmers and provide them with seed (free if they can't pay for it) with these farmers then becoming the "seed keepers" in their village. It then becomes the duty of each farmer to plant those seeds and the next year to collect them and provide seed to two more farmers—so that ten additional farmers become seed keepers in the second year, and so on. In this way within four years, there can be more than a hundred seed keepers thereby developing a well-functioning, efficient, and highly diverse *community seed bank*.

4. Market analysis. A fourth area of initial investigation is a market analysis to assess the likely returns to farmers from shifting to organic and other more sustainable farming methods. Initial consultations reveal differing views on likely markets. Bhutan's Prime Minister has indicated that India's growing urban middle class is developing an "insatiable" appetite for organic products that is a potentially lucrative market for Bhutanese organic producers. Some Ministry of Agriculture officials, on the other hand, feel that transportation challenges and costs, along with growing awareness among Bhutanese consumers, make the domestic market a more likely initial target for organic growers, though they acknowledge, through their own prior investigations, that there is presently no domestic premium for organic produce even among Bhutan's high-end

resorts catering to foreign tourists.

There does seems broad agreement among analysts within Bhutan that value-added processing (for example to packaged dried fruits, juices, jams, pickles, etc.) is key to effective marketing, and particularly to overcoming the transportation and storage challenges faced in marketing fresh produce.

Consultations with Navdanya's two leading farmer trainers indicated that in the first few years the marketing strategy should first focus on feeding the family and reducing farmers' own dependence on purchased food, along with building the local market, before expanding to the district, the region, the nation, and finally the international market. This strategy, building from the inside out, ensures food security for families and also increases self-sufficiency. In sum, this approach to market analysis begins at home—first feeding the family with an increasing diversity of nutritious foods, and then selling food locally.

5. Fertilisers: Types of fertilisers used depend on many factors including land type, size of landholding, what the farmers are growing, and whether they are lazy or active. Farmers may need to switch systems and use a mixture of fertilising systems: compost, biomass, green manuring, dung, etc. According to Navdanya's farmer trainers, as noted, the organic farming system is a whole knowledge system, and it will take the average farmer a minimum of three to four years to adopt all the techniques that are characteristic of organic agriculture.

Selected Bibliography

Books

Berry, Wendell. 1981. “Solving for Pattern”. Chapter 9 in *The Gift of Good Land: Further Essays Cultural and Agricultural.* North Point Press.

Brown, Lester. 2001. *Eco-economy: Building an Economy for the Earth*. Washington, D.C.: Earth Policy Institute.

Brown, Lindsay, Bradley Mayhew, Stan Armington, and Richard W. Whitecross. 2007. *Lonely Planet Guide Book: Bhutan*.

Cribb, Julian. 2010. *The Coming Famine: The Global Food Crisis and What We Can do to Avoid it.* University of California Press. Berkeley.

Davis, Wade. 2009. “The Wayfinders. Why Ancient Wisdom Matters in the Modern World”. CBC Massey Lectures. Anansi Press. Toronto.

Inskipp, Carol, Tim Inskipp, and Richard Grimmett. 2004. *Birds of Bhutan.* Helm Field Guides. Christopher Helm Publishers Ltd., London.

Kunzang Choden. 2008. *Chilli and Cheese: Food and Society in Bhutan*. White Lotus Press. Bangkok.

McKibben, Bill. 2007. *Deep Economy: The Wealth of Communities and the Durable Future.* Henry Holt and Company. New York.

National Organic Program. 2007. *A Guide to Organic Agriculture in Bhutan*. Department of Agriculture, Ministry of Agriculture, Thimphu.

National Biodiversity Centre. 2008. *Plant Genetic Resources of Bhutan. Volume 1: Field Crops*. Ministry of Agriculture, Thimphu.

Patel, Raj. 2009. *The Value of Nothing: Why Everything Costs so Much More than We Think*. Harper Collins Publishers Ltd. Toronto.

Patel, Raj. 2007. *Stuffed and Starved: The Hidden Battle for the World’s Food System*. Harper Perennial. Toronto.

Shiva, Vandana. 1995. “Biodiversity, Biothechnology, and Profits”. In *Biodiversity: Social and Ecological Perspectives.* Zed Books. London.

Shiva, Vandana and Poonam Pandey. 2006. *A New Paradigm for Food Security and Food Safety*. Navdanya. Systems Vision. New Delhi.

Shiva, Vandana, Vir Singh, Irene Dankelman, Biju Negi and Shilpy Singh. 2005. *Biodiversity, Gender and Technology in Mountain Agriculture: Glimpses of the Indian Central Himalayas*. Navdanya. Systems Vision, New Delhi.

Wilkinson, Richard and Kate Pickett. 2010. *The Spirit Level: Why Equality is Better for Everyone*. Penguin Books. London.

Wright, Ronald. 2004. *A Short History of Progress*. Anansi Press. Toronto.

Reports and Newspaper Articles (also used to prepare Background Statistical Material)

Agriculture Statistics, 2009, Vols. I and II, Department of Agriculture, Ministry of Agriculture and Forests, Royal Government of Bhutan.
http://www.moa.gov.bt/moa/downloads/down_detail.php?cat=4&catname=Statistics

Air Quality Guidelines for Europe, 2000, World Health Organization Regional Publications, European Series, No. 91.
http://www.euro.who.int/__data/assets/pdf_file/0005/74732/E71922.pdf

Annual Education Statistics, 2010. Ministry of Education, Royal Government of Bhutan.
http://www.education.gov.bt/Publications/AES%202010%20working%20final%20version%20without%20indicator.pdf

Australian Centre for International Agriculture Research. 2008. *Results of a Survey of Citrus Farmers in Bhutan 2007*. Australian Government.
http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload8ll7651zg.pdf.

Bhutan Country Environmental Analysis, 2004. Asian Development Bank.
http://www.adb.org/Documents/CEAs/BHU/BHU-CEA-Nov2004.pdf

Bhutan Living Standard Survey Report (BLSS), 2007. National Statistics Bureau, Royal Government of Bhutan. http://www.nsb.gov.bt/pub/surveys/blss/blss2007.pdf

Bhutan Observer, 12 April 2010. "Farm shows the organic way."
http://www.bhutanobserver.bt/farm-shows-the-organic-way

Bhutan Observer, 21 August 2009. "Wetland fallowing doubles."
http://www.bhutanobserver.bt/wetland-fallowing-doubles

Bhutan Observer. October 22–29, 2010. "Poverty by Headcount".
http://www.bhutanobserver.bt/poverty-by-headcount-2/.

Bhutan Observer. October 19–26, 2010. "Weaving Centre Boasts Five Loom Machines." http://www.bhutanobserver.bt/weaving-centre-boasts-five-loom-machines/.

Bhutan Observer Focus article. December 10–17, 2010. "Rice Crisis Redux: Could Bhutan be cut off again? *Food and Nutrition Security*, Volume 3, no. 12. http://www.bhutanobserver.bt/wp-content/uploads/2010/12/BO-FOCUS_FNS-FINAL-1.pdf.

Bhutan Times. n.d. "Cultural industries can help stave off poverty". http://www.bhutantimes.bt/index.php?option=com_content&task=view&id=1377&Itemid=73

Bhutan Times. n.d. "Marijuana leads the kick". http://www.bhutantimes.bt/index.php?option=com_content&task=view&id=1641&Itemid=5

Biodiversity Action Plan 2009. 2009. National Biodiversity Centre, Ministry of Agriculture, Royal Government of Bhutan. http://www.undp.org.bt/assets/files/publication/BAP%202009%20Doc.pdf.

Chandra Prakash Kala, Nehal A. Farooquee, and B.S. Majila. 2005. "Indigenous Knowledge and Medicinal Plants used by Vaidyas in Uttaranchal, India". G.B. Pant Institute of Himalayan Environment and Development. *Natural Product Radiance*, Vol 4, 3: 195–204. http://nopr.niscair.res.in/bitstream/123456789/8090/1/NPR%204(3)%20195-206.pdf.

Dzongkhag Agriculture Sector, June 2010, and National Plant Protection Centre (NPPC), March 2010. In: *Agriculture Statistics*, 2009, Vols. I and II, Department of Agriculture, Ministry of Agriculture and Forests, Royal Government of Bhutan. (Table 51: RNR infrastructure inventories as of December 2009).
Vol 1: http://www.moaf.gov.bt/moaf/?wpfb_dl=105, and
Vol. 2: http://www.moaf.gov.bt/moaf/?wpfb_dl=106.

Dzongkhags and Departments, April 2010. CountrySTAT – Bhutan. http://www.rnrstat.bt/csbhutan/index.asp?cont=selection.asp&pageid=pxweb/dialog/varval.asp&ma=infrastructures&ti=Existing+RNR+Infrastructiures+as+of+April+2010+&path=pxweb/database/main/1_NationalCore/1.6.rnrinfrastructures/&search=IRRIGATION&lang=1

Environmental Assessment Report: Preparing the Rural Renewable Energy Development Project. Samdrup Jongkhar Accelerated Rural Electrification Subproject. 2010. Department of Energy, Royal Government of Bhutan, for the Asian Development Bank (ADB). http://www.adb.org/Documents/IEES/BHU/42252/42252-02-bhu-iee-08.pdf

Food and Agriculture Organization of the United Nations. 1996. "Manual on Resin Tapping for Chir Pine Areas Under Tapping in Bhutan", In: *Non-wood Forest Products of Bhutan*. FAO Regional Office for Asia and the Pacific. http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload1nu3452kb.pdf

Forest Resources Development Division, Department of Forests. 2008. *Guidelines for Resource Assessment and Management of Chirata. Swertia chirayita*, Ministry of Agriculture, Royal Government of Bhutan. http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload6jk6398ep.pdf

Gossling, Stefan, Carina Borgstrom Hansson, Oliver Horstmeier, and Stefan Saggel. 2002. "Ecological Footprint Analysis as a Tool to Assess Tourism Sustainability". *Ecological Economics,* 43: 199–211. http://webs.uvigo.es/maxose/pdf/gossling.pdf

Institute of Traditional Medicine Services (ITMS) website. Royal Government of Bhutan. http://www.health.gov.bt/itms/01index/01htm/01index.htm.

International Fund for Agricultural Development (IFAD). 2001. *Rural Poverty Report 2001: The challenge of ending rural poverty*. IFAD, Poverty Research Unit at Sussex. Oxford University Press.

Karma Lhendup. 2008. *System of Rice Intensification (SRI) Method of Rice Cultivation: How to Produce More Rice with Less Inputs, A Field Extension Manual.* 2 p. Faculty of Agriculture of the Royal University of Bhutan's College of Natural Resources. http://sri.ciifad.cornell.edu/countries/bhutan/extmats/bhExtManual08.pdf

Kuensel. 18 April, 2010. "Wood of the gods (if infected)". (Aquillaria trees or agar wood) http://www.kuenselonline.com/modules.php?name=News&file=article&sid=15213

Kuensel. 21 June 2010. "Using science not violence". (Human-Wildlife Conflict) http://www.kuenselonline.com/modules.php?name=News&file=article&sid=15831

Kuensel. 30 November 2009. "Coal company gets clearance". http://www.kuenselonline.com/modules.php?name=News&file=article&sid=14095

Kuensel. 8 May 2009. "ACC shuts down S D Eastern mines". http://www.kuenselonline.com/modules.php?name=News&file=article&sid=12444

Kuensel. September 2009. "Undermining Food Security". http://www.kuenselonline.com/2010/modules.php?name=News&file=article&sid=13429

Kuenzang Norbu and Jigme Gyeltshen. 2007. *Chirata: A Medicinal Plant Rescued by Community Forestry*, Dzongkhag Forestry Service, Samdrup Jongkhar, Ministry of Agriculture, Royal Government of Bhutan. http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload1gv5445ut.pdf

Mukhia, Prabhat Kumar. 2006. *Management Guidelines for Illicium Griffithii for Community Forests of Bhutan*. Participatory Forest Management Project, Social Forestry Division, Department of Forests, Ministry of Agriculture and Forests, Royal Government of Bhutan. http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload2go9765gc.pdf

National Environment Commission. 2008. *Bhutan Environment Outlook*. National Environment Commission Secretariat, Royal Government of Bhutan. http://www.nec.gov.bt/publications/Bhutan%20Environment%20Outlook%202008.pdf.

National Environment Commission. 2006. *Bhutan National Adaptation Programme of Action*. NEC, Royal Government of Bhutan. http://www.nec.gov.bt/publications/NAPA.pdf.

National Environment Commission. 2004. *Brief Report on State of the Environment*. NEC, Royal Government of Bhutan. http://www.nec.gov.bt/publications/SOE2004.pdf.

Ninth Five Year Plan. *Main Document*. 2002. Gross National Happiness Commission, Royal Government of Bhutan, 2002–2007. http://www.gnhc.gov.bt/wpcontent/uploads/2011/04/5yp09_main.pdf

Population and Housing Census Bhutan (PHCB). 2005. National Statistics Bureau, Office of the Census Commissioner, Royal Government of Bhutan. http://www.nsb.gov.bt/pub/phcb/PHCB2005.pdf

Poverty Analysis Report (PAR). 2007. National Statistics Bureau, Royal Government of Bhutan. http://www.nsb.gov.bt/pub/surveys/par/par2007.pdf

Raling Nawang, Integrated Forest Management Project, Bumthang. "Medicinal Plants." In: *Non-wood Forest Products of Bhutan*. 1996. Food and Agriculture Organization of the United Nations. Regional Office for Asia and the Pacific. http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload1nu3452kb.pdf

"Reconnaissance Survey on Probable Recreational Spots in Eastern Part of Bhutan Mainly to Create Winter Visiting Venues". 2009. Royal Botanical and Recreational Parks Division, Department of Forests, Royal Government of Bhutan. (not available online)

Renewable Natural Resources (RNR). 2007. *A Guide to Organic Agriculture in Bhutan*. Extension Material. National Organic Programme, Department of Agriculture, Ministry of Agriculture, Royal Government of Bhutan. http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload8aa2349am.pdf.

Renewable Natural Resources (RNR) Census, 2009. Ministry of Agriculture & Forests, Royal Government of Bhutan. http://www.rnrstat.bt/csbhutan/index.asp?cont=ShowItems.asp&catid=8&type=doc

Renewable Natural Resources (RNR) Sector Tenth Plan 2008–2013: Enabling farming communities to overcome poverty. 2009. Ministry of Agriculture and Forests, Royal Government of Bhutan. http://www.rnrstat.bt/csbhutan/documents/RNR%20Plans%20and%20Progress%20Reports%5CRNR%2010th%20Five-Year%20Plan%20%282008-2013%29%20Volume%20I_Main%20Document.pdf

Renton, Alex. "Suicide by Pesticide: India's Hidden Climate Change Catastrophe". *The Independent.* January 2, 2011. http://www.independent.co.uk/environment/climate-change/indias-hidden-climate-change-catastrophe-2173995.html.

Saraswathy, A. et al. 2010. "Essential oil constituents of Illicium griffithii and its antimicrobial activity". *Pharmacognosy Magazine*. Jul–Sep; 6, 23: 208–211. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2950384/

Small Area Estimation of Poverty in Rural Bhutan. 2010. National Statistics Bureau and the World Bank. http://siteresources.worldbank.org/BHUTANEXTN/Resources/306148-1284655533176/BHPovertymapping.pdf.

Southern Zone Irrigation Development Reconnaissance Mission Report. March 2010. United Nations Food and Agriculture Organization (FAO). (not available online) http://www.fao.org/

Statistical Yearbook of Bhutan. 2009. National Statistics Bureau (NSB), Royal Government of Bhutan. http://www.nsb.gov.bt/pub/syb/syb2009.pdf

Statistical Yearbook of Bhutan. 2007. National Statistics Bureau (NSB), Royal Government of Bhutan. http://www.nsb.gov.bt/pub/syb/syb2007.pdf

Subedi, Dr. Ugyog. 2009. *Support to Development of Farmer Groups' Enterprise in Eastern Bhutan*, for SNV, Ministry of Agriculture and Forests, Royal Government of Bhutan. http://www.moa.gov.bt/moa/downloads/downloadFiles/MoADownload7xt3860xg.pdf.

Surendra Raj Joshi and Bhim Raj Gurung. 2009. *Citrus in Bhutan: Value Chain Analysis*, Department of Agricultural Marketing and Cooperatives, Ministry of Agriculture and Forests. http://202.144.157.181/moa/downloads/downloadFiles/MoADownload10ww4680xf.pdf

Samdrup Jongkhar Dzongkhag Tenth Five Year Plan 2008–2013. 2009. Gross National Happiness Commission, Royal Government of Bhutan, http://www.gnhc.gov.bt/wp-content/uploads/2011/10thplan/Sjongkhar.pdf

Tenth Five Year Plan 2008–2013. Vol 1: Main Document and Vol 2: Programme Profile. 2009. Gross National Happiness Commission, Royal Government of Bhutan.

Vol 1: http://www.gnhc.gov.bt/wp-content/uploads/2011/10thplan/TenthPlan_Vol1_Web.pdf.
Vol 2: http://www.gnhc.gov.bt/wp-content/uploads/2011/10thplan/TenthPlan_Vol2_Web.pdf.

Tsai, James. "Citrus Greening and its Psyllid Vector". 2004. In: *Radcliffe's IPM* [Integrated Pest Management] *World Textbook*, University of Minnesota. http://ipmworld.umn.edu/chapters/TsaiGreening.htm

United Nations Development Programme (UNDP). 2009. *Human Development Report*. http://www.undp.org/hdr2009.shtml.

United Nations Development Programme (UNDP). 2009. *Human Development Report, Statistical Annex*. http://hdr.undp.org/en/media/HDR_2009_EN_Indicators.pdf

United Nations Development Programme (UNDP). 2010. *Human Development Report, Statistical Annex*. http://hdr.undp.org/en/media/HDR_2010_EN_Table1_reprint.pdf

Vulnerability Analysis and Mapping (VAM) Report. 2005. Ministry of Agriculture and World Food Programme Bhutan. http://www.faorap-apcas.org/bhutan/busdirectory/doc/VAMReport.pdf

Worldwatch Institute. 2011. *State of the World 2011: Innovations that Nourish the Planet*. http://www.worldwatch.org/sow11. (available for purchase in hardcopy or pdf online)