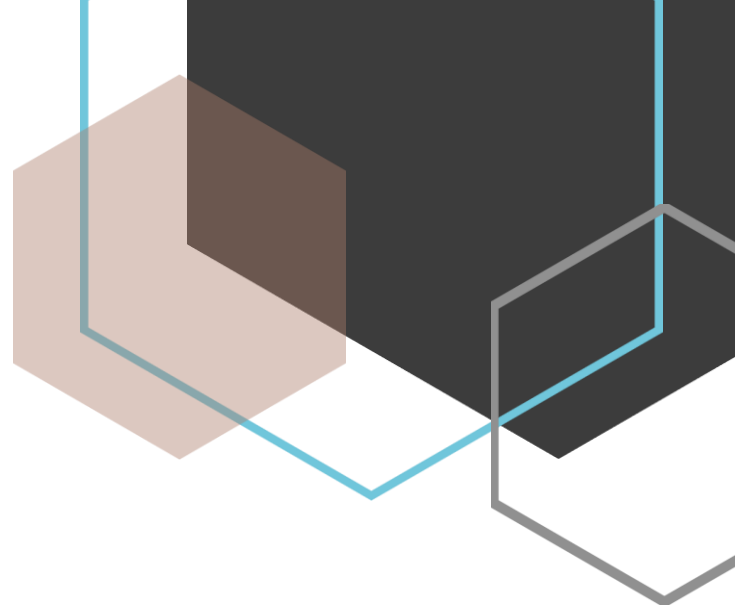




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UNIVERSITY PRIORITY SETTING REPORT FOR THE PROVISION OF RESEARCH AND EDUCATION

BENGUET STATE UNIVERSITY, PHILIPPINES

Integrating Talent Development into Innovation Ecosystems in Higher Education

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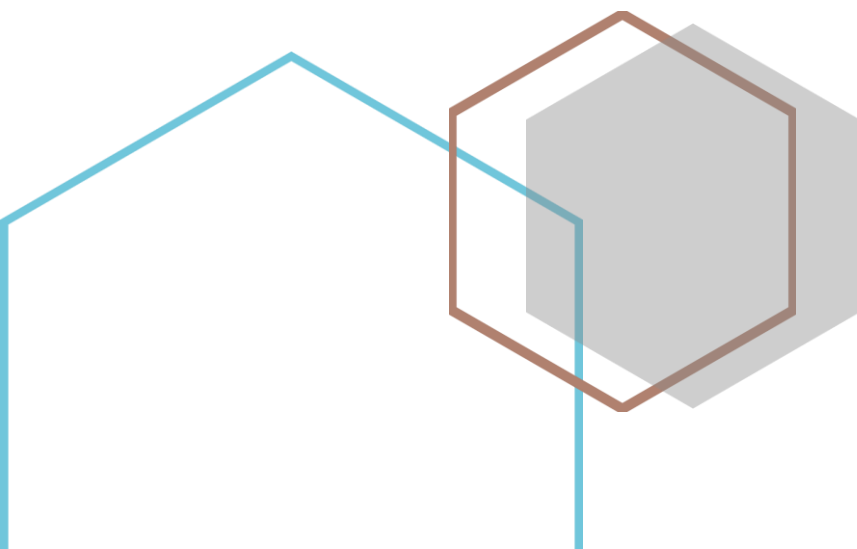




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This report seeks to map priority areas for research and education provision at the University. It aims to provide a vision on how the institution can develop further to become innovation and skills provider for its region and locality, and how students and graduates should be involved in this process.

Authors:

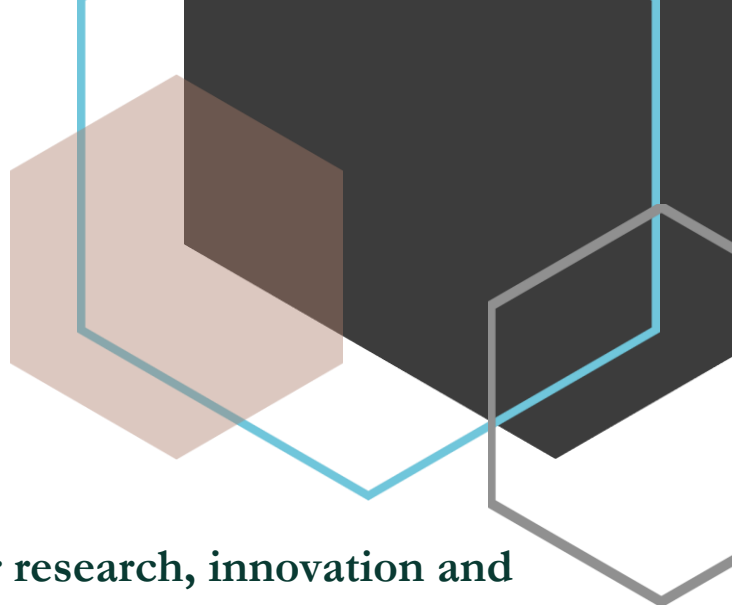
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Benguet State University

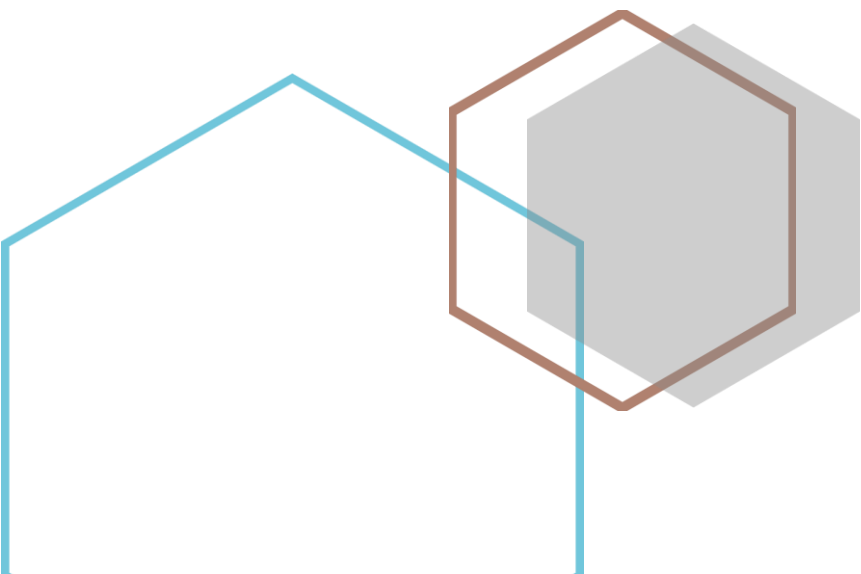


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Review of national priorities for research, innovation and education



NATIONAL PRIORITIES FOR RESEARCH, INNOVATION AND EDUCATION REFLECTED IN BSU'S RESEARCH AND EDUCATION AGENDA

The main framework that guides the direction and actions of every institution and agency in the Philippines, including the Benguet State University, is the Philippine Development Plan 2017-2022. This is anchored on the long-term vision for the country (AmBisyon Natin 2040), and on a long-term development agenda (Agenda 2030) that is consistent with the priorities of the Duterte administration. AmBisyon Natin 2040 is the vision of what the Filipinos want for themselves in the next 25 years which is primarily “*A prosperous, predominantly middle class society where no one is poor, and where people live long and healthy lives in a society that is trustworthy, smart, and innovative.*” The Philippine Development Plan 2017-2022 is expected to lay the groundwork to achieve this. This plan has three major targets, namely: “*malasakit*”- enhancing the social fabric, “*pagbabago*”- reducing inequality, and “*patuloy na pag-unlad*” - increasing the growth potential. The main strategies to reduce inequality are accelerating human capital development, and increasing access to economic opportunities. The main strategies to increase growth potential are advancing technology, and stimulating innovations.

To advance technology, the strategic framework to leverage science, technology and innovation (STI) is shown in Figure 1. Four main outcomes are foreseen, namely; 1) increased STI utilization in agriculture, industry and service sectors; 2) increased investments in STI-based start-ups, enterprises, and spin-offs; 3) enhanced creative capacity for knowledge and technology generation, adaptation, and adoption; and 4) strengthened open collaboration among actors in the STI ecosystem.

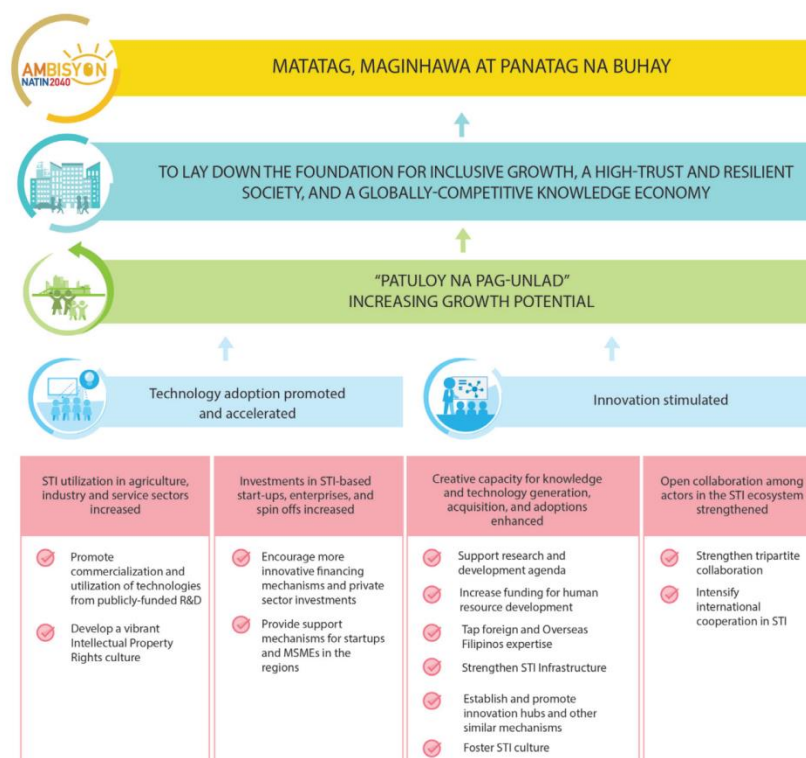


Figure 1: Strategic framework to leverage Science, technology and Innovation, 2017-2022



To accelerate human capital development, two of the major targets are to increase the ability of people to earn income, and to ensure lifelong learning opportunities for all. This is shown in Figure 2. A major outcome for the former are improved employability, productivity, and enhanced labor mobility and income security. One of the major outcomes for the latter is improved quality of higher and technical education and research for equity and global competitiveness.

Various agencies of the country have to align with these national priorities according to their respective mandates. National public agencies like the Department of Science and Technology, the Department of Agriculture, and the Commission on Higher Education, to name a few, as well as State Universities and Colleges like the Benguet State University, have to be in sync with the national priorities as they perform their respective mandates as public institutions.



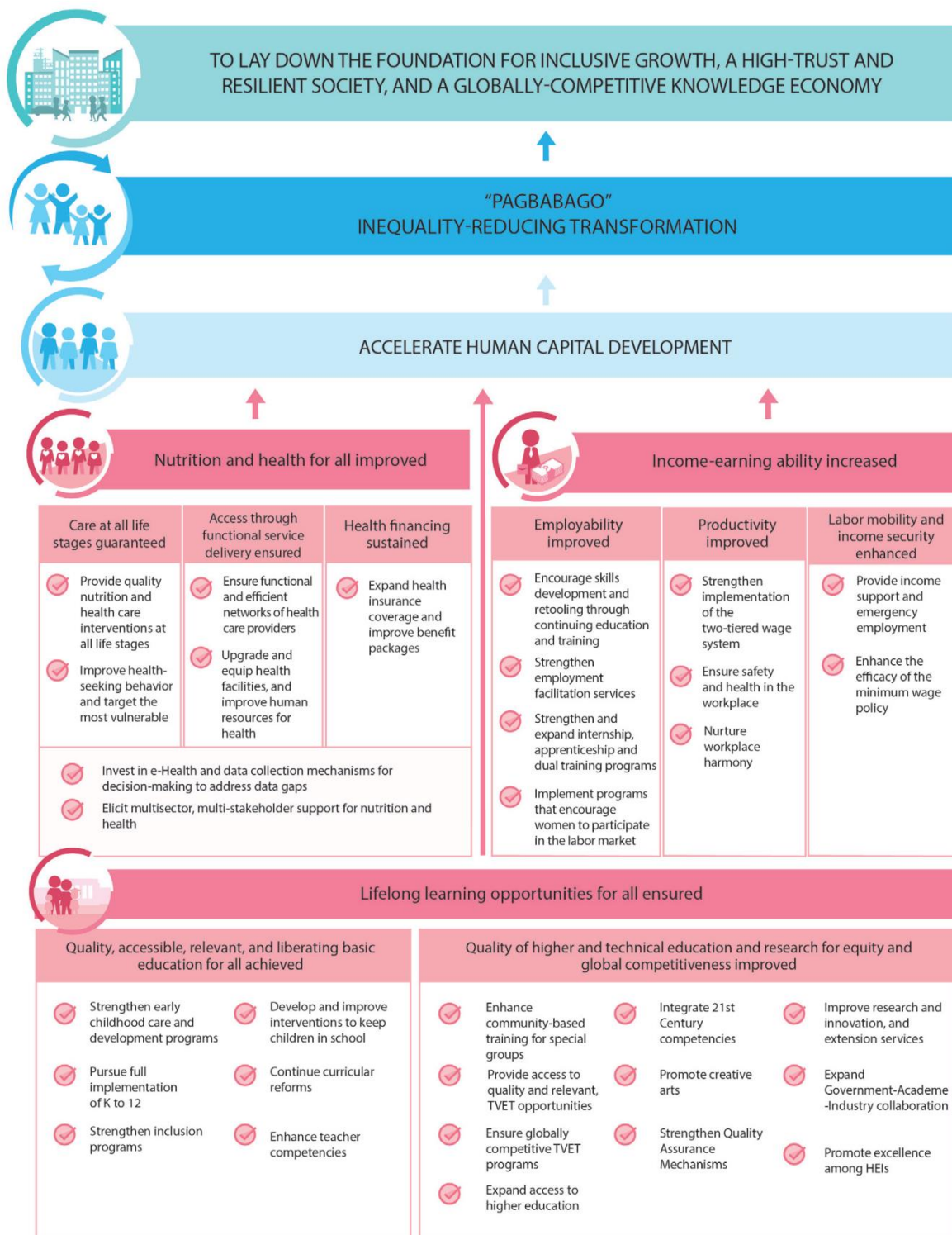
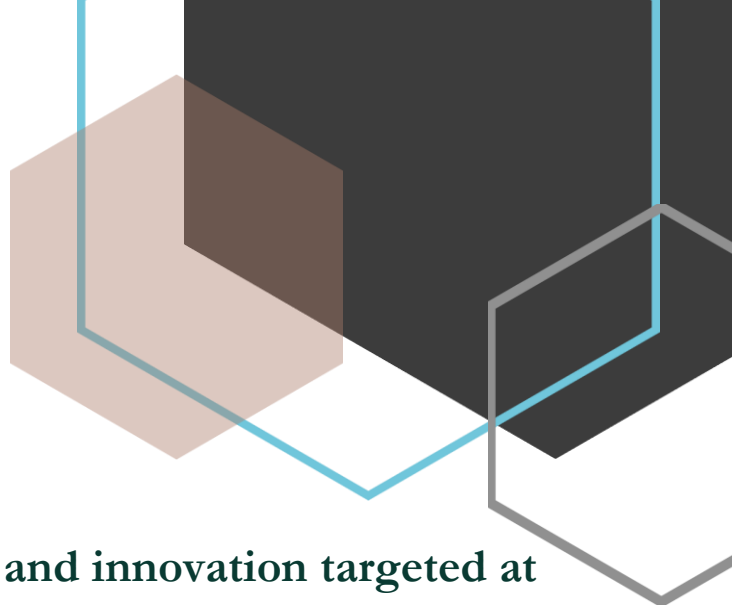
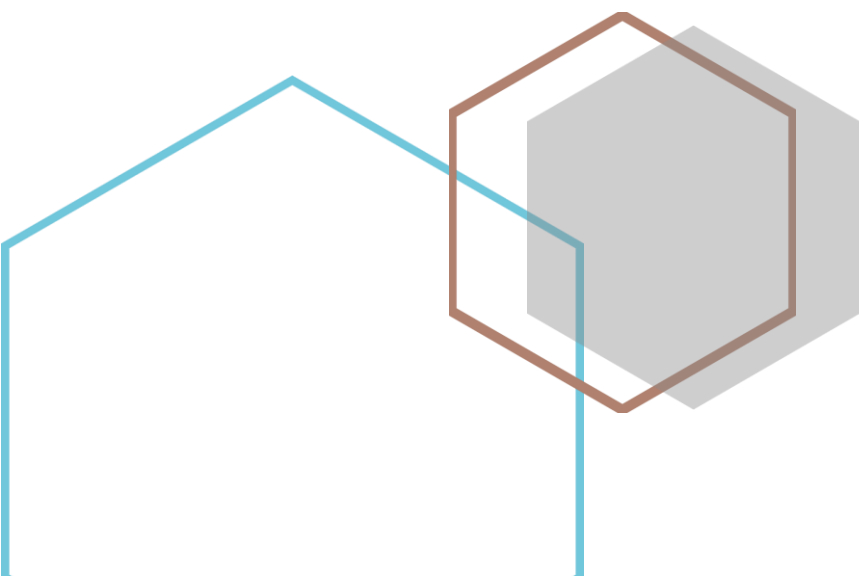


Figure 2. Strategic framework for accelerating human capital development



University priorities for research and innovation targeted at the economy and business enterprises



**PRIORITY RESEARCH
AREAS IN WHICH THE
UNIVERSITY
CURRENTLY EXCELS**

The Benguet State University currently excels in research and innovation targeted at addressing the needs of the Cordillera people given their unique culture, and catering to the businesses that are associated with the semi-temperate environment of the Cordillera region where the university is located. In this regard, the priority areas can be inferred from the university's current structure. The way in which the two major sectors of the university, namely the academic and the research, development and extension sectors are established and organized, reflects the priority areas that are currently being pursued.

The university has a distinct research, development and extension sector headed by a Vice President with the following mission, goal and objectives:

Mission: To lead strong and excellent research and extension culture through knowledge creation and dissemination

Goal: To generate and utilize knowledge and technologies in order to enrich/enhance the academic programs and income generating projects of the University and sustain and empower communities

Objectives

- Generate, develop and verify technologies responsive to the needs of the clients;
- Disseminate, incubate and commercialize mature and appropriate technologies developed
- Protect, manage and commercialize generated intellectual properties
- Publish Research and Extension outputs in refereed/indexed journals
- Conduct relevant and timely trainings and outreach activities in the communities
- Expand and strengthen local and international linkages/partnerships
- Promote professional growth and strengthen the capabilities of Research and Extension personnel and students
- Upgrade facilities
- Enhance Research, Development and Extension governance through updating of Research and Extension policies
- Generate revenues from research outputs and extension activities to augment Research, Development and Extension funds.

Research and innovation is conducted in twelve (12) research and development centers, namely:

- Northern Philippine Root Crops Research and Development



Centre (NPRCRTC) - created through Presidential Decree No. 1107, this center is mandated together with the Philippine Root Crops Research and Training Center at Visayas State University to spearhead, coordinate, and implement root crops research, development, and extension programs in the country. The flagship commodities for research and development at this center are for white potato and sweet potato, and for other root crops such as cassava, yam, taro.

- Horticulture Research and Training Institute (HORTI) - spearheads the generation, promotion and utilization of appropriate technologies or significant information to accelerate and sustain the development of temperate vegetable, fruit, plantation, and ornamental industries, and to benefit the public with the use of horticultural commodities.
- Institute of Highland Farming Systems and Agroforestry (IHFS) - spearhead the development, dissemination and utilization of agroforestry, sericulture, and other farming system technologies for highland farmers.
- Institute of Social Research and Development (ISRD) – conducts relevant social research and development activities in the highlands and other communities. This institute is also responsible in the advocacy and promotion of indigenous knowledge systems and practices of the Indigenous Peoples especially in the Cordillera region.
- Cordillera Organic Agriculture Development Centre (COARDC) – spearheads and coordinates research, development and extension activities in organic agriculture.
- Research and Extension Publication Office (REPO) – is in charge of the university journal - the Mountain Journal of Science and Interdisciplinary Research that accepts university-based or external research studies that are publication worthy.
- Climate-Smart Agriculture Centre (CSAC) - spearheads the development, dissemination and utilization of climate smart agriculture system and technologies in highland farming communities.
- Higher Education Regional Research Centre (HERRC) - conducts research and development activities responsive to the needs of the Cordillera region in agriculture, forestry, natural resources education, social and health concerns, and spearheads the promotion, networking and utilization of research results/outputs.
- Agribased Technology Business Incubator/Innovation Centre (ATBI-IC) - is a non-profit educational service, research and development program where start-up, and early- stage micro-level entrepreneurial companies can be nurtured in a stimulating



physical environment and given access to professional support services to enhance the stability of their business ventures.

- Cordillera Regional Apiculture Centre (CRAC) – conducts research, extension and training activities for beekeepers, apiculturists and other stakeholders towards the development of the apiculture industry in the region.
- Intellectual Property Rights Office (IPRO) - ensures that the university will protect and secure the exclusive rights of its scientists, researchers, artists and other gifted employees and students to their intellectual property and creations as provided in Republic Act 8293, otherwise known as the Intellectual Property Code of the Philippines.
- Food Science, Research and Innovation Centre (FSRIC) - is the lead agency, head researcher and technology incubator to accelerate food industry research and development.

Research conducted in the above-cited centers is largely technical and applied, meaning addressing issues related to increasing productivity through more effective production inputs (seed production, varietal selections/improvements, etc.) and the use of more efficient methods (integrated pest management, organic agriculture, mixed croppings, etc.). This is to enable the predominant farming business in the region to become more competitive and viable. The university completed 62 projects/studies in 2017 and some examples of these are as follows:

- Development of protocols for the production of inoculants and field application of atoxigenic strains of *aspergillus flavus* (ASAFs) as biological control agents against pre-harvest aflatoxin contamination of peanut
- Characterization of organically-grown Arabica coffee and identification/assessment of Arabica coffee diseases in Mountain Province
- Characterization and identification of edible mycorrhizal mushrooms at pine tree based areas of the Cordillera Administrative Region
- Increasing yield of heirloom rice in Benguet through variety selection and organic production practices
- Promotion of processing potato varieties and seed rapid multiplication techniques for sustainable production
- Promotion and adoption of root crops and fruit-based processing technologies in some parts of CAR and Region 1
- Development of Ex Vitro acclimatization technology for selected in-vitro propagated ornamental crops
- Comparative polyphasic study of organic and conventional strawberry production systems with emphasis on disease management

- Development of Upland Satsuma Orange based organic cropping system
- Integrated Pests Management of Selected Highland Vegetables
- Value chain studies in support of native pig production in the Cordillera Region
- Development and Evaluation of NSIC-approved improved varieties of bush and pole snap beans (*Phaseolus vulgaris* L) for commercialization in Northern Philippines
- Growth performance of finisher broiler fed with ration containing potato (*Solanum tuberosum*) meals as partial substitutes to corn
- Design and fabrication of a passive solar dryer for meat preservation in the Cordillera Region of Northern Philippines
- Response to sweet potato problem in Kayapa, Nueva Vizcaya
- Varietal evaluation and selection of tomato under conventional production
- Development of production technologies in Medinilla
- Knowledge transfer of potato varieties known and grown by indigenous peoples in the Highlands of Northern Philippines
- Alternative crop shelter designs for the production of high value crops
- 20. Development of agroforestry model with shiitake and Arabica coffee production
- Strengthening the vegetable sector in the Cordillera Administrative Region (CAR) Philippines

Some value added research studies that were conducted included the following:

- Production, evaluation and market niches of spinach, sweet potato tops and amaranth- enriched canton noodles, enriched instant noodles, dried miki noodles, enriched udon noodles, and enriched fettucine noodles
- Production and evaluation of pre-packed ready-to-cook and ready-to-eat veggie noodles
- Seafood, poultry and pork meat product development Research and Development
- Production of potato based ice cream
- Value adding of Cordillera pork-based ethnic food delicacy (Etag) for commercialization
- Development of root crop wheat flour formulations for quality miki

- Marketability of root crop based products at the BSU marketing center

The academic sector complements the research, development and extension sector in research and innovation. Specifically, the academic sector provides the key human resources for the research activities of the centers. The senior researchers are from the colleges and the research staff are usually the graduates of the various colleges. There are twelve (12) colleges and institutes at Benguet State University where graduate and undergraduate programs are offered. Faculty members and the students conduct research and innovation based on their disciplines or expertise, based on research grants obtained, and as part of student thesis requirements. Research is done within the college or in collaboration with a university research center. Hence, the priority areas are according to the programs being offered and the current specializations of the faculty members. The colleges and institutes are listed as follows:

- College of Agriculture
- College of Arts and Sciences
- College of Engineering and Applied Technology
- College of Forestry
- College of Home Economics and Technology
- College of Nursing
- College of Teacher Education
- College of Veterinary Medicine
- Graduate School
- Open University
- Institute of Human Kinetics
- Institute of Public Administration

Research done at the Graduate School and at the Open University is cross-cutting in nature. The Graduate School is the coordination office for all the graduate courses that are offered by the various colleges. The teaching and research is lodged at the colleges, but all administrative matters about student enrolment and progress are managed at the Graduate School.

RESEARCH
PRIORITIES FOR THE
FUTURE
DEVELOPMENT OF
THE UNIVERSITY

The Benguet State University in the future will continue to work in the same research priority areas that make it relevant to the needs of stakeholders in the Cordilleras. However, it will expand efforts for research, development and extension (RDE) in the following areas: root crops, vegetable, strawberry, ornamentals, agroforestry, socio-cultural, higher education, organic agriculture, climate-smart agriculture, food



POTENTIAL
EXPANSION OF
EXISTING RESEARCH
CENTRES

science, apiculture, and agribased technology incubation and innovation according to the priorities of the various research centers. It will also expand research in the colleges related to the different graduate and undergraduate program offerings. However, new priority areas are planned to be added, subject to approval by the university Board of Regents namely: bioresources, health and nutrition, engineering and agro-Industry, forestry, animal RDE, and interdisciplinary studies. Moreover, the research for strawberry and Arabica coffee will be given further emphasis.

The following research centres are proposed to be reorganized and renamed in order to give focus on areas that are being addressed and to eliminate overlaps. The Institute of Social Research and Development is proposed to become the Institute for Indigenous Studies and Social Research and Development (IISSRD). The Climate-Smart Agriculture Centre (CSAC) is envisioned to become the Institute for Climate Resilience and Adaptation (ICRA). The Food Science, Research and Innovation Centre (FSRIC) will expand and envisioned to be the Food, Health, and Nutrition Research Centre (FHNRC). While there is no change in name, the plan is for the Higher Education Regional Research Centre to focus primarily on educational research.

Some of the research institutes with broad coverage are planned to have specific mandates like the Institute of Highland Farming Systems and Agroforestry (IHFSA) to become the Arabica Coffee Research and Development Centre (ACoRDC) and that there will be a new Tropical Mountain Forest Research and Extension Centre (TMFREC).

POTENTIAL OPENING
OF NEW RESEARCH
CENTRES

Two new research centers are proposed to be established that will be located in the external campuses of the university namely, in Bokod and Buguias. Since the Buguias campus is right at the heart of Loo Valley where vegetables are being grown, the Semi-Temperate Vegetable Research and Development Centre will be established in this site. On the other hand, the Bioresources Research Institute will be established at the Bokod campus where the location and proximity to Mount Pulag make it a good base for biodiversity-related research. This move will also strengthen the ability of the faculty members and students in these two campuses to do RDE activities.

Moreover, in the main campus - and in order to address specific concerns by business - the following research centres are being proposed: the Strawberry Research and Development Centre, the Cordillera Centre for Animal Research and Development (CCARD), and the Centre for Engineering and Agro-Industry Research and Development (CEAIRD).



POTENTIAL
EXPANSION OF
COLLABORATIONS
WITH BUSINESS OR
CREATION OF NEW
COLLABORATIONS

It is envisioned for the university to expand the link with the private sector, especially for the commercialization of technologies. The current partners that represent the input supply sector will continue to be rallied, but it is also envisioned to cover the other players of the supply chain for the commodities that the university has focused its RDE activities on. Active collaboration with more farmer organizations and associations will be prioritized, too.

The expansion of collaborations with national and local partners for research and innovation should also be mentioned. In the future, the research partnership with the Commission on Higher Education through the Higher Education Regional Research Centre will continue through the conduct of the following research:

- R&D Program on Arabica Coffee in the Cordillera Administrative Region
- Rediscovery of underutilized food legumes in Benguet and Mountain Province: Germplasm characterization and evaluation, seed production and development of legume-derived specialty food products
- Adoption and impacts of drip and sprinkler irrigation systems and other water-saving practices for highland horticulture
- Language bank of the Cordillera Administrative Region

With the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development of the Department of Science and Technology, the following research will continue until 2020: “Strengthening the BSU/ATBI/IC through capability building and program enhancement,” and a research on climate adaptation which will be elaborated more in the next section..

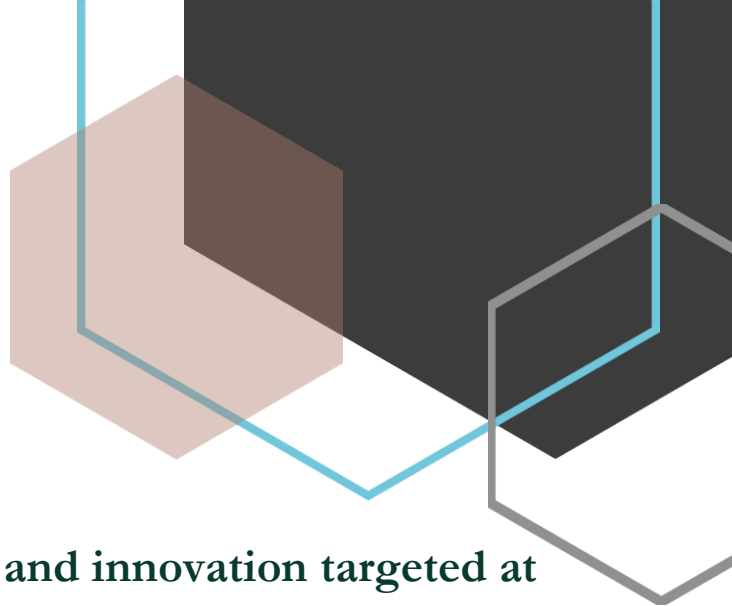
POTENTIAL
EXPANSION OF
INTERNATIONAL
COLLABORATIONS OR
CREATION OF NEW
INTERNATIONAL
COLLABORATIONS

For the University to assist business in improving productivity, becoming more competitive and creating higher-value added goods and services, collaboration with international partners will be pursued. For instance, to introduce new vegetable varieties and improved crop production techniques, pending discussions for research partnerships with the World Vegetable Center and schools like the National Chiayi University and the National Pingtung University of Science and Technology in Taiwan will be followed up. The same is true for research collaborations that are being discussed with some universities in Thailand like the King Mongkut’s Institute of Technology in Ladkrabang for food processing and agricultural engineering, and the King Mongkut’s University of Technology in Thonburi for postharvest technologies. A project with the National Chung Hsing University, Taiwan funded by the Taiwan Economic Exchange Office, Manila Economic Exchange Office and the Philippine Department of Science and Technology entitled: “Integrated Pest Management in GAP and Organic Production of Broccoli and Strawberry under Protected

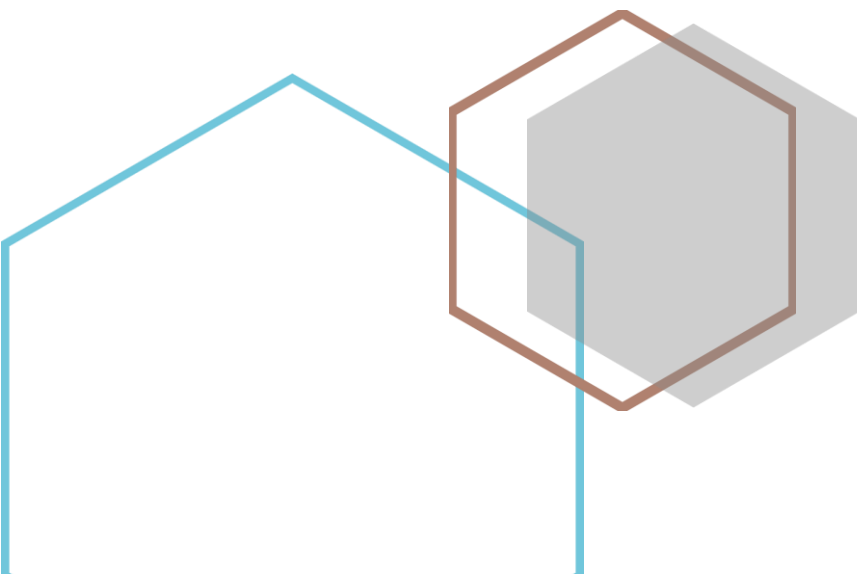


Structures” will be implemented until 2020.





**University priorities for research and innovation targeted at
inclusive economic growth**



**PRIORITY RESEARCH
AREAS IN WHICH THE
UNIVERSITY
CURRENTLY EXCELS**

Through the research centers and the colleges/institutes as described in the first section, the Benguet State University continues to promote inclusive economic growth in the region. This is done as the technical research centers conduct research and innovation to improve productivity through better inputs and methods and thus reduce hunger and poverty. On the other hand, the social research centers study aspects of individual decision making, attitudes and social dynamics at the household, enterprise and community levels to improve welfare including employability, and to preserve indigenous knowledge systems.

The university leads the research, development and extension of the various research units in the region through the Cordillera Consortium for Agriculture, Aquatic and Resources Research and Development (CorCAARRD). This consortium is composed of 19 member agencies representing the various regional department public units, state universities and colleges, and non-governmental organizations in the Cordillera Administrative Region. Through this consortium, joint and technical research, including advocacies for social and gender inclusion, are being promoted among the member agencies.

On gender inclusion, pursuant to Section 36 of Republic Act No. 9710, otherwise known as the Magna Carta of Women (MCW), all government departments, including their attached agencies, offices, bureaus, state universities and colleges, government-owned and government-controlled corporations, local government units and all other government instrumentalities shall adopt gender mainstreaming as a strategy to promote women's human rights and eliminate gender discrimination in their systems, structures, policies, programs, processes, and procedures. Also, 5% of the annual government appropriation shall be used for gender mainstreaming.

At Benguet State University, part of the gender mainstreaming is done through the conduct of research and extension activities. There is a Gender and Development Office at the university that plans and monitors all gender and development activities. However, when it comes to research and extension, the various research centers (especially the Institute of Social Research and Development) and the colleges are at the helm. Examples of research already completed from 2015 to 2017 that tackle gender and development are as follows;

- Gender and development issues among college students in la Trinidad: An analysis
- Gendered responses in organic agriculture: decision-making, discourses and engagements in organic farming in two communities in Benguet
- Gender roles in root and tuber crop among selected ethnoscapes in Northern Philippines
- Women farmers amidst climate change and fading cultures
- Women, food crop diversity and seed keeping as a cultural adaptation to climate change



- Gender dimensions of and challenges in local health legislation
- Exploring the sexual scripts of adolescents
- Time use analysis: women and their households as sites for everyday negotiations and organizing community life
- Balancing life: Struggles of working mothers with 0 – 6 years old children in Benguet State University
- Gender stereotyping along the areas of Technology Education: Its impact to gender participation in secondary education

In fighting unemployment and fostering better employability of graduates, the Benguet State University through the colleges have conducted tracer studies where graduates were followed through and asked about their experiences in seeking employment. Tracer studies are also usual requirements in the accreditation of the university curricular programs. Two of the recent tracer studies conducted are:

- Graduate tracer study for masters and doctorate degree program in rural development, College of Agriculture
- A tracer study on the graduates of the BSU-Buguias campus

Complementary to the tracer studies, are studies on the skills that students should have, teaching strategies/effects, and as well of current job markets that are available. Examples of this are the following studies conducted

- Employment skills: Implications for instructional enhancement and student development
- Indigenous technical knowledge and innovation used for agricultural and industrial jobs in the municipality of Buguias: An assessment
- Factors influencing mathematics teaching as a career choice: an instrumental development and validation
- Interactive physics apparatus: Influence on interest of secondary school students in pursuing a career path in Science, Technology, Engineering and Mathematics
- Exploring blended learning using social networking site in selected cohorts of BSU Graduate school
- Enhancing classroom interaction creatively
- Verbal learning style as the least preferred learning style of students in an Asian country
- Spoken discourse strategies of tertiary science teachers
- Experiences with problem-based learning approaches: Influences on pre-service teachers scientific literacy, cognition and self-regulation
- Case-based biology teaching: Impact on students' literacy,

cognition and self-regulation

- Assessment practices in higher education institutions
- Motivational factors and self-projection of students in pursuit of nursing education

Some studies on providing access to universal services are as follows:

- Implementation of inclusive education in the Cordillera Administrative Region
- Teachers' preparedness for inclusive education

On the improvement of living specifically in terms of promoting health and nutrition, mention was made of research that focused on the use of vegetables to make noodles, as well as baked products, and ice cream. Aside from fortifying food available to the public, studies that look into the role of commonly available root vegetables and underutilized food legumes, and other research studies were also made as follows:

- Role of roots and tubers in household food security and income of indigenous peoples of Northern Philippines
- Rediscovery of underutilized food legumes in Benguet and Mountain Province: Germplasm characterization and evaluation, seed production and development of legume-derived specialty food products
- Veggie enriched noodle feeding program for food and nutrition security in the Cordillera
- Development of production and processing technologies on orange-fleshed sweet potatoes to help address Vitamin A deficiency problem in the Cordillera Administrative Region
- Monitoring household salt, knowledge, attitude and practices on Iodine and Iodized salt among day care pupils' caregiver in La Trinidad, Benguet
- Development of chickpea (*Cicer arietinum* L) food products and its benefits to human nutrition.

RESEARCH
PRIORITIES FOR THE
FUTURE
DEVELOPMENT OF
THE UNIVERSITY

Benguet State University in the future will continue what it is doing towards assisting society in achieving sustainable growth, social and gender inclusion, fighting youth unemployment, underemployment and precarious employment, eradicating poverty, access to universal services and improvement of living. In the areas of research that the university is already currently doing, there is definitely more room for expansion on topics where not much has yet been done like in improving employment opportunities, as well as in improving access to universal services. While the university is very strong in technical agriculture research, research addressing inclusive growth needs to be strengthened in the next years.



**POTENTIAL OPENING
OF NEW RESEARCH
CENTRES**

The proposed creation of the following centres: the Bioresources Research Institute, the Semi-Temperate Vegetable Research and Development Centre, the Strawberry Research and Development Centre, the Cordillera Centre for Animal Research and Development (CCARD), and the Centre for Engineering and Agro-Industry Research and Development (CEAIRD) will help expand the opportunities for promoting inclusive economic growth. Given the limited resources available, creation of more centres may not be feasible. Therefore in this case, the research and innovation functions of the various colleges should be strengthened.

**POTENTIAL
EXPANSION OF
COLLABORATIONS
WITH BUSINESS OR
CREATION OF NEW
COLLABORATIONS**

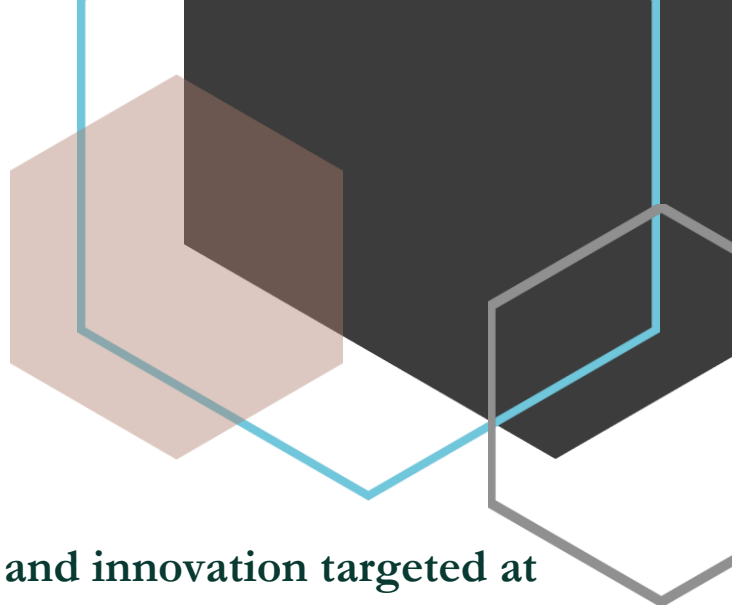
The partners engaged in agricultural supply will be further engaged to assist in research addressing sustainable growth. The engagement of partners from the local governments will still be pursued especially with the farmer organizations and associations. In the future, however, partners from the food sector may be approached to contribute to food-related research that involves fortification and commercialization. Partners from the private sector engaged in the vertical integration aspects of food production may be solicited to provide assistance in the inputs and throughput provision (especially new equipment and new processes) and market development.

**POTENTIAL
EXPANSION OF
INTERNATIONAL
COLLABORATIONS OR
CREATION OF NEW
INTERNATIONAL
COLLABORATIONS**

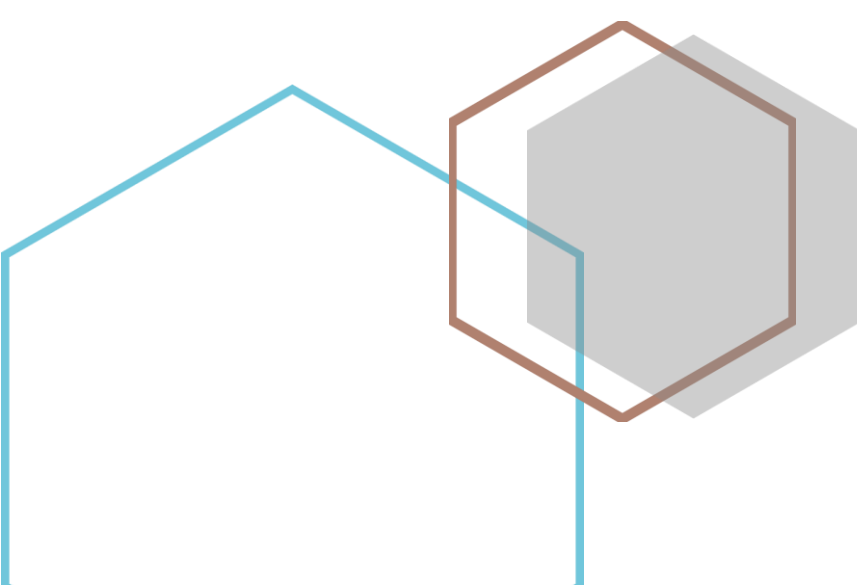
Since there is not much going at the university, international partners with particular interests and advocacies in this area will be sought. Gender inclusion is a topic that is a world concern and many donors are willing to fund research in this area. Unemployment in all its forms as applied to the rural farming communities will be a research priority area reintroduced to concerned colleges and institutes. This includes topics on inclusive growth especially in education.

In the next years, the university will need to make efficient and smart use of new funding through Erasmus Plus, the Newton Fund, funds from development agencies like VLIR-UOS Belgium, DAAD Germany, ACIAR Australia, to name a few. The INNOTAL project (Integrating Talent Innovation into Innovation Ecosystems in Higher Education) is one example of an international collaboration that will extend into the future.





University priorities for research and innovation targeted at pressing challenges facing societies in Southern and Southeast Asia



**PRIORITY RESEARCH
AREAS IN WHICH THE
UNIVERSITY
CURRENTLY EXCELS**

Benguet State University has been active doing research and innovation activities on the pressing challenges related to climate change and environmental issues. The university has conducted many university and donor funded projects (nationally and internationally) to mitigate the effects and foster resilience and adaptation among the stakeholders in the university and the communities. The track being taken is two-pronged: to investigate the specific effects to the ecosystem, the crops, the animals, to the people, and knowledge systems, among others, and to suggest measures to mitigate the effects. Some examples of studies conducted along this line in the last two years are:

- Evaluation, selection and seed production of selected vegetable, legume and root crops germplasm for drought, waterlogging and low temperature resistance for climate change adaptation in the Cordilleras.
- Disaster risk reduction of climate change impacts on vegetable terrace farms in Benguet, Philippines” Phase 1
- Partnering for resilience: Ecosystems management, restoration-risk reduction and climate change adaptation
- R&D program towards environmental sustainability of the Cordillera highlands amidst changing climate
- Participatory and community-based climate change adaptation strategies in Benguet Province
- Agroforestry as a strategy for climate change adaptation and mitigation
- Animal clinic to address emerging diseases due to climate change
- Conservation agriculture for rain-fed upland areas as climate change adaptation
- Improvement of forest/watershed management system of the Climate-Smart Agriculture Center forest/watershed areas
- Management of prevalent crops pests and diseases under varying climatic conditions in Benguet
- Ecological solid waste management practices of households in City of Baguio: Basis for an advocacy towards climate change mitigation
- Climate change vulnerability in selected highland areas of Benguet: An application of VAST-Agro tool

Research that tackles climate change and environmental issues are crucial in the region where the university is located. The Cordillera Administrative Region being predominantly mountainous is subject to a diverse set of climate disturbances like extreme cold during the months of November, December, January and February, extreme heat during the summer months of March, April, and May, and too much precipitation during the rainy season (July to October) resulting to landslides and



some flooding, etc. These climate disturbances not only impact the Cordillera people's routines, health and livelihoods, but also communities in the lowlands. The thinning watersheds result in limited water supplies during the summer months and create flood hazards during the rainy months. Crop damage and landslides reduce the availability of vegetables that the region supplies to the lowlands, affecting consumers and business alike. Hence, the university feels the imperative to conduct climate change and environmental research to address the problems plaguing the region, but also the country and the rest of the world.

On health issues, the university lacks research on this especially as linked to climate change and environmental concerns. However, some health and well-being studies have been done. Some of the recently conducted research studies in this regard are as follows;

- Pilot integration of nutrition in the college curriculum: Effect on body mass index, dietary intake, nutrition, nutrition knowledge and dietary habits
- Stress and coping strategies among employees of the Benguet State University
- Factors affecting lifestyle and health status of pocket miners of Benguet
- Effects of corrective exercises on the functional movement screen scores of football athletes.

With regards to the broader context of Southeast Asia and South Asia, the university has to be further involved in research collaborations to address the pressing challenges. The project earlier mentioned which is a tie-up with the National Chung Hsing University in Taiwan entitled: "Integrated Pest Management in GAP and Organic Production of Broccoli and Strawberry under Protected Structures" is an initiative in this direction.

RESEARCH AND
EDUCATION
PRIORITIES FOR THE
FUTURE
DEVELOPMENT OF
THE UNIVERSITY

In a survey made of the research performance of countries in Southeast Asia in 2015 by the British Council, the Philippines was reported to have high activity and impact in environmental sciences, and agriculture and biological sciences, but high activity and low impact in veterinary science, economics, econometrics and finance. Surveyed countries in the ASEAN (Malaysia, Indonesia, Thailand, Vietnam and the Philippines) overall shows the highest relative impact in energy research, which is said to be a particularly vibrant area that also displays high output and high growth. The focus of national research on environmental sciences and agriculture and biological sciences will continue, given the conditions in the country. In the case of Benguet State University, the focus will still be in the same fields and will likewise intensify in the next years. Harnessing energy through other sources like wind and sun, and harvesting water from fog are research areas being considered.



POTENTIAL
EXPANSION OF
EXISTING RESEARCH
CENTRES

Additional areas of research will be on the link between climate change, environmental issues and health. This will be true not only for humans but for animals as well. Animal-related and veterinary science research will be intensified.

More socio-economic research will be undertaken especially in light of the ASEAN economic integration that is now in full implementation for the member countries of Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Singapore, Thailand, Vietnam and the Philippines. The issues arising from the integration and the impacts on the economies, business and people's lives are ripe areas to include for research.

The proposed renaming of the Climate-Smart Agriculture Centre (CSAC) to become the Institute for Climate Resilience and Adaptation (ICRA) is more than just aesthetics. The intention is to search means to be able to do research that will alleviate the problems caused by climate change. The proposed renaming of the Food Science, Research and Innovation Centre (FSRIC) to be the Food, Health, and Nutrition Research Centre (FHNRC) deliberately accommodates the mandate to address health issues in the university research agenda. More social and economic research hopefully will be conducted to accompany the technical research that will be done through the proposed Institute for Indigenous Studies and Social Research and Development (IISSRD), and in the colleges/institutes.

POTENTIAL OPENING
OF NEW RESEARCH
CENTRES

As only recently realized, research on animals and veterinary science will now be given greater attention in the next years if the plan to establish the Cordillera Center for Animal Research and Development (CCARD) will materialize. A strategy that is being considered in place of establishing new research centres is for the existing university research centers and colleges/institutes to link with new research centers in the country and abroad for joint projects which will minimize the need for the university to allocate resources for new facilities.

POTENTIAL
EXPANSION OF
COLLABORATIONS
WITH BUSINESS OR
CREATION OF NEW
COLLABORATIONS

To address issues in the country and in neighboring countries, the participation of the private sector can also be crucial. Non-governmental organizations and foundations supportive of the development of the ASEAN and the Philippines will be targeted. Global business and business in the ASEAN can be sources of support for research on product development as they extend their activities to the Philippines.



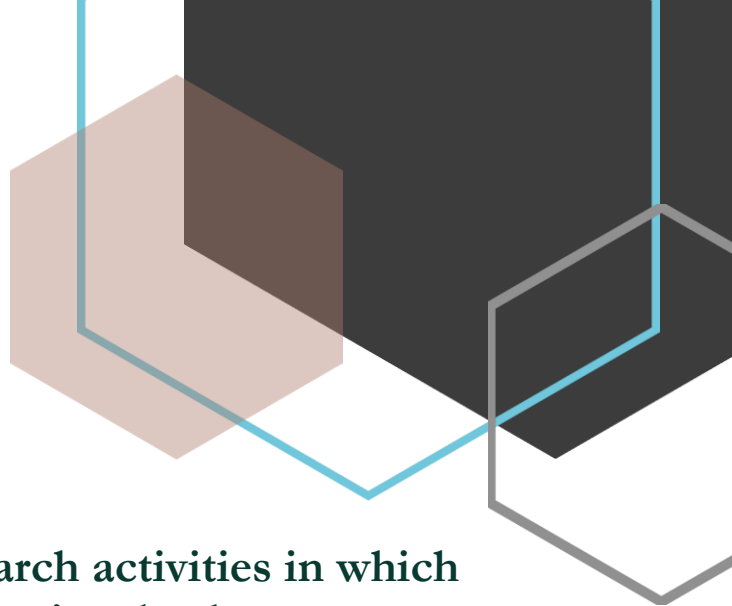
POTENTIAL
EXPANSION OF
INTERNATIONAL
COLLABORATIONS OR
CREATION OF NEW
INTERNATIONAL
COLLABORATIONS

There are success stories to tell of continuing partnerships with international donors and institutions on research studies that are being done. Mention of the following collaborations on sustainable development, especially related to climate change, that continued this year are noteworthy:

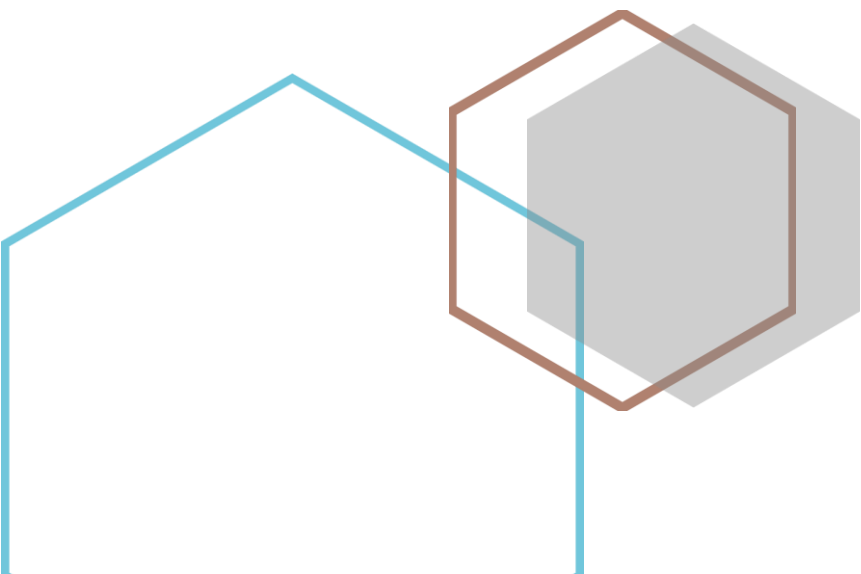
- Study on “Building Farmers’ Resilience in Disaster Prone Areas in Bokod and Kabayan, Benguet” by the World Food programme which up until 2019 will be continued with funding support by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development of the Department of Science and Technology but now entitled “Disaster risk reduction of climate change impacts on agricultural farms in the Cordillera Administrative Region
- “Implementation of the project Ecosystem Services and dynamics of indigenous knowledge in harnessing food security and biodiversity conservation in the highlands of the Cordillera, Philippines” by the Neys Van Hoogstraten Foundation.

Universities from the ASEAN network are going out of their way to establish links with one another. The initiative of the King Mongkut’s Institute of Technology in Ladkrabang and other schools in Thailand to come to Benguet State University for possible collaborations in recent years is expected to be replicated by other schools in the network as free mobility will be further promoted. Support for internationalization by donors like the European Commission is creating opportunities for institutions in the country and in Europe to partner with Benguet State University for research collaboration.





Areas of innovation and research activities in which students should be involved



In all the areas where the university conducts research to respond to stakeholder needs, as well as to extend the frontiers of science, students should also be involved. There are two ways in which this can be done: as part of their thesis requirements, and as class requirements to enhance learning. Benguet State University has adopted both strategies for student involvement in research. Students are required to conduct research as part of the final requirement for graduation and this is true for all the Graduate School courses (Master and Doctorate degrees) and at the Open University. The research areas are alongside identified problems and interests associated with the degree programs the students are enrolled in. Graduate courses are offered in the following colleges/institutes: Agriculture, Teacher Education, Arts and Sciences, Forestry, Home Economics and Technology, Public Administration and Human Kinetics. Seven Doctor of Philosophy courses are offered in the fields of agricultural education, agronomy, educational management, horticulture, language education, rural development, and science education (biology). Research through thesis is done according to the course enrolled in. There are 19 Master of Arts courses namely: applied statistics, chemistry, English as a second language, Filipino, general science, guidance, home economics, mathematics, physical education, physics, social studies, technology and home economics, education, educational administration and supervision, guidance and counseling, elementary education, early childhood education, library and information science, and public administration. There are 13 Master of Science courses, namely: agribusiness management, agricultural economics, agricultural education, agronomy, animal science, biology, entomology, forestry, horticulture, mountain engineering, plant pathology, rural development, and soil science. The Open University offers seven master courses in the following fields: community development, community health development, cooperative management, development communication, human resource management, non-formal education, and urban management.

At the undergraduate level, not all the colleges require students to conduct research through thesis. However, the majority of the colleges especially the technical ones do, e.g. the College of Agriculture, the College of Engineering and Applied Technology, the College of Forestry, the College of Veterinary Medicine, the College of Home Economics and Technology, and the Institute of Public Administration. The research is usually conducted during the two semesters of the last year at university. The research priority areas are in line with the courses the students are enrolled in. A faculty member serves as adviser, and the research is more often than not an individual undertaking, though some colleges allow group research. Whether a thesis will be done or not is actually prescribed in the curriculum set by the Commission on Higher Education.

Students who are not required to write a thesis, conduct mini-research through individual or group assignments given by teachers. They usually conduct action type research and quick surveys.

At Benguet State University, students are not just encouraged to do research; they are also encouraged to share the results of their research. They are encouraged to face the academic and research community to defend the validity and relevance of their research. The sharing of research has widened to three levels: at the college, at the university, and in the region with other state universities and colleges. The department recommends which research will be presented at the college level. At this level, the selected student research works in all levels (undergraduate, master and doctorate) undergo public presentation with external evaluators invited to judge which are best ones. The authors of the best research works receive awards and incentives. The best student research works get to compete with the other colleges at the university level, and the winning research works compete at the regional level. The student research congress was started in 2016. This practice is aimed at creating a culture of doing good research among students. It is modelled after the Annual In-House Reviews where all research conducted by the faculty and staff is presented to the scientific community both from within and outside the university.



A summary data on student research works involved in the 1st and 2nd University Student Congresses are shown in the table below where a total of 39 and 49 research works, respectively, were presented:

Level	College/Institute	Category				
		Science and Technology Research		Social Research		
		1 st	2 nd	1 st	2 nd	
Graduate	College of Agriculture		2			
	Institute of Public Administration			3	3	
	Open University		1	2	3	
	College of Arts and Sciences			3	2	
	College of Home Economics and Technology	1			2	
Total		1	3	8	10	
Undergraduate	College of Teacher Education	3	1	3	3	
	College of Arts and Sciences		2	3		
	College of Home Economics and Technology	1	3	2	3	
	College of Veterinary Medicine	4	3			
	College of Agriculture	4	3		3	
	College of Engineering and Applied Technology	3	3			
	College of Forestry	1	3		3	
	College of Nursing	3		3	3	
	Institute of Human Kinetics				3	
	Total		19	18	11	18

In the 2nd University Student Congress and the 1st Cordillera Region Student Congress in 2017, the following BSU student research works got awards. This is to indicate the research areas that students in the colleges are also working in:

- Design, construction and performance evaluation of a coco peat block making machine
- Morphological characters, growth and yield of rice (*Oryza sativa* L) entries for cool elevated areas
- Design, fabrication and performance evaluation if a manually fed mature coconut (*Cocos nucifera* A) dehusking machine



- Profiling and vegetative propagation of Balukok (*Microcos philippinensis*) (Perkins) Burret
- “Takumpilleng”: Cultural educator Ventura Bitot leading the beat towards the conservation of indigenous Cordillera music and dances
- The level of reading proficiency of Grade 7 student of short story, poem, and expository essay
- Morpho-genetic characterization, diversity analysis and evaluation of rice landraces in Benguet
- Professional development and leadership competence of school heads in urban and rural areas
- Speaking anxiety: sources, coping mechanisms and teacher management.

As much exposure to research and innovation should be given to the students in the future. The university is mindful of the importance of research work in terms of the discipline and analytical training that students obtain in the process. A review of the courses that still do not require research to be conducted by undergraduate students should be made at the university to make research an important component of every curriculum. However, the research should be within the prescribed academic load that the students carry per semester. The research assignments should also consider the ability, time and resources of the students.

Finally, it should be mentioned that an enabling mechanism to help transition the students to become entrepreneurs upon graduation through research and innovation was the creation of the Agribased Technology Business Incubator/ Innovation Centre (ATBI-IC). This can be done even during the last years of the student’s stay at the university. Just barely a few years old, the centre is getting support from various agencies like the Japanese Development Agency, the Philippine Department of Science and Technology, and the Department of Trade and Industry. The link between this centre, the other research centres and the colleges, should be further explored to provide greater opportunities for students to be employed or better yet to be self-employed.

