

**Research into Use Programme
Supporting Innovation - Changing lives**



EVENT DOCUMENTATION IN SIERRA LEONE

Compiled

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Preface

The objective of this compilation is to see at a glance all events relating to RIU work in Sierra Leone for 2007. It contains various documents including reports (workshops, field visits, assessments etc), proposals, articles, historical information on research work in Sierra Leone, strategy document an the like.

At the glance is produced for the purpose of information sharing and to follow a step-by-step progress on events in Sierra Leone. It is divided into eleven sections and each section is just the same as it has been presented in the original document.

I hope the reader finds it useful in his/her work.

SECTION 1: SIERRA LEONE COUNTRY ASSESSMENT REPORT

Assessment Team

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1. Executive Summary

- 1.1 The RIUP has been established to maximise the poverty reducing impact of previous RNRRS (and other) research, and in so doing to significantly increase understanding of how the promotion and widespread use of such research can contribute to poverty reduction and sustainable economic growth
- 1.2 The key task of the RIUP Assessment Team has been to see whether arrangements can be put in place to add value to existing (and future) “new knowledge” from scientific and technological research in the agricultural/rural sector of Sierra Leone. The team was particularly looking for “windows of opportunity” to increase the demand for such knowledge by users of different types
- 1.3 The main organising principle is that of an *innovation system* which the RIUP has adopted as a major focus for its activities. Correspondingly the assessment has focused on identifying suitable *innovation platforms* to guide and manage interventions
- 1.4 The team began its mission on February 11th with a week’s round of interviews in the capital Freetown plus collection and review of relevant literature. Week 2 was spent up-country interviewing stakeholder groups in selected rural areas. Week 3 was spent back in Freetown on further visits and report drafting.
- 1.5 The team believe it important to recognise the special circumstances of the country. The recent civil war virtually destroyed its social, economic and institutional fabric. Major areas of rural society ceased to function economically, people migrated to the towns in large numbers (especially Freetown the capital) virtually halting agricultural production. Infrastructure like roads and energy supply were also destroyed. Corruption is endemic and the private sector investment climate very weak.
- 1.6 In the rural areas the problems are fundamentally associated with poverty and feed upon each other in a vicious cycle of negative impact. Seeds, fertilizers, tools and other inputs are in short supply and subject to exploitative behaviour on the part of traders; access to markets is constrained by poor transportation, decrepit feeder roads (some impassable in the wet season); livestock was virtually wiped out and restocking is still only slowly taking place; capacity to engage in agro processing is limited. The capacity of government to help resolve these issues is weak.
- 1.7 Four windows of opportunities were identified. These are prioritised as follows:
- Livestock enhancement and provision of complementary veterinary capacity
 - Assistance in post-harvest arrangements
 - Establishment of micro credit and related facilities in rural areas
 - Assistance in developing the operations of farmer field schools
- Each of these show evidence of reasonable innovation platforms and all map on to each other quite closely, the difference lying in the main field of focus and perhaps on the most appropriate institutional entry point.
- 1.8 The opportunities that have been identified should start at very basic levels, focus on operations within rural communities and concentrate on improvements in incomes, empowerment, employment and market access
- 1.9 The lead agencies for innovation platforms should be INGOs and/or local NGOs or CBOs so as to ensure that drivers of change operate at rural levels. This is partly due to lack of adequate capacity at local government level and weak private sector activity.
- 1.10 Partnerships should include key RNRRS technology suppliers, CBOs,¹ research/academic bodies, private sector operators and local government agencies.
- 1.11 RIUP interventions should be subject at all times to close financial scrutiny with regular reporting and auditing arrangements in place.
- 1.12 Base line data should be collected in all cases to ensure effective M&E work.
- 1.13 For innovation platforms to be able to operate well all RIU programmes/projects should include a strong capacity building element. This will enable stakeholder groups to be brought up to speed as soon as possible.
- 1.14 In particular there is need to integrate the university and research sectors into innovation systems as an integral part of interventions. However, this should be done as much as possible by drawing such bodies in on the operational side rather than simply providing resources directly for R&D and related work.

¹ There may be instances where CBOs might be suitable lead partners. The team across a small number of instances where this could work but further investigation would need to be done before a decision was made

2. Background and Country Specific Considerations

(i) Background

- 2.1 The RIUP was established to maximise the poverty reducing impact of previous RNRRS (and other) research, and in so doing to significantly increase understanding of how the promotion and widespread use of such research can contribute to poverty reduction and sustainable economic growth. It has collated outputs from DFID's previous Renewable Natural Resources Research Strategy (RNRRS), and other research based on their potential to contribute to sustained growth and poverty reduction. These comprise some 300 or so "best bet" technologies that could have generic applicability in sub-Saharan Africa and South Asia.
- 2.2 The key task of the Assessment Team has been to see whether arrangements can be put in place to add value to existing (and future) "new knowledge" from scientific and technological research in the agricultural/rural sector of Sierra Leone. The team was particularly looking for "windows of opportunity" to increase the demand for such knowledge by users of different types. In other words there has been a strong focus on innovation to assess whether and to what extent new DFID funds (managed by the RIUP) can promote innovation and in this way contribute to sustainable development, particularly in rural areas.
- 2.3 Central to this process is the notion of an *innovation system* which the RIUP has adopted as a major organising focus for its activities. The innovation systems model has increasingly come to be used in relevant policy circles in order to understand better the complexities of knowledge-led development. Its main message is to broaden the institutional context of "knowledge generation and use" beyond formal research infrastructures to include also the wide range of stakeholder groupings that play key roles. These potential *"innovation platforms"*² include particularly the private sector, LNGOs, INGOs, public sector agencies, research bodies, community organisations and related groups. The assessment team sought to identify potential innovation platforms and related entry points that would allow the RIUP suitable opportunities for investment over the coming 4 years.

(ii) Methodology

- 2.4 The Sierra Leone Team used a recently completed World Bank study as a basic methodological source³. This study showed that it is how well such groupings are networked that often determines the success of innovations in the agricultural sectors of very poor countries. In particular the methodology specifies the:
- (a) Actors, roles they play, and activities in which they are involved;
 - (b) Enabling environment (policies and infrastructure);
 - (c) Attitudes and practices of the main actors;
 - (d) Patterns of interaction among them;
- 2.5 The team began its visit on 9th to 11th February when it met up in Freetown along with a representative of the RIU management team. He had been part of an earlier scoping visit in November 2006. The first week was spent reviewing literature and in identifying and visiting a range of organisations and individuals whose views would be important to the assessment. Details of these may be found in the Annex.⁴ In its interviews the team explained the nature of the mission and explored what are the likeliest "windows of opportunity" for productive engagement on the part of sectors/groupings that are likely also to create jobs and have long-term development effects. Environmental and poverty considerations were also be important criteria.
- 2.6 However, it quickly became clear that whatever we were being told in Freetown would need to be tested by visits to the field. This was partly because we were assessing mainly the agricultural sector. But it also reflected a growing concern about the validity of some expressed views. Accordingly the team split into two, one visiting the south and east of Sierra Leone, and the other the north and west. These visits took place over the second week. The objectives of the field trip were to:

² An "innovation platform" has been defined by NR International as "A network of partners, working on a common theme and using research knowledge in ways it has not been used before to generate goods/services for the benefit of the poor".

³ See World Bank (2006). See also Arnold and Bell (2001). For a detailed account of the development of innovation systems approaches in the RNRRS CPHP see Barnett (2006)

⁴ Preliminary work had been done on this by the pre-assessment visit in November 2006 and a range of people/organisations identified.

- Collect first hand information on and from agencies (international, civil society organizations and 'grass root' community based organizations); working at regional, district and village levels, in the areas of poverty reduction, food security and natural resources management
 - Verify the track records of major agencies working with a randomly selected targeted community groups in the areas of crop and livestock production, research – extension – farmer – input supply – processing & marketing linkage systems, the farmer field school programme, micro credit, and capacity building; and
 - Assess the prevailing situation of the poor, hungry and marginalized (voice of the underprivileged) and to identify the windows of opportunity for RIUP engagement/collaboration.
 - Focus on identifying key stakeholder groups and assessing the extent to which they could form suitable innovation platforms.
- 2.7 The team used a combination of participatory methods; key informant interviews (KIIs) and focus group discussions (FGDs), which facilitated the full participation of all partners/stakeholders in the review process. Accordingly the team split into two, one visiting the south and east of Sierra Leone, and the other the north and west. These visits took place over the second week. They focused on identifying key stakeholder groups and assessing the extent to which they could form suitable innovation platforms. In some cases it was possible to pre-arrange interviews either through District Agricultural Co-ordinators or through the equivalent officers of CBOs such as women's groups and farmers associations. In these cases the meetings were quite large (in one case over 300 people were present) since most stakeholder representatives appeared from some distance around. In other cases visits were *ad hoc* and smaller in scope. The team then re-convened at the end of week two to assess its evidence and plan out the rough first draft of the report. A final round of visits took place during the re-drafting period in week three.
- (iii) *Country Context*
- 2.8 The team believe that it is important for the RIUP to recognise the special circumstances of the country. Sierra Leone has recently come out of a devastating civil war that virtually destroyed its social, economic and institutional fabric. Major areas of rural society ceased to function economically, people migrated to the towns in large numbers (especially Freetown the capital) virtually halting agricultural production. Infrastructure like roads and energy supply were also destroyed.
- 2.9 Since 2002 therefore, the country has been starting virtually from scratch. A recent DFID report maintains that some progress appears to have made on fundamentals. For example, there is peace and security in the country, national and local elections have been held and improvements have been made in primary health and education areas. In addition the government has begun a process of resuscitating the rural areas through establishing a decentralization policy designed to boost the local economic activity. Nevertheless, the contextual conditions are poor. Corruption is widespread and this combined with stultifying bureaucracy, an inadequate judiciary, poorly developed financial institutions (there is very limited commercial banking outside Freetown) is having a strong negative impact on normal drivers of economic change, particularly foreign direct investment.
- 2.10 In contrast Sierra Leone has good natural resources and a favourable climate for sustainable production including a long coastal stretch from Kambia in the north to Sulima in Pujehun district in the south. A large stretch of grazing land is available for livestock production; Seventy five percent (5.36 million hectares) of the country's 72,000 square kilometers land area is arable land, comprising:
- Uplands – 4.30 million hectares (80.2%), suitable for cultivation of a variety of crops under rain fed conditions.
 - Inland Valley Swamps – 0.63 million hectare (11.8%) with possibilities for irrigation and multiple cropping.
 - Mangroves – 0.20 million hectares (3.7%), subject to sea water flooding and suitable for rice cultivation.
 - Riverain Grasslands – 0.12 million hectare (2.2%) suitable for mechanical cultivation of rice.
 - Bolilands – 0.11 million hectare (2.1%) seasonally flooded and also suitable for mechanical cultivation
 - Three to four thousand millimeters annual rainfall, spread over six months. The temperature is tropical (23 – 28 degrees centigrade);
- 2.11 A wide range of food crops are grown under the upland bush fallow system. Sorghum, millet, maize, cassava, beniseed and beans are the associated crops grown with rice. Most farmers sow a first crop of rice after clearing the bush, while the other crops follow. There are regional differences: with the south

- and east growing a wider range of crops and the north relying mostly on rice, cassava, some millet and sorghum. Lowlands are generally cultivated to crops, particularly rice, in pure stands.
- 2.12 There are clearly many opportunities for major innovation in Sierra Leone such as in tourism for example, but so difficult is it to break through the bureaucratic system that incentives for risk-taking are weak. Entrepreneurs tend to seek soft international loans as a means of minimizing such risks. The private sector more generally is confined to the import, trading, diamond and construction sectors most of which is tightly controlled by “non-indigenous” communities like those of the Lebanese and other Asian groupings (with high-level political support), virtually excluding African communities from participation in meaningful economic progress. As a result most Sierra Leoneans rely on petty trading, small scale agriculture and diamond digging, most of this informal. In consequence the major donors such as the World Bank, the EU and DFID are presently concentrating their efforts on macroeconomic support and institutional reform, particularly on governance structures.
- 2.13 In the rural areas the problems are fundamentally associated with poverty and feed upon each other in a vicious cycle of negative impact. Seeds, fertilizers, tools and other inputs are in short supply and subject to exploitative behaviour on the part of traders; access to markets is constrained by poor transportation, decrepit feeder roads (some impassable in the wet season); livestock was virtually wiped out and restocking is still only slowly taking place; capacity to engage in agro processing is limited. The capacity of government to help resolve these issues is weak. For all of these reasons the opportunities for RIU intervention must start from the lowest possible level.
- 2.14 The assessment team’s visits to the rural areas broadly confirmed this diagnosis. Wherever it went it came across examples of ruin, destruction and neglect. For example, the Rice Research Institute at Rokupr in the north of the country is now virtually moribund⁵. All the laboratories are denuded of equipment; these and other office buildings are blackened and empty shells. There remains one scientific officer on site conducting some residual field trials but it is hard to avoid the conclusion that virtually no serious research is being done since no results of this research have been published. Nor is it likely that they ever will be. A similar story can be told of the large animal research station at Makeni, which we were told was at one time the main institute for livestock research and enhancement for West Africa. Again there remains just one livestock veterinarian assisted by a technician. But the facility has practically no funds and appears to be eking out an existence assisting local farmers deal with their livestock problems. Similarly the agricultural university at Njala in Moyamba district has very limited laboratory facilities and although things are now beginning to improve, students conduct practical work mainly in the field.
- 2.15 In the industrial sector conditions are no different. The team was told of a palm oil factory in the bush near Rokupr in the north. It spent some 1½ hours finding its way to the plantation but again the factory is a burned out shell. Its contents may be useful for scrap metal but even this may be hard to extract because the feeder road is in poor condition with bad gulling and surface drainage. It is probably impassable in the wet season. The plantation functions by selling palm fruit to local people who use it to make products like palm oil using open cooking pans⁶. A major iron ore mining complex at Rogbere, some 100 miles north of Freetown is in a similar state although the team has been told that a British company (London Mining Company) has just recently been granted the rights to exploit the deposit. Again the amount of investment and lead time needed look considerable and it is likely that complementary funding will have to be forthcoming from an international source such as the World Bank.
- 2.16 In fact the team came across only one example of large scale agro processing that is functioning. This is a sugar factory rehabilitated by a Chinese company which started operations in 2005. The firm employs some 200 staff. It sells brown sugar for export to Europe, white sugar on the local market and converts molasses to alcohol that is bought by people in the surrounding area. The bagasse is used to power the plant’s steam boilers for sugar refining but there has been no attempt to engage in combined heat and power activity. Nor apparently are there any plans to engage in bio diesel manufacture. The plantation looks well organized, though the team was only able to spend a short time at the facility.
- 2.17 At a smaller scale level the team also came across an interesting agricultural engineering company operating on the edge of Freetown. This small firm is designing, manufacturing and supplying a range of agro processing equipment from rice hullers, gari processors and cassava presses to simple transport equipment like tricycle carriers. The owner was originally an automotive technician who went on to receive

⁵ Though this was not an obvious assertion of the senior scientists in Freetown

⁶ A similar defunct plant was visited in the east near Bo.

further mechanical engineering training in Germany. Most of his designs are based upon the use of automotive parts since these are easily accessible in Freetown and they are tailored to the special requirements of poor farming communities. His equipment is used by a variety of groups (particularly INGOs) and he accesses limited government funds (some \$6,000/ann) to provide technical training to youths (an intake of 40 students a year for a 3-year course). The team recommend that serious thought be given to incorporating this firm⁷ into whatever interventions are decided upon by the RIU.

- 2.18 A second major problem confirmed by the team is that of transportation. Some progress has been made on the main arterial roads to the north and east of the country but this still leaves large swathes of the country reliant on a network of dirt feeder roads that are in poor condition. Combined with inadequate transportation facilitation access to markets becomes a major constraint, a constraint that increases with distance from the main road network. The main issue here is one of how to deal with surpluses at the end of growing seasons that cannot be immediately consumed or stored since marketing becomes a big problem. A third issue is that of energy supply. Even in Freetown the electricity grid barely functions. In the rural areas such electricity as is used comes from generators. The Bumbuna dam near Makeni will probably help to deal with some of the problem but it is unlikely to start operations before the beginning of 2008.
- 2.19 The other important factor that seems to be having a negative effect is the extent to which political and rent-seeking behaviour affects attempts to improve livelihoods. This is an endemic problem that pervades Sierra Leone society particularly where publicly administered resources are concerned.

3. Opportunities for RIUP engagement

- 3.1 Despite this relatively bleak picture there are a number of areas where innovations could make a big difference. More details of these are contained in the Annexes. Many of these opportunities should be classified not as introducing new knowledge in a global sense, but rather new to the communities concerned⁸. In addition they are areas where innovation platforms already exist at some level and show possibilities for enhancement. Hence in practice many of the initiatives suggested below would map on to each other since in all cases they would involve adding value to existing (if somewhat embryonic) platforms. The difference would tend probably to lie in the entry points at which RIUP could begin to get involved. In all cases this would involve further visits to establish partnerships (see discussion below).
- 3.2 In some cases the opportunities cut across lead stakeholders. For example, four INGOs act as a consortium (CORAD)⁹ focusing each on specific regions of the country. Presumably any one of the CORAD consortium could act as the main partner for opportunity 2¹⁰. Similarly there are two other groups¹¹ in the east who are doing similar work to the St Joseph's missionary group highlighted under opportunity 3. This group would also benefit from close linkage with the Cotton Tree Foundation (see Annex 1/15). Again many of the INGOs are making use of farmer field schools as "building blocks" for their subsequent capacity building activities. Indeed their approach to farmer field schools seems to be more community-led than those managed by the groups mentioned under opportunity 4.
- 3.3 The opportunities outlined below do not specifically include sectors that were originally envisaged by the team, like cocoa, fisheries, tourism and forestry for example. This is partly due to the highly restrictive overall investment climate alluded to above plus a very weak and circumscribed private sector. In fisheries, for example, with one exception production is almost completely artisanal and heavily circumscribed by illegal industrial fishing by foreign fleets. Local storage facilities are rare and what there are appear to be used for the sale of ice to street vendors of soft drinks. Most of the catch is either sold directly or smoked for later resale. In cocoa the team were not able to explore the sector due to lack of time.

⁷ There are probably three to four similar operations around the country including that run by the Cotton Tree Foundation at Rogbere. See Annex 1/15

⁸ This point is stressed by the World Bank report as being an important feature of innovation systems interventions.

⁹ The two visited were Africare and World Vision International. See Annex 1/11&13

¹⁰ Indeed there is we believe a lead agency for the CORAD consortium

¹¹ Like ADDO or MIA for example. See Annex 1/3&4

3.4 Opportunity 1—Livestock and Veterinary Services Interventions

- 3.4.1 In all regions visited there were expressed wishes for help in re-establishing livestock as integral components of farming systems. This was simply wiped out during the war. There was special emphasis given to poultry and small ruminants but mention was also made of pigs, rabbits and cattle. The main animal breeding centre at Makeni was destroyed during the war, as were most of the facilities at the Institute of Agricultural Research (IAR) at Njala. Indeed all research/teaching organisations abandoned in-country activities and relocated to Freetown, mainly to poorly furnished and unsuitable facilities. There are, however, efforts being made to re-establish facilities on the original campuses (see below) so that both the IAR and the university could form part of new RIUP-sponsored innovation platforms.
- 3.4.2 The agricultural university at Njala plans to restart operations on the original campus in September on the same campus and includes degrees in animal science¹² in its School of Agriculture. There are also new animal husbandry facilities planned to be established. However, there are still no facilities for veterinary training, treatment regimes, laboratories for storing vaccines and drugs, and research facilities needed to deal with new diseases. Nevertheless there are a range of initiatives taking place across the country, initiated and managed mainly by INGOs all of which could benefit from assistance of this kind. The partners would be research institutes, university departments, extension agencies, community groups (especially women's groups) and farmers.
- 3.4.3 The advantages of this opportunity would be to build appropriate capacities needed to backstop improvements for very poor communities. Currently for example, new diseases like PPR (a viral disease similar to rinderpest) and coxidirosis are beginning to affect the introduction of livestock. Many of these diseases could be controlled with timely vaccination and drug administration but resources will be necessary to achieve this.
- 3.4.4 Potential RIUP outputs that will result include new capacities in veterinary practice, improved livestock production, a wider set of opportunities for poor farmers, and help to rebuild much needed capacity within the research and teaching sectors. It would also include capacity enhancement of community animal health worker (CAHW) provision and establish linkages with cognate groups across Africa.
- 3.4.5 Some of the technologies and processes developed by the RNRSS Animal Health Programme appear well-suited to rolling out in this area, particularly the e-learning scheme (AUVEC) and other livestock work summarised in the source CD. In the AUVEC case complementary resources will be needed for distance learning to take place. Perhaps an approach to a body like the UK Open University might pay dividends.

3.5 Opportunity 2—Assistance in post-harvest arrangements

- 3.5.1 One of the major issues in Sierra Leone lies in an inability to deal with agricultural surpluses at the end of the growing season. For example the team were told of many instances where produce such as cassava that cannot be immediately consumed is left to rot. The problems are poor transportation, bad feeder roads, a lack of agro-processing facilities and ineffective marketing processes. The CORAD group of INGOs have formed themselves into a consortium to assist in these areas. Each partner focuses on a specific geographical region but they coordinate their work in a general food security drive in the Koinadugu, Kono and Kailahun regions. This approach emphasises improved market information, transportation such as the provision of tricycle trolleys, storage and processing facilities. In all these areas technologies developed by the RNRSS could be used as potential inputs to the work of the CORAD group.
- 3.5.2 Preliminary discussions indicate that these INGOs are well managed with good financial control and accounting arrangements and reporting structures. They are well funded and have been granted a further 3 years money by donors to roll out interventions to a wider group of communities in their respective areas. They also appear to have good working arrangements with central and local government
- 3.5.3 The advantage for RIUP would be that it would be partnering with a progressive on-going activity that has been sanctioned by donors and whose operations are well managed. Assistance at the technological end would certainly help to add value to what is already a progressive set of activities. In addition some of the assistance in transportation and processing get their inputs from local production sources (in Freetown). This will certainly help in capacity building backward linkages. The down side is that there are few links

¹² Both the IAR and the university moved to Freetown during the war

with the formal research sector. However, this is a generic problem in Sierra Leone. Indeed it could be seen as an opportunity for the RIUP to build relevant capacity and so improve innovation systems.

- 3.5.4 RIUP outputs would be mainly technological and capacity building both at the delivery end and at the R&D end. They would include levels of physical investment in crop management, storage and processing, increased acquisition (and lower prices) of locally sourced inputs and better linkages with the research/university sector.

3.6 *Opportunity 3---Establishment of micro credit and related facilities in rural areas*

- 3.6.1 A third entry point where the RIUP could make a difference is in the establishment and operation of micro credit facilities where the team came across a small number of initiatives. For example, a technical institute run by catholic missionaries in the north-west of the country has started operating a phased scheme of community-based development which is aimed at empowering rural groups (especially women and youths). The institute (which has been operational in some form since before and even during the war) employs 5 extension staff and one supervisor on this development scheme. It started 4 years ago, by sensitising communities to possibilities for seed rice loan recovery principles (so many bushels of seed rice lent and so many paid back), providing loans to agricultural household heads (FFHs) on a seasonal basis with pay back plus interest at the end of the season.

- 3.6.2 The system operates on the basis of monitoring FFHs over a 3-5 year period to ensure recovery and the response appears to have been very good. The interest is accumulated in a special account which is used both to extend the scheme to new FFHs and to build up common pool resources for the villages concerned (in a community fund). In fact most FFHs have been able to pay back at a rate of 50% and currently around 88 beneficiaries in 25 communities have benefited from the scheme. There are good networks with INGOs such as CRS and donors such as the Italian government. The institute is reasonably equipped in terms of machinery and tools for training purposes but some of this could do with upgrading.

- 3.6.3 The advantages of this scheme are potentially many. Availability of good quality seed is a major problem in a country for which rice is a staple crop. Exploitation by unscrupulous agents has been a widely felt issue in recent years confining communities to an endless cycle of subsistence farming and poverty. The build-up of social capital through empowerment of marginal groups is a third advantage. In addition the scheme provides an opportunity for the institute's graduates to offer investment services to improve infrastructure (construction, irrigation etc) and agro processing facilities, thereby improving employment and income generating possibilities (and hence markets) in the rural areas. Another advantage would be that an RIUP input could make a difference with relatively limited inputs of resources. It might also help to re-establish the work of the Rice Research Institute (RRI) in nearby stations. As outlined above the RRI is in a moribund state and needs to be re-integrated into relevant innovation systems.

- 3.6.4 Potential RIUP outputs would be in helping to build up the technological basis for the empowered communities through improved crop management, rice intensification schemes, mechanised input provision, agro processing and other technologies that have been developed by the RNRRS (for example some of the rice research conducted by NRI). Quantitative measures would include improvements in income and common pool resources at community level (e.g. levels of bank accounts), marketed surpluses, and numbers of communities reached. Outputs would also include rebuilding relevant capacity in the research sector.

3.7 *Opportunity 4---Assistance in developing the operations of farmer field schools*

- 3.7.1 Considerable assistance is now being offered in the form of support for farmer field schools, a form of agricultural extension originally stated in rice growing areas in South Asia. The main actors here are the FAO, UNDP and some INGOs such as members of the CORAD group. Interviews were held with all three sets of actors and it is clear that here too is a potential entry point for RIUP activity. The farmer field schools programmes started soon after the ending of the war in 2003. They operate through a staged programme of training facilitators who then create the farmer field schools in collaboration with progressive community groups, backstopping operations through field co-ordinators. Farmer field schools usually consist of around 25-30 members and schools engage in a wide range of activities, going beyond those originally envisaged (upland rice, lowland rice, vegetables, poultry and aquaculture).

- 3.7.2 They are now involved also in cassava, groundnut, sweet potato, beans and maize, thus covering most relevant rural activity. By mid-2006 there were over 500 such schools operational and according to a recent ODI evaluation report the indications are that they are economically successful.¹³ Relations with government appear good in the sense that district agricultural coordinators (the main local governance officials) leave the field staff to get on with the job without undue interference.
- 3.7.3 On the negative side there was some indication in our interviews that schools function more in a “teaching” rather than an “interactive” mode.¹⁴ They operate mainly on the technical side and do not have training on issues like community empowerment or organising communities for input purchase and marketing. Moreover there is also evidence that many farmer field schools do not link much to each other. For these reasons this opportunity represents the lowest in the team’s ranking. This incidentally is claimed not to be the case with the farmer field schools operated by the INGOs who appear to operate in a more holistic way. These schools are used as core building blocks of wider clustering arrangements through which communities are organised into bulk purchase, processing, marketing and micro credit operations (see discussion above).
- 3.7.4 The advantages of this opportunity for the RIUP are that it would partner with an on-going operation that is well organised and managed. There would also be opportunities to build capacity at research sector and extension training level at Njala University, the RRI and the IAR. The disadvantage is that many of the FAO/UNDP operations are already technological in orientation and are operating at a scale that may be beyond the efficient use RIUP resources. Very probably the RIUP would be advised to opt for one of the first three opportunities many of which also connect to farmer field schools in any case.
- 3.7.5 As before RIUP outputs would be mainly technological and capacity building both at the delivery end and at the R&D end. They might include increasing the number of farmer field schools established, improved productivity and incomes of existing farmer field schools, better trained extension staff, improved equipment provision for the research sector and improvement in linkages between the research sector and other partners.

4. Process and timetable to develop a strategic plan and detailed implementation proposals, including processes to ensure national and local ownership

- 4.1.1 The strategic plan for each opportunity would probably not vary much across the opportunities identified but might operate in the following way. In each case a lead partner would be selected to act as the focal point for the relevant innovation platform. Its function would be:
- Administer the resources supplied by the RIUP, ensuring proper financial management and reporting procedures.
 - Liaise with UK “supply” partners on establishing the nature, location and management of project activities
 - Be responsible for establishing a formal group (or groups) of stakeholders that would comprise that platform
 - Establish operational linkages with collaborating partners
 - Establish benchmarks and milestones for project activities. This would include especially base line data to enable M&E work to proceed efficiently as time went on.
 - Identify areas where capacity building should take place and organise appropriate activities in collaboration with RIUP management.
 - Maintain good relations with government infrastructures (probably through the District Directorates of Agriculture)

4.2 Timescale of operations

Stage 1 (say end May 2007): Choice of which opportunities to follow up. This would be done by RIUP management in the light of assessment team reports from all countries, having in mind other factors of relevance such as most suitable “best bet” technologies and lead UK institution(s). It might mean a follow-

¹³ See Longley et al (2006) for an excellent summary of the position last year based on a sample evaluation in 3 regions.

¹⁴ A view confirmed by the ODI report cited above, p v.

up visit but that would probably not be necessary (could it be handled by DFID country office, if it were?). Probably this could be decided soon after the Advisory Committee meets and the inception report is agreed by DFID CRD.

Stage 2 (end July 2007): Choice of lead partners in Sierra Leone. It might be advisable at this stage to solicit proposals from candidate groupings. It would also mean a follow-up visit to ascertain in more detail capabilities in country and discuss the nature of the inputs local partners would wish to access from the UK partner, management/reporting procedures, budget levels, time scales, agreed benchmarks etc.

Stage 3 (end September 2007): Completion of agreements. This stage would include ensuring all necessary regulatory procedures are agreed with the relevant governance bodies in Sierra Leone. As outlined above project management would follow a normal reporting schedule with regular visits by the UK partner to backstop technology development.

5. Further investigations/visits required to develop implementation programme

- 5.1 In all cases outlined above the RIUP would probably need to establish a relationship with on-going activity and set up appropriate partnership arrangements. Such arrangements would include measures to ensure local ownership is maintained. Specific arrangements would certainly involve further visits.

6. Potential regional opportunities which would complement national opportunities

- 6.1 The recommendations made to the RIUP are entirely in keeping with the broad thrust of the CORAD/WECARD draft strategic Plan published in January this year. This document supports an aim of technology development that complements the innovation systems position adopted by the RIUP in terms of competitiveness, agricultural productivity, market access and related issues.¹⁵ It is also in keeping with the objectives of the NEPAD/CAADP process and cognate activity within FARA.
- 6.2 In addition the University of Njala has begun a series of arrangements with foreign universities (including three in Africa) that are designed to improve its facilities. These include especially split postgraduate training courses in which students carry out research components abroad, returning home to write up and submit.
- 6.3 The Ministry of Agriculture and Food Security (MAFS) is beginning a partnership with the IFAD and the AfDB to enhance all aspects of rural development¹⁶. The project is worth some \$31 million and is focused on precisely the same areas targeted by this assessment team. For this reason it is recommended that the RIUP develops linkages with this project for all its interventions in Sierra Leone.
- 6.4 National Agricultural Research Coordinating Council (NARCC) and its constituent institutes have established links with several international centers and international development agencies. They include the West Africa Rice Centre (WARDA), the International institute of Tropical Agriculture (IITA), the International Rice Research Institute (IRRI), the International Crops Research institute for the Semi Arid Tropics (ICRISAT), the Food and Agriculture Organization (FAO), the International Atomic energy Agency (IAEA), Council for Agriculture Research and Development in West Africa (CORAF), International Service for National Agriculture Research (ISNAR) and Forum for Agricultural Research in Africa (FARA)

7. Conclusions and recommendations

- 7.1 This assessment report may well be rather different from those carried out in other African countries for the simple reason that the conflict which ended in 2002 virtually put a stop to most activity beyond the most basic of subsistence agriculture. Physical infrastructure, industry and social capital were destroyed, institutional structures seriously damaged and population migrated in large numbers to the urban cities. As a result Sierra Leone is only now beginning to recover. However, the team believe that there are now real opportunities for innovative change, not least paradoxically because it is often easier to start rebuilding from a low base.

¹⁵ See CORAD/WECARD (2007)

¹⁶ The two activities involved are named as (i) Rehabilitation and Community Based Poverty Reduction Scheme (RCPRP---IFAD/MAFS) and (ii) Agricultural Sector Rehabilitation Project (ASREP---AfDB/MAFS)

- 7.2 The opportunities that have been identified should start at very basic levels, focus on operations within rural communities and concentrate on improvements in incomes, empowerment, employment and market access
- 7.3 The lead agencies for innovation platforms should be INGOs, CBOs¹⁷ and/or LNGOs so as to ensure that drivers of change operate at rural levels. This is partly due to lack of adequate capacity at local government level. Partnerships should also include key RNRRS technology suppliers, research/academic bodies, private sector operators and local government agencies.
- 7.4 RIUP interventions should be subject at all times to close financial scrutiny with regular reporting and auditing arrangements in place
- 7.5 For innovation platforms to be able to operate well all RIUP programmes/projects should include a strong capacity building element. This will enable stakeholder groups to be brought up to speed where necessary.
- 7.6 In particular there is need to integrate the university and research sectors into innovation systems as an integral part of all interventions. However, this should be done as much as possible by drawing such bodies in on the operational side rather than simply providing resources directly for R&D and related work. The team came across significant evidence of *mode 1* approaches to research and teaching activities, so much so that it would probably be counter productive to channel funds directly through these institutions. Rather the team recommend that ways are found to channel funding directly to field operations and to encourage the research sector to buy into developing innovation platforms.
- 7.7 Having said this there is undoubtedly need for the sorts of facilities normally needed for research and teaching to function properly, but as emphasised above, provision of such facilities should be as an adjunct to operational needs driven by community and farmer demand. How to manage this will be a challenge to the RIUP but one that is well worth the effort in the team's view.
- 7.8 The opportunities for technology development will require complementary funding for facilities like feed mills (for livestock), processing plant (e.g. for gari), improved feeder roads for market access etc. It is clear that support for operations such as the private sector (and other) engineering firms mentioned earlier, could leverage significant improvements at field level. The RIUP will need, however, to make decisions about how far its budget will allow it to move beyond the purely technological arena. In some cases partner bodies will be able to provide this but we suspect that this will not always be the case. Perhaps the RIUP could approach other parts of DFID for complementary resources to assist technology development in this sense.
- 7.9 More generally whatever opportunities the RIUP eventually decide upon should recognise and plan to enhance the essential linked nature of interventions.

¹⁷ There may be instances where CBOs might be suitable lead partners. The team across a small number of instances where this could work but further investigation would need to be done before a decision was made

8. Annexes

Annex 1 Summaries of selected field visits

The following accounts have been selected to give the RIUP an indication of the kinds of data acquired during the team's mission. They are not comprehensive but give a reasonable flavour of what the team found.

1. Institute of Agricultural Research – Dr. Abdulai Jalloh

- The institute was established in 1984 after the phasing out of the ACRE project to continue with research and extension activities in the following mandated crops – cassava, sweet potato, maize, cowpea, yam, groundnut and soybean.
- The focus areas include research in crop improvement, nutrition, agronomy, natural resources management, extension and socio-economics.
- Participatory Varietal Selection (PVS) form the main basis of the varietal selection programme involving the farmers from the onset.
- The link with the FFS is very weak and needs considerable improvement;
- Research – Extension – Linkage found to be very weak i.e. areas of collaboration not formalised;
- Inputs, processing, marketing, savings and credit are key areas that influence farmers adoption of new technologies/research findings. These were found to be limited or even absent within several farming systems in the visited areas;
- The windows of opportunities mentioned include biotechnology; strengthening research – extension - farmer – input – processing/marketing – savings and credit linkage systems, soil analytical work, soil conservation, water harvesting and aquaculture,
- Most of the scientists are back to the research station and some limited work is in progress.
- The team took a drive around Njala University campus to see what progress is made on the rehabilitation work. Tremendous work has been done putting up the infrastructure to facilitate the immediate return of the students and the lecturers.

2. Farmer Field School – P.K. Masuba NAFSL Chairman, Kamajei Chiefdom Moyamba district.

- The FFS is established in Gbongeh with a membership of 25 – 9 females and 16 males. They are involved in vegetable gardening and fishpond. There was nothing much to see on the demonstration field. The team observed some deviation from the philosophy of the FFS, i.e. researchers at Njala, a few miles from the fishpond were not even aware of its existence.
- The fishpond established failed as a result of lack of knowledge in fishpond management, and shortage of water in the dry season. Poor feeding also contributed to the poor harvest realised (stunted fingerlings);
- Farmers of this area have identified livestock production, especially in the areas of small ruminant and swine production, as a window of opportunity. But the team feel feeding for these livestock must be adequately addressed before going into the enterprise.

3. Arch Diocesan Development Organization (ADDO) – Fr. Peter Konteh - Coordinator

- ADDO is the development wing of the Catholic Church providing humanitarian and development assistance to vulnerable communities.
- Have developed a 3-year strategic plan in a participatory manner focusing on the parish's catchment community.
- The major donor is Caritas Germany. This seems to be very risky (sole donor). Outsourced funding locally is through bilateral agreements with CRS and other donors.
- Partnerships with local Caritas organizations, CRS, UNHCR, Caritas West Africa regional office, CordAid and NaCSA.
- Provide communities with seeds and tools, cassava cuttings, sweet potato vines and post harvest support in the area of cassava processing. Support 1151 farm families and 248 groups.
- Limitations – human resource development, logistics (vehicles and office equipment).

- Needs more technologies to be able to reach the poor and very much interested in FFS activities.
- Windows of opportunities identified are in the areas of staff and farmer capacity building, outreach activities possible in all development areas, as agency has own extension agents, the provision of relevant technical and market information on major crops, and institutional building.

4. Manjama Institute of Agriculture (MIA) – John Bosco Musa Executive Director

- Established in 1985 in Bo with the aim of contributing to national development through the provision of skills for middle level manpower. Situated in a peri-urban area.
- Target 50 students per annual. 17 staff members employed with qualifications ranging from MSc., BSc., and HTC.
- The focus areas include agriculture, animal husbandry, food and nutrition, carpentry and metal work, the repayment rate of the loans is usually 90% on average.
- Limitations – lack of learning and teaching materials, equipment for practical work in carpentry, metal work and food and nutrition.
- Windows of opportunity – provision of settlement loans to outgoing students, feed mills (2-300,000 USD), micro credit facilities for farmer groups assisted by institute.
- Resource centre, aquaculture, livelihood activities, hatchery system to improve local poultry production.

5. Moamuwah Women's group (MWG)– Mamie Wai – Chairlady and executive members

- The Manjama Institute of Agriculture (MIA) largely supports this group.
- The name Moamuwah means “we came”. They are strangers and do not own land (landless women). The group comprise of 112 women representing different families.
- They are engaged in crop production, soap making, gari, tie-dyeing, backyard gardening.
- Limitation – Land acquisition
- Windows of opportunity –Land acquisition, small ruminants and vegetable production.

6. Farmer Field School – Daniel Koroma – Facilitator

- The name of the FFS is Mabohinanday located a mile outside Kenema (Bandama in the Small Bo chiefdom). Supported by Operation Feed the Nation(FAO and MAFFS)
- The group size is 18 members. The size is small because of the lack of interest from other community members.
- The size of the plots is 150 ft x 150 ft.
- They grow crops like maize, cucumber, tomato, okra, and cowpea. They also manage fish ponds.
- Fertilization – applied both organic and inorganic fertilizers.
- The women who were interviewed by the team indicated that they have not started applying the techniques or replicated the skills learned on their farms. They spend more time on the field school site because they do not own land.
- The fish grown in the fish ponds is tilapia and the yield is encouraging. The water control is perfectly done.
- Limitation – lack of access to micro credit facility.
- They also have 2 other FFS at Tanninahun and Fabaina all in the Kenema district.

7. The Lutheran World Federation – Holima A. Samai Regional Programme Officer

- The Lutheran World Federation Department of World Service (LWF/DWS) started its activities in Sierra Leone in 2000 following the invitation from the Evangelical Lutheran Church of Sierra Leone (ELCSL) and endorsed by the Government of Sierra Leone (GOSL). In the beginning of LWF/DWS operations in Sierra Leone, support was given to the ELCSL's relief operations, which were linked to relief and rehabilitation activities conducted by the Council of Churches in Sierra Leone (CCSL). The LWF/DWS programme in Sierra Leone was initially managed by the LWF/DWS programme in Liberia until 2002. The ELCSL is the host organization for LWF/DWS in Sierra Leone and strategic and management issues are discussed in a Joint Coordination Committee (JCC).

- A planning document for the period 2006-2008 has been developed referred to as Integrated Community Empowerment Project focusing on community empowerment, agriculture and food security, small micro enterprise development, advocacy and human rights, environmental management, peace building and conflict resolution, HIV/AIDS and adult literacy.
- Windows of opportunity – environmental management, swamp development for the cultivation of rice, sweet potato, maize and groundnut etc, partnership and micro credit support to women and youth groups.
- Will work with FFS in their new dispensation.

8. Finnish Refugee Council (FRC)– Rashid Bah – National Coordinator

- It was a very interesting meeting. FRC is a Finnish NGO focusing on development research and strategy.
- Implement through local non-government organizations. FRC provide funds to LNGOs in order to reach the poor rural for poverty alleviation and economic equity.
- The areas of support include education research e.g. traditional indigenous knowledge can augment modern knowledge, adult education (non formal), and transfer of technology.
- FRC provide support in the area of micro credit.
- Limitation – corruption practices of partners
- Windows of opportunity – Disease prevention, quality seed supply, study of farming systems to cater for more upland and lowland cultivation e.g. rice, groundnut, maize, cassava and sweet potato and indigenous languages.

9. Movement for Assistance and Promotion of Rural Communities (MAPCO) – Abdul Karim Kamara – Admin/Finance.

- We were very much impressed during the interviewing with the well grounded knowledge on the activities undertaken by the programme.
- MAPCO was established in 1986 in the form of cooperative organization to provide assistance to Malen chiefdom hence previously named Malen Producers Cooperatives.
- The programme is now upgraded targeting more communities in the country.
- The objective is to render assistance to marginalized communities.
- The key areas of intervention include skills empowerment in the fabrication of local tools, weaving, tailoring, food processing, capacity building through training, micro credit etc.
- Limitation – funding and civil society challenges on issues like child abuse and GBV.
- Windows of opportunity - marketing, market research, feeder roads, micro credit, fisheries etc.

10. Leleima Women Development Association (LEWODA) – Mariatu Jusu Programme Coordinator

- This is a CBO with the following motto “to work for the less privileged”.
- The group is categorised into three wings the women, youth and micro credit wings. The number in the group is 450 from seven communities including Mano, Samie, Koribondo, Bendu, Gbangama and Kakua. 70% of these are widows.
- Received support from FAO, ROPPA (Peasant farmers for the production of cotton in West Africa) and CEDA (Community Empowerment and Development Association).
- They are involved in the following activities farmer field school, adult literacy, seed rice production, vegetable garden, maize, groundnut etc.
- They cultivate 10 acres of cotton as raw material for weaving. Required more capacity building for cultivation and processing. They lack the appropriate processing equipment.
- Have established over 500 acres of oil palm plantation.
- The cassava processing equipment (grater machine) was loan to the group by FINIC a private sector company based in Freetown.

- Limitations – lack of tools and equipment for the cotton industry, palm nut cracker, power tiller for swamp rice cultivation, training in food processing, late supply of inputs, lack post harvest facility, lack support for the rehabilitation of tree crops, rodents etc.
- The micro credit is supported by CEDA targeting 49 members at Le 300,000 per person for 6 months duration. The interest rate is 2.5%. The repayment rate is 100%. Just started in January 2007. With more credit and saving facilities, the group can do a lot. This group could be a very good partner for RIUP engagement.

11. **World Vision International (WVI)--Dr Tom Roberts, Agricultural Economist,**

- WVI is a Christian humanitarian organisation which has traditionally provided relief support to the very poorest groups. In recent years in Sierra Leone it has begun to move into development mainly because of a perceived need to empower people and to help remove the dependency syndrome. The way this has been managed is to use farmer field schools as the building block for a livelihoods strategy that promotes capacity and institution building in the rural areas.
- Since 2004 they have been operating in chiefdoms (communities) in Kono, Bo and Bonthe districts and the programme has a 15 year time horizon since WVI believe that the process is a long-term one.
- The farmer field schools work in the following ways. In each community an assessment is made (through dialogue with communities) of the major production and related issues. These are then prioritised leading to specific FFS projects. The starting point is to train facilitators. This is done by WVI training staff (20) who are themselves agricultural graduates from Njala University. The facilitators then run the farmer field schools in each community using a selection of technologies that have been developed by the NARS (IAR) and tailored to local requirements and conditions. So far 700 farmer field schools have been established and 50 facilitators trained in the three districts. Facilitators are not paid but are given tricycle transport.
- The focal areas are agriculture, health, water/sanitation, micro enterprises and education (the schools are an important focal point). Technologies involved include seeds, agronomy, control agents, fertiliser, small transport systems (local fabricator is FINIC in Freetown) gari processing (automatic feeder) and rotary driers for crops. Most technologies used are adaptations of existing technologies.
- The focus crops are gari, rice, palm oil and cocoa. Farmer field schools are then clustered into input shops in each community. These act as marketing associations and multi-purpose co-operatives and are designed to create economic units for efficient buying and selling of inputs and produce.
- Finance is handled by micro-credit facilities started with small WVI grants but then managed by local micro finance (MFI) banks on a commercial basis. It seems to be the hope that many of these initiatives will mature into genuine private sector activities. The overall assessment could be as follows though many should be followed up in the field:
 - There are still considerable gaps for example in livestock provision and post-harvest developments which need filling
 - There is a premium on building up trust, relationships and mechanisms of accountability
 - Local MFIs appear to be willing to lend after seeing the start.
 - There may well be evidence of local trade development in rural areas arising from the multiplication of farmer field school based activities though that will need to be tested. This may help to deal with the marketing problem that is country-wide
 - Corruption is minimised by ensuring that authority figures are kept in an overall judicial position
 - There is a strong focus on the development of the private sector
 - There appears to be evidence of innovation platforms being established, albeit with weaknesses. For example, the NARS are reluctant to engage directly with farmers. Also though there is co-operation with the FAO farmer field schools the latter tend to be research sector driven.
 - Communities form local committees to manage affairs and these are linked into local councils and chieftainships

12. European Union-- Mr Andreas Laggis, Head of Operations

- This meeting was interesting mainly because it has confirmed the impression we have of a major set of obstacles to foreign direct investment. This involves many aspects but important factors include difficulties in obtaining licenses (290 days for one was quoted), local partnership requirements for all FDI regardless of local capacities and inability to own land.
- The EU is handling this in collaboration with other donors through the IGAP initiative. This is a phased programme of tying EU aid to benchmarks of good governance. There are many of these and we were given an embargoed paper with their specifications albeit at a rather general level. The implementation should begin in April and thereafter will proceed as well as can be expected.
- In terms of windows of opportunity he emphasised mining, agriculture (including cocoa), fisheries and tourism. In fisheries assistance is being provided to ease possibilities for export into the EU market in the longer term. In all cases there are huge opportunities that are compromised by the institutional context.
- Timber is not really a viable option just now.
- The EU is also helping to develop transport and energy infrastructure. A dam will be ready by the end of the year and assistance is being made available to the main local bauxite company to facilitate the development of local facilities in renewable energy and aquaculture.

13. Africare---Casimir Chipere-Country Representative

- Africare has been operational since 1970. It is currently part of the CORAD consortium that has been operating a Development Relief programme (DRP) funded by USAID since 2004 and due soon to come to an end. The other groups are WVI, CARE (focus) and CRS. They all do roughly the same thing but in different regions in the country
- The focus is on agriculture and health and they work through local groups (community, farmer field schools, family and women)
- There are also good links with FAO/UNDP etc
- Within this they are active in the following areas:
 - Agricultural input provision (improved seeds)
 - Storage facilities
 - Establishing market linkages
 - Building/repairing feeder roads
 - Establishing tree crops
 - Processing (Vitagoat)
- In addition they have developed ancillary projects that map on to core activity. One of these is the HEART programme where they act as facilitators for Ministry of Health outreach clinics (e.g. transport of vaccines, training of para-medics)
- Other activities in the pilot phase (or planned) are as follows:
 - Minimising post harvest losses (rice huller)
 - Improving poultry and small ruminants through breeding (need for vet services-coxidiosis)
 - crop diversification (soya)
 - Building feeder roads (youth programmes)
 - Establishing MFIs (mainly through women's groups)
 - Safety net scheme for the vulnerable groups (10% levy)
 - Revitalising swamp areas (possibilities for multi-cropping and aquaculture)
- They will shortly embark on a new project which is a rolling out of the DRP to other villages and regions. This programme will be fully funded by USAID for 3 years.

14. Okeke Agencies Ltd.----Melvin Link, Manager Director

- This company started operations in 1972 and has concentrated on trawler fishing for export (60%) and the home market (40%)
- The firm is a joint venture with a Chinese company (16 boats)
- It is the only substantial fishing firm in Sierra Leone

- The exported fish are loaded on to large foreign trawlers off shore
- The landed catch is stored in deep freeze facilities before being sold around the country
- Claimed constraints are as follows:
 - Piracy from Guinea (loss of \$2 million last year)
 - Big increases in taxation with little return from government
 - Poor harbour facilities in Freetown

15. Cotton Tree Foundation Sierra Leone---Michael M. Kamara, Managing Director

- The Cotton Tree Foundation Sierra Leone was set up to establish centres of excellence in formal, non-formal, vocational, agricultural forms of education committed to provide quality knowledge and skills. It operates near Rogbere.
- Its support includes school furniture and equipment, learning and teaching materials, uniforms and medicare facilities
- It is supported by Cordaid and Woorden Daad, both Netherlands operations
- It began by organising local growers of ginger as out-growers for the export market and has since moved into the production of groundnut, hot pepper (chill), poultry and livestock (small ruminants) for domestic consumption.
- Livestock activity is in its pilot phase, and 250 farmers are currently benefiting. 65% of this represents women and 35% male. It is believed that the per capita of households in rural poor areas can increased if women are given preference, because they are heavily involved in agricultural production.
- Its rice mechanization project started in May 2006, and so far has serviced 90 farmers with ploughing facilities for 180 ha, as well as 450 bushels of seed rice, and fertilizers. Of the Ploughing service 50% goes as benefit to farmer from Cotton Tree and farmers pays 50% tractorization cost. Seed rice, fertilizers are distributed on loan basis with no interest.
- It also has a plan to target 1000 sesame and cashew out growers in the Marampa and Buya Romende chiefdoms in the Port Loko district.

Annex 2. Analysis framework for potential opportunities

Opportunity in order of priority	Category of beneficiary ¹⁸ (primary/secondary)	Potential partners	Category of partner ¹⁹	Geographical/sectoral focus	Type of intervention	Possible RNRRS outputs	advantages	disadvantages
Opportunity 1	Poor/medium	CORAD Njala U IAR MIA MWG MAFS	INGO Research Research CBO CBO Extension	Kenema, Bo	Livestock enhancement and vet service capacity building	Vet/paravet capacity, Livestock improvement Univ equip, research Income gen.	Intgr. farm systems, Begin new livestock activity, cap building at uni.	Need to involve UK group centrally
2	Poor/medium	CORAD Njala U Finic LWDA MWG MAFS	INGO Research Private CBO CBO Extension	Kenema, Bo	Assistance in post-harvest arrangements	Income gen, input provision, Processing, Water management	Markets food security, gd. Management	Need to integrate research bodies
3	Poor	St	CBO	Port Loko, Kambia	Micro credit etc,	Productivity,	Technical	Not many

¹⁸ Poor, medium, well off etc

¹⁹ NGO, CBO, Public/Private sector research, SME, lager enterprises, information service provider (public/private), policy makers, etc.

		Josephs, ADDO, FINIC, Cotton Tree Foundn.	CBO Private	Bamboli, Kenema	inputs and processes, employment gains	market access,	training, empowerment, good linkages	
4	Poor/medium	Various FFS, MAFS	FFS Extension	Kenema, Bo	FFS	Productivity,	Technical training, empowerment	Style of working, FAO/UNDP dominance Poor linkages

Annex 3 – List of Contacts

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Joseph Banguru District Co-ordinator	Robuya Farmer Field School Bomboli District Makene	n/a	n/a
Mamie Wai Coordinator	Moamuwah Women's Group Manjama Bo.	n/a	n/a
Jarlatu Kamara Co-ordinator	Comra Women's Development Organisation Kambia	n/a	n/a

Mariatu Jusu Leleima	Women's Development Association Jonborhun Jaiama Bongor Chiefdom Bo	n/a	+232 76 833555
Abdul Karim Kamara Admin/Finance Officer	Movement for Assistance and Promotion of Rural Communities (MAPCO) Kebbie Town Bo.	n/a	n/a
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Annex 5 Abbreviations

ADDO	Arch Diocesan Development Organization
AUVEC	African Universities Veterinary Education Consortium
AfDB	African Development Bank
CAHW	Community Animal Health Worker
CARE	
CBO	Community Based Organisation
CEDA	Community Empowerment and Development Association
CORAD	Consortium for Rehabilitation and Development
CORAF	Conseil Ouest et Centre Africain pour la Recherche et le Developpment Agricoles
CRS	Catholic Relief Services
DFID	Department for International development
DRP	Development Relief programme
ELCSL	Evangelical Lutheran Church of Sierra Leone
EC	European Commission
EU	European Union
FAO	Food and Agriculture Organisation

FARA	Forum for Agricultural Research in Africa
FDI	Foreign Direct Investment
FFS	Farmer Field School
FGD	Focus Group Discussions
FRC	Finnish Refugee Council
GOSL	Government of Sierra Leone
IAR	Institute of Agricultural Research
INGO	International NGO
IFAD	International Fund for Agricultural development
IFPRI	International Food Policy Research Institute
IGAP	
ISNAR	International Service for National Agricultural Research
KII	key informant interviews
LNGO	Local NGO
LWDA	Leleima Women Development Association
LWF/DWS	Lutheran World Federation/ Department of World Service
MIA	Manjama Institute of Agriculture
MAFS	Ministry of Agriculture and Food Security
MAPCO	Movement for Assistance and Promotion of Rural Communities
MFI	Micro Finance Institution

MWG	Moamuwah Women's group
NAFSL	National Association of Farmers of Sierra Leone
NARCC	National Agricultural Research Coordination Council
NARS	National Agricultural Research System
NEPAD	New Partnership for African Development
NRI	Natural Resources Institute
ODI	Overseas Development Institute
PVS	Participatory Varietal Selection
RIUP	Research into Use Programme
RNRRS	Renewable Natural Resource Research Strategy
ROPFA	Peasant Farmers for the Production of Cotton in West Africa
RRI	Rice Research Institute
UNDP	United Nations Development Programme
UNHCR	United Nations High Commission for Refugees
USAID	United States Agency for International Development
WECARD	West and Central African Council for Agricultural research and Development
WVI	World Vision International

Beside the rebel war in which the agriculture sector was the hardest hit, several constraints plagued and still plague this sector, among which are:

- Low investment in the sector

- Lack of effective institutional arrangements for agricultural credit
- Poor pricing policy and marketing arrangements
- Poor transport facilities and infrastructure for delivery of inputs to farmers and transmission of farm produce to consumers
- Inadequate agro-processing facilities and high post harvest losses in crops
- Weak Research-Extension-Farmer linkages, resulting in information gaps
- Inadequate support for research, technology generation and extension services
- Scarcity of labour because of rural-urban migration of active youths
- Low morale of agricultural extension workers
- Low extension worker – farmer ratio

**SECTION 2: REPORT OF RESEARCH FAIR - SIERRA LEONE
BINTUMANI HOTEL**

MARCH 2007

Executive Summary

The Research into Use (RIU) has twin aims of maximising the livelihood improving potential of research in the natural resources sector and to capture lessons about best practice in achieving this for different social groups and in different environments. The RIU is funded by the UK Department for International Development (DFID). It build's on DFID's previous Renewable Natural Resources Research Strategy (RNRRS) which funded research in the areas of crops, livestock, fisheries, forestry, post harvest and natural resource management. It is recognised that a lot of this research has a great deal of unfulfilled potential for impacting upon poverty. The RIU is an opportunity to achieve that potential and to learn lessons that can be incorporated into future research for development.

Sierra Leone has been identified as a target country for the RIU. It will enable the programme to learn lessons in operating in a post conflict state and, as there was almost no contact with the RNRRS should also provide lessons on getting research into use in different locations as to where it was generated. An initial visit in November 2006 brought requests for stakeholder groups to discover more about previous research which might have potential for use in Sierra Leone. Discussions with key informants suggested that a 'Research Fair' along the lines of a 'Trade Fair' might be the best way to address this need.

In February 2007, a Country Assessment Exercise was conducted to review development initiatives operating in the natural resources sector, institutions in this sector, demands and opportunities of the poor and of those working with and for the poor. This would lay the foundations and the framework for the RIU Sierra Leone country strategy. The country assessment team were unable to spend large amounts of time considering the application of research outputs in Sierra Leone. Therefore as well as raising peoples' awareness of previous research the Research Fair also had the objective of capturing stakeholder's feedback so that it could be considered in the development of the Sierra Leone country strategy.

Over 60 participants, from throughout Sierra Leone, attended the event. 49 evaluation forms were received from the participants and feedback was also provided by the resource people. These represented the Forestry, Crop Protection, Plant Sciences, Livestock Production, Fisheries and Crop Post Harvest programmes funded through the RNRRS. The participants were divided into five groups: Local NGOs, INGOs, Civil Society, Public Sector and Researchers. Each group was allocated 40 minutes with the resource people representing the RNRRS research programmes. The resource people were asked to share research outputs with the participants and be available to answer questions but the format in which they did this was left up to them. Each research programme also provided a selection of publications and had the facility to capture interest from participants for additional copies.

The feedback from the Research Fair was entirely positive. It was noted by the resource people that the fisheries sector (neither fisher groups nor policy makers), forest user groups and the private sector were under represented. Participants were asked to note the three areas of research they had been most interested by. All areas were mentioned: Crop Post Harvest (65% respondents), Plant Sciences (57%), Crop Protection (51%), Forestry (39%), Livestock (35%) and Fisheries (31%). Considering the biased nature of the participants it should be concluded that there is interest in research outputs from across the natural resources sphere. The Research Fair showed how the outputs from the RNRRS would be appropriate for use in Sierra Leone.

The 'Research Fair' was strongly supported with many people being surprised at how much information there was available. The internet seemed to be the most popular source of information amongst the participants but this is not available throughout Sierra Leone. The conclusion drawn was that information, especially information directly related to Sierra Leone, supply issue.

Comments were made about the structure of the day with many people suggesting that they would have appreciated more time with each stand, the event could have been longer and that is could have been located in the regions. The representatives of the NARS suggested that it could have been conducted in collaboration with them and it could have been a component of the annual national research prioritisation exercise.

Background

The DFID funded Research into Use (RIU) programme began in July 2006 with the twin objectives:

- maximise the poverty-reducing **impact** of the outputs of natural resources research in sub-Saharan Africa and South Asia; and by so doing
- significantly increase the understanding of how the promotion and widespread use of such research can contribute to **poverty reduction** and **economic growth**

The RIU has its foundations in DFID's Renewable Natural Resources Research Strategy (RNRRS) which funded research in the areas of crops, livestock, fisheries, forestry, post harvest and natural resource management from 1995-2006. It was only in the latter years of this strategy that projects with a more knowledge promotion approach were supported. These showed clearly the potential that the research had in terms of improving livelihoods. Towards the end of the RNRRS individual programmes worked together and with knowledge user groups to share and promote knowledge generated. Research showcase events were held in Zimbabwe in October 2005 and in Uganda in February 2006.

Sierra Leone has been identified as an initial target country for the RIU. Sierra Leone is ranked as the second poorest country in the world (UNDP 2006) although it does have a strong natural resources base in terms of potential for cropping, fisheries, livestock keeping, forestry management and environmental management. However, the civil war virtually destroyed its social, economic and institutional fabric. Major areas of rural society ceased to function economically, people migrated to the towns in large numbers (especially Freetown the capital) virtually halting agricultural production. Infrastructure like roads and energy supply were also destroyed. Corruption is endemic and the private sector and investment climate very weak.

Apart from a little contact with the Plant Sciences Programme and the Fisheries Management Programme research under the RNRRS did not take place in Sierra Leone. Over the last twelve years there have also been few links with the Consultative Group on International Agricultural Research (CGIAR) although recently the International Institute of Tropical Agriculture (IITA) has had increasing contact with Sierra Leone. The Sierra Leone research institutes which had been major centres of excellence earlier in the twentieth century suffered terribly during the war. Presently new natural resources research has almost ground to a halt and a lot of knowledge lost. Since 2002 the country has been starting virtually from scratch.

An initial visit in November 2006 by the RIU programme management brought requests from the private sector (especially Sam King, head of the Chamber of Commerce) and the NGO sector to discover more about previous research which might have potential for use in Sierra Leone. Discussions with key informants suggested that a 'Research Fair' along the lines of a 'Trade Fair' might be the best way to address this need. Guardian Projects were contracted to manage the logistics of the event and resource people to represent appropriate programmes from the RNRRS programmes were identified.

During February a separate but related exercise was being supported in Sierra Leone. The Country Assessment was conducted by Norman Clark, Patrick Mansaray, David Suale and Sheriff Sima who also informed people about the research fair. The key task of this team was to see whether arrangements can be put in place to add value to existing (and future) "new knowledge" from scientific and technological research in the agricultural²⁰/rural sector of Sierra Leone. The team was particularly looking for "windows of opportunity" to increase the demand for such knowledge by users of different types. The team focussed on demand and opportunity identification and institutional analysis. They were not able to focus on the supply of technologies that was available from the RNRRS.

²⁰ Throughout this document agriculture is taken as including livestock, fisheries, forestry and natural resources management.

Showcase Objectives

The objectives of the research fair were:

1. To provide knowledge from natural resources research to those who could either utilise it on the ground or use it to influence policy.
2. To find out what areas of research were of interest (and why) to those working with and for the poor.
3. To gather some initial information on where people currently access information.
4. To initiate a strategy for bringing together knowledge and knowledge users.
5. To validate and add value to the country assessment report.

Opening

The 2007 Research into Use, Sierra Leone research fair was opened by DFrancis K. Ngebeh, Deputy Minister of Agriculture for Sierra Leone. He welcomed the Research into Use programme and also the opportunity to bring together research and research users in such a unique event. He saw a benefit to having all of the disciplines presenting their information together as there are clearly links between them. He provided an overview of the objectives of the research into use programme, of working with current initiatives and institutions and to consider the enabling environment as well as the direct issues involved with getting research into use.

The Research Fair

The participants were divided into the following groups:

1. Researchers
2. Public Sector
3. International NGOs
4. National NGOs
5. Civil Society Organisations

There were six research programmes represented:

1. Plant Sciences
2. Fisheries
3. Forestry
4. Livestock
5. Crop Post Harvest
6. Crop Protection

The research programmes were visited by one group at a time. The group had 40 minutes during which the resource person/ people representing the programme interacted with them and presented information from research, conducted in other countries but which was likely to have application in Sierra Leone. A limited amount of printed and electronic information was available and participants were able to request additional copies of publications that they were particularly interested in. Participants were asked to consider the information about the research and to complete an evaluation form. At the start of the day there were 65 participants, 49 returned their evaluation forms. A copy of the evaluation form template can be found in Annex 1. The resource personnel from the programmes were also asked to complete an evaluation form, the template for this is located in Annex 2.

Feedback from the Participants

Feedback was received in two forms: the evaluation forms (summarised in Annex 3) and on pins in the map which was provided by John Palmer (annex 4). The topics in the map did not contradict the topics in the evaluation form but were useful in showing their dispersion.

The evaluation reports showed very clearly the extent to which the day was appreciated. All evaluation forms were positive about the 'Research Fair' even those who had some reservations about organisational issues. In terms of the structure of the research fair 24 participants (49% of evaluation forms completed) commented that it would have been better if the

research fair had been held over a longer period. Some people also mentioned that it would have been better if they been able to spend longer with each programme. People commented that it would have been better if there had been more publications available. Three people commented that they would have preferred it if the presentations had been more set by the farmers and one commented positively about the forestry presentation which was a lot more participatory. 7 people suggested that the research fair would have a lot to offer as an extension tool for research users and 4 commented that it should have been conducted in collaboration with national scientists, possibly as part of their annual strategic planning event. People felt that publicity should be improved so that more people would attend and one person suggested that having to submit a registration form in advance might have put some people off, as with the absence of a promise to pay travel costs. It should be noted that although 97 people registered for the event only 65 people turned up.

Participants were asked to describe the three pieces of research that they were most interested in. Many responded by programme:

Table 1 Feedback on participants of most relevant research (by programme)

Programme	Number of times mentioned	Percentage
Crop Post Harvest	32	65%
Plant Sciences	28	57%
Crop Protection	25	51%
Forestry	19	39%
Livestock	17	35%
Fisheries	15	31%

NB for this table when a specific issue was mentioned it was counted under the programme that presented it.

Care should be taken in interpreting this data as the participants were not representative of the natural resources sector in Sierra Leone, forestry, livestock and fisheries groups were not specifically targeted (unlike farmers' groups). The most important conclusion that can be drawn therefore is that all of the programmes present represented a field which is of significant importance to the population of Sierra Leone.

Table 2 presents the feedback on specific research topics mentioned by the participants in their evaluation forms.

Table 2 Feedback from participants on specific research issues

Issue	Number of times mentioned
Post harvest processing of cassava	13
Seed Priming	8
Cover crops	5
Fuelwood	4
Herbicides	3
Public private partnerships	3
Artisinal fisheries	2
Medicinal plants	2
Stem borer management	2

This supports the country assessment which identified cassava processing as a potential area of focus for the RIU in Sierra Leone. Clearly the RNRRS research outputs could be used to address the needs of the poor in Sierra Leone. It is worth noting that despite the private sector not being present interest was still noted in public private partnerships.

In terms of accessing information, 18 participants (37%) said that they did not currently access research outputs. This is a significant number, especially considering that those who were attending the research fair were probably the better informed. Of the remaining 63% roughly equal numbers said that they accessed information from the internet (16) or Research organisations and their publications (15). Most of the research organisations mentioned were Sierra Leonean. Working with these research organisations therefore might enable people to access information from further a field. Only the

TEEAL website was mentioned. It might be interesting to see how knowledge from the database is being applied/ adopted with the technical backup of researchers/ others with tacit knowledge.

When participants were asked as to the form of publication that they preferred 9 (18%) said that they had no preference, 16 (33%) said that they preferred electronic and 22 (45%) said that they preferred hard copy (although there might have been a little confusion with a typo in the evaluation on this question). Computer access in Sierra Leone is not ubiquitous and should not be assumed to be so in any information provision activities engaged upon by the RIU programme.

Feedback from the Resource Personnel

Charlie Riches and Richard Lamboll – Presented Outputs from the Crop Protection Programme.

This presentation covered a huge number of issues on many different crops. Of the issues that were presented the following issues were widely picked up by the participants: grasshoppers on cassava, the use of green legume cover crops in rice systems, rodent management. Apart from these the different groups brought out a wide range of different issues. Unfortunately due to limited time these resource persons were unable to further explore these. This programme was able to benefit from the presence of Richard Lamboll in the country for a different programme. However, they feel that having two people gave them a real advantage over the other teams. They also requested whether the publication 'Perspectives on Pests II' could be put on the, still active, CPP website?

Chris Mees – Presenting outputs from DFID Fisheries Research Programmes

The feedback that Chris has provided, including some thoughts on matches between DFID research funded under the RNRRS and demands in Sierra Leone are presented in Annex 5. The demands from the participants are varied but they fit well with outputs from the three fisheries programmes under the RNRRS and potentially there are some very clear matches from. In terms of this event the fisheries sector was not represented. No fisher representatives were present in parallel with the farmer groups that were represented at the small scale / artisanal level. No representatives of the fishing industry were present either from the catching or the post harvest processing and marketing side. This should be addressed in any future activity. Policy makers and high level technical staff from relevant government ministries were not represented amongst the stakeholder group, certainly for fisheries. Whilst Ministers attended the opening, they did not stay for the event. This is an important target group and alternative means of reaching them are required. An additional day at the end of the meeting to enable face to face meetings with key stakeholders in order to brief them would have been valuable. As a mechanism for evaluating demand the Fair must be used as one of a number of mechanisms (as I believe is the case). Furthermore it does not obviously indicate any ranking of demand, although certain issues were raised across the groups more than others. (NB a short study has since been commissioned to start addressing this point).

Dave Harris – Presenting outputs from DFID Plant Sciences Programme

Dave concentrated his presentation on three areas: seed priming, participatory varietal selection and transplanting from nurseries of non rice crops. More details on these and the feedback he provided can be found in Annex 6. Some of the seed priming research was conducted in Sierra Leone and the other technologies were not completely novel and so easy to grasp. The presentation was well received by the participants who seemed genuinely pleased with the Showcase efforts. The overall impression is that the needs of SL farmers are almost infinite and that the technologies available, if applied effectively, could have a great impact in the country. More general issues that arose were:

1. Lack of promotional/information material to distribute to participants was a problem. In the future, planning of other such events should include a mechanism to ship larger amounts of supporting materials into the country.
2. Choice of venue is critical. The Bintumani hotel, while perfectly comfortable as regards accommodation, was not well equipped as a conference venue.
3. Although the resource persons were given a brief by the country assessment team more attention to the country context would improve the effectiveness and relevance of the presentations and interaction with the participants. This would likely necessitate additional 'in-country' days to allow greater familiarisation.

Tunga Rukuni – Presented outputs from DFID Crop Post Harvest Programme

Tunga's presentation focussed on the presentation of a video on the post harvest uses of cassava in Ghana although there was also a lot of interest in the other publications that he had brought along (see Annex 7). Time constraints did not enable collection of representative feedback from the participants. Generally women raised practical issues concerning, transportation and markets and processing techniques. In future events (fairs) inclusion of more women participants would

yield better results in assessing demand for the different research outputs and options for “field” implementation strategy. If the RIU is going to yield results the participation of private sector and financial institutions is a “MUST”. Developing a symbolic relationship helps both the farmers and private sector.

It is therefore essential that RIU works with financial institutions, (private or public sector) so that the beneficiaries can access funding on a “commercial” scheme. This will make recipients financially accountable and have a sense of ownership of the enterprises.

The poor infrastructure (roads, power, communication etc) holds back the development potential of the post harvest sector. Government ministries and private sector charged with provision of “infrastructure” should be made aware of the RIU initiative and participate in workshops/fairs. Rural transport is key to efficient marketing of produce and products and draught animal power may have something to offer on this front.

John Palmer- Presented outputs from the DFID Forestry Research Programme

Rather than simply presenting research John first of all asked participants to bring out their forestry related issues and then related research funded through the FRP to these demands. This was appreciated and specifically noted by a number of participants. John’s feedback is very useful and can be found in Annex 8. All groups mentioned fuelwood as a particular area of concern, post harvest issues were mentioned and then a wide range of different issues. Specific points of interest are:

1. A more complete set of briefing papers should be sent out further in advance to assist resource people with planning their presentations.
2. With the dire need for infrastructure strengthening and dealing with corruption is the time ripe for exploring the potential of research outputs in Sierra Leone?
3. The farming population is ageing but there are few incentives for the young to enter into farming. Traditional structures were considered to be a constraint.
4. There were no Syrians or Lebanese in attendance at the research fair but they are an important component of the local economy.
5. There was a complete spectrum of views about whether traditional communal land tenure outside the Western Area is an obstacle to post-war development.
6. So much research information was lost during the civil war that it would be a good starting point for the RIU to collate historical grey literature on natural resources research in Sierra Leone (this has been initiated with a study in the UK).
7. RIU would be best employing a mentoring role in Sierra Leone.
8. The role of Paramount chiefs in rural development needs to be scrutinised.
9. The RIU would need to have tight financial control in Sierra Leone

Tim Smith – Presented outputs from the DFID’s livestock programme

Tim provided participants with background to the production of livestock production and health outputs (box baling, acacia pods, improving the hatchability of eggs and presented different types of outputs (cds; books; wambui messages; newsletter etc) and demonstrated the Smallstock toolbox. Further information in Annex 9.

All the groups had similar questions about restocking of livestock following the war and animal health issues. The range of outputs appeared to be well received especially the toolbox concept and book. However, because of the vagaries of the power supply CDs need supporting by hard copy, especially away from Freetown. As with other presenters Tim would have preferred more time with each groups and time for a longer in-country brief (this was dictated to some extent by air flights and the availability of politicians).

James Newton from Guardian Projects Limited was contracted to manage the logistics of the research fair. His report is included in Annex 10. The main points that he makes concerning future events are:

1. There needs to be a longer lead time to organise the event (this event took less than two months from requesting Guardian Projects for assistance to implementation). This would especially be so if physical demonstrations of crops or livestock were to be included. The Uganda workshop (2006) was organised over 2 months but that was done by a larger team working solidly with some of the staff in-country.
2. Communication between delegates and organisers needs to be improved; start earlier and make the participants more involved in what is to take place. This would assist with organisation, catering and seating.

3. Of the Marketing mix meaning: Product, Price, Placement and Promotion of the project, the product and placement were good. In terms of the promotion having more people of the ground to ensure government buy in and the newspaper adverts were successful would be improvements. It would also have been good to have linked the fair to other events. Guardian Projects had suggested that there should have been a registration fee. This would have ensured greater participation of those who had registered. It was suggested that certain participants could have been sponsored to attend to cover the registration fee and travel expenses.
4. Contractual arrangements, in the future a written legally binding document needs to be used to ensure that the service providers contracted by the conference organisers provide the facilities that they said that they would and at the price agreed E.g. to state that "The terms of payment can not change from that which is written in this agreement, not verbally, written or in any other way."

Conclusions

The Research Fair was unanimously supported by the participants. Most people also said that they would like the event to be repeated but recommended some changes, that is should be longer and people should have longer with the resource people. Some farmers were keen that there should be future research fairs, held up country as a method of disseminating further information. Some of the researchers suggested that such an event could be well timed as part of their annual strategy development week (RIU is sending somebody to this meeting later in March). As long as those attending are representative it could really be an asset to the national programme research priority setting. The RIU could investigate whether there was broader interest in this 'research fair' concept throughout CORAF/WECARD, or even other SROs.

It would appear that there were high levels of interest in the topics provided (despite the resource persons requesting additional time and information to better appraise them of the in-country demands). Part of the value of the research fair is that it not only addresses the demands of the poor but also provides ideas on issues that had not been previously considered. The research fair has also shown some of the stakeholders that the RIU should be working with that the RIU does have something to offer. This report should augment the country assessment report. There will also be additional reports on the forestry and fisheries sectors which can all be brought together to develop the way forward for the RIU in Sierra Leone.

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March 2007
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**SECTION 3: POST COUNTRY ASSESSMENT STRATEGY DEVELOPMENT VISIT TO
SIERRA LEONE**

14TH – 21ST MAY 2007

Introduction

The Visit set itself the following objectives:

1. Validate if there is support for 'windows of opportunity' identified during the country assessment
2. Is there broad support for the additional opportunities identified: research fair, help desk, forestry studies, linking with fish programmes
3. Identify how to take these initiatives forward (implementation plan)
4. Identify MIL expertise and what MIL should be exploring in Sierra Leone on the lesson learning side.

To achieve these objectives, a team comprising Andrew Ward, David Suale and Nicholas Atampugre held discussions with representatives of:

- 1 Freelance Consultant
- 7 Sierra Leonean institutions working on renewable natural resource related issues including research,
- 2 Donor agencies – DFID and EU
- 1 representative of the British High Commission
- 4 International NGOs – World Vision, CARE, Africare and CRS – referred to as the CORAD group of NGOs
- 1 local NGO – Cotton Tree Foundation
- 2 Farmers Field Schools in Waterloo near Freetown.

The notes below show the officials met, their organisations and the date of the meeting. An attempt is made to highlight sections of the discussions which contribute to the realisation of the objectives of the visit. It records primarily the ideas and suggestions of the SL interviewees.

14th May 2007

Meeting with Richard Fanthorpe – Freelance Consultant

Richard is a social anthropologist who has been working in and on Sierra Leone for well over 20 years. He is working with the current EU Concern/NRI project as a free lance consultant. He has supervised or had contact with many Sierra Leone based PhDs which add to his own knowledge of the country. Issues:

Land tenure – last studied in 1964 by Karim Hussein (RF has his PhD). CARE tried to put together secondary data recently. Land tenure rules have led to land borrowing, conflict and have a heavy influence on farmer level innovation/ uptake of research outputs. Are partners taking this into consideration? Chiefs control land rights.

MIL/ Historical Research and Research Uptake – David Moseray did his PhD on this with rice. RF feels that there are a lot more PhDs that could be of benefit on this that could be sourced through American thesis copy services UMI, University of London, SOAS etc. Lessons haven't necessarily been learnt, in the 1920s Indian researchers were invited over to investigate the cultivation of swamp rice. After 6 years they recommended that the traditional methods were more productive, although this didn't prevent further initiatives on swamp rice which also failed.

Help Desk – RF would suggest locating it at Njala. However there is a special collection of research papers at Fourah Bay although nothing has been added since the 1980s. How accessible is it. Could such an archive be scanned?

DFID are funding a programme entitled 'Enhancing Communication between Civil Society and State (ENCISS). Jane Hobson is the person to contact on this one but they have some excellent people involved. RF also rated the NGO field staff.

Communications – Community radio has given people a lot of ideas and is the more accessible form of media. Could we support Q&A shows to support the help desk and advertise the research fairs? Mobiles are likely to go nationwide next year. NB Do we consider if people are too poor to innovate?

Socially – Before the war agriculture was a default option. Now people are doing it so as to preserve a way of life (they can see the threat).

Other stakeholders – Descendants association (this might be a name which has a website)

The RUF in the war killed those that they saw with power, who had benefited from the 'old regime'. There are still people with more power in the rural areas although Paramount chiefs have had to accept the establishment of development structures (management committees, youth or women's groups) over which they have no control. There is also the issue of rural people seeing elites in urban areas, there is still a danger of renewed conflict.

Meeting with Dr Ernest Ndomahina, Director Institute of Marine Biology and Oceanography, Fourah Bay College

It had been recommended that we speak to EN regarding the Fisheries Sector Strategy Paper (FSSP) and if the RIU was complementary towards it. In the end it was not clear how much involvement he had in its development and we were unable to get much discussion on enhancing communities' ability/ attitude toward demanding knowledge and services, research fairs or information help desks!

Other donor initiatives – EU project coming on stream on stock assessment, capacity building, and environment. He couldn't believe that MRAG were not selected for this. African Development Bank is funding a programme on stock assessment for the next 3 years. He had just evaluated a JICA funded World Bank project to be commissioned 'Rural and private sector development' which will have a focus on accessing information, upgrading agricultural markets and feeder roads. He saw this as a very exciting multisector/ stakeholder initiative.

AP We must find out more about this and before we present to CORAD. Need to meet E. K. Allieu

MIL/ Historical – Lack of sustainability in programmes. He illustrated the smoking ovens introduced by a GTZ programme which were expensive and could not be made locally. His students have evaluated a lot of the fisheries programmes and he has the thesis. These evaluations were considered very adequate.

Knowledge management – Ian Payne had mentioned the fish stock assessment data collected by the Soviets. EN said that the data from 1976-86 had been collated in a PhD thesis by Coutin, co-supervised by Payne. Need to find out what this is all about. EN has one, much photocopied version left.

He has problems accessing international journals. And the historical library of journals and colonial records was lost.

AP AW to talk to Wyn about communication programmes and sees if Fourah Bay can qualify for free journal access through DFID.

Capacity Strengthening – EU is looking at certification for SL fisheries but have no expertise in quality assurance. At the moment he has somebody who has been accepted for a Masters but has no funding. He would use her to establish a diploma course in the college.

Meeting with Chris Squire Commissioner of National Commission for Environment and Forestry (NACEF)

Felt that there were a lot of communication projects in the country at the moment and he warned against forgetting about translation as well as information provision. He also felt that before the war there had been some very nice integration within agricultural systems but that had been lost now and projects were repeating mistakes that they had been making before the war. He really felt that what was needed was a catalogue of the mistakes that had been made in terms of getting research into use with counteracting examples of success. This could act as a guide to researchers, government and donors and would be a guide against which proposals could be reviewed. If it was electronic as well it would be more user friendly. Chris would be keen to be involved.

He said that they knew what the problems in forestry were but they had insufficient funding to do anything about it.

AP Send Chris the URL of Trees of Sierra Leone and any other information from the FRP.

15th May 2007

Meeting with A.B.C Jones – Director of fisheries, Ministry of Fisheries & Marine Resources.

a) An update on developments in the ministry:

Fisheries Sector Strategy paper timely. The structure of the ministry has been looked at and the management arrangements are currently being reviewed. The initiative is still on-going in the sense that there are more stages to run. It is however important because of its primary focus of improving service delivery. The sector strategy will focus on fisheries management and fisheries related enterprises.

Some research is currently being undertaken – a regional research programme on the Guinea Current large marine ecosystem and the Artisanal associations' development programme being supported by the African Development Bank (as major partner) and with the government as a minor partner also have some research element factored into it. The research aspect is being handled by the Institute of Marine Biology and Oceanography at Fourah Bay College

The ministry has no direct involvement with NGOs but there are 2 fishing associations – the SL Artisanal Fishermen's Union (SLAFU) and the Sierra Amalgamated Artisanal Fishermen's Union (SLAAFU – an amalgamation of two unions). There are tensions and conflicts among these Artisanal fishing associations with the former refusing to collaborate with the latter

because of alleged poor fishing practices (channel fishing). High level political initiatives are currently under way to try and resolve existing differences and concerns (especially gaining access to funds meant for Artisanal fishery development). There is a Sierra Leonean Indigenous Fishing companies association but they tend to come together only when there is something crucial or threatening them and lobby to advance their interests.

Aquaculture was piloted with HIPC funds and although the review of the HIPC funded initiatives highlighted the non-performance of several sectors, there were signs of potential in aquaculture. However, not much work has been done on aquaculture and the challenges facing it include those of feed, equipment, pond construction (high cost element) and training on pond management. Previous research has been around how to make use of fish waste as manure but nothing on producing local feed. With global developments, there is a case to be made for promoting aqua culture and fish farming in the interior of the country but the major challenge remains the feed. The ministry of fisheries is keen to engage with RIU and open to suggestions on how best this can be done. They are of the opinion that the proposed research fair is OK but will require a sensitisation of the stakeholders on the potential benefits of the fair. There is some cynicism (though reducing) among policy makers on the usefulness of research and they need to be convinced about the benefits. On the help desk, they would require greater clarity on its focus. Some case studies on how it might work will be useful for the ministry to buy into the idea. Generally the current leadership of the ministry come across as inclined towards delegation and involvement of stakeholders in the planning and implementation of initiatives. On working with community associations, a support to strengthen them will be of benefit to the ministry.

Dr. Abdulai Jalloh – Institute of Agricultural Research

He is still enthusiastic about the research fair idea but would rather prefer NARCC (the umbrella body) leads on it. The goal should still be how to make research useful to the end user but a lot depends on the format of the event. Will it be experts from outside presenting ideas not necessarily applicable in SL or will it be an opportunity to show case relevant research from SL and the sub-region? Dr. Jalloh is keen that the research fair should have a sub-regional flair. Equally critical is who is involved in it (farmers, processors and researchers) and how the interaction will be organised (a lecture or classroom style versus an interactive approach). A meeting of potential stakeholders for the fair will be needed to iron out the above issues.

The idea of a Help Desk is also good and could be linked to the Research Fair. Fortunately, SL now has a wide reaching communication backbone covering all districts of the country. The Help Desk could be organised in such a way that it is linked to the government's decentralisation effort and in particular the presence of district agricultural officers linked to subject matter specialists at district level. District Agric officers could be the focal point failing which issues could be referred to a central point. In developing the Help Desk, the NARCC system which co-ordinates all activities should be brought into the loop. Furthermore, mobile phone companies now carry news on different activities as well as prices for different commodities. A stakeholder meeting involving mobile companies could help move the idea forward.

The NARCC system has an annual strategy meeting involving policy makers, farmers and researchers (national and international) and a consultative meeting to plan the research fair and realise the help desk involving NARCC could feed into the NARCC annual strategy meeting. Such a consultative meeting could help clarify how the objectives of RIU could interface with the broader strategy of NARCC. However, the two exercises do not need to be directly linked. What is important is to get local stakeholders to plan the fair (unlike was the case with the first one) and this can only happen after mid-September when the elections are clearly over.

On Farmer Field Schools, he has serious reservations especially the duration but recognises that FFS and participatory varietal trials have reduced costs significantly.

Brief encounter with Harunah Dialloh – Leader of the Young Farmers – and Chief Yusuf Sankoh – Chair of the National Association of Farmers of Sierra Leone.

Left with the results of the 2003 election and a feeling that this Association will most likely have some political muscle around it given its elaborate organisational structure, nation-wide presence and full time staff in charge of the national office.

Team evening review meeting

Land tenure issues, especially land use relations, are important in the adoption of research outputs and should be kept in mind as RIU, with its pro-poor focus, seeks to promote the adoption of research outputs. On MIL, there is a need for a study on how research has been put into use. It is important for RIU to gain a composite understanding of the nature of learning that has occurred in the farming system as a result of past research. An evaluative documentation, from a historical perspective, of attempts at increased productivity or putting research into use will be useful. Someone with a lot of Sierra Leonean experience will be appropriate possibly a partnership between national and international Sierra Leonean expertise.

The Help Desk idea has generally been endorsed and the suggestion is to host it at IAR-Njala although Fourah Bay College has a special collection of research papers (up till the 1980s) which can be a useful resource.

Farmer Field Schools can be a useful entry point for RIU by tracking the experiences of "model" farmers that have gone through the school with the view to finding out what research outputs have been put to use and what the experiences have been. It should aim to establish research outputs (and their source) that have been put to use by resource poor communities and the impact they have had on their lives. It is important too to establish the social changes that have been brought about – are they demanding more information, are they working together or conversely has the selection of farmers produced inequalities within rural communities. It is important however for RIU to recognise that FFSs are not its baby and the purpose of such a study should primarily aim to identify entry points rather than analyse too deeply into FFSs.

DFID funded project on enhancing communication between civil society and the state (ENCISS) is worth finding out more about. Efforts so far to establish contact with Jane Hobson of DFID-SL have not been successful. Radio phone-in programmes is being used in other sectors to facilitate the sharing of information. RIU could explore how best to integrate this into the Help Desk concept.

On fisheries, there is a need for historical data which the Soviets are alleged to have (especially on fish stock) so it is worth following up past data sources on fisheries as a way of looking at the impact on fisheries policy.

The discussion with ABC Jones of the Ministry of Fisheries suggests that the sector could be at the threshold of a major transformation. It could be said that aquaculture is a red herring in SL especially regarding its immediate potential. Objectively, it is not a quick win in terms of RIU and may have to be put on the back burner for the meantime. However, ABC Jones is enthusiastic about inland fishing and aquaculture partly because of the low fish stock in capture fishing. If discussions with CORAD NGOs show that farmers are demanding knowledge on aquaculture, RIU could provide the training and the CORAD NGOs provide the inputs required. There is however no INGO involvement in the fisheries sector. RIU engagement with the fisheries strategy could be a way of mainstreaming RIU into DFIDSL programming and resource commitments. If that happens, it will be a very effective way of enhancing the sustainability of RIU interventions.

The research fair could be part of the process that will enable RIU identify quick wins and determine its priorities. The outcome of such discussions could shape the ultimate RIU strategy in SL. There is however a risk of opening up the possibilities within RIU especially as there are resource constraints and the programme advisory board has views on what RIU should focus on. The on-going process of validating the country assessment report should lead to the firming up of priority areas and allow the programme to evolve over time. The private sector remains weak and there is little SL investment in the fisheries sector and the RNR sector in general.

16th May 2007-06-02

Meeting with the Minister of Agriculture, Forestry and Food Security

Very keen to ensure that the programme succeeds and upscaled over time because it is coming to clear a major problem of clearing the bottlenecks in getting research to farmers. It is coming at the right time and the cooperation and support of the various sections of the ministry will be forthcoming. Through the steering committee, it will be possible to put resources into RIU if it can demonstrate some quick impact. The timing however could be changed till after the elections and after the harvest time. An effort should be made to prioritise the entry points. The rice sub-sector is still crucial and with the advent of Nerica – its targeting could help overcome remaining challenges e.g. how to handle its weed, issues of harvest and

processing during the rains. There are also still challenges such as pest control confronting farmers in the areas of Cassava and Maize. What is important for now is to agree the priorities.

Will be worthwhile to gain the support of other programmes such as that of the WB and IFAD which could be useful in widening the scope of RIU which has good prospects. What is required is to let the ministry know the support that is required. A one-page write-up on RIU and what it seeks to achieve will be useful for distribution to all relevant stakeholders in Freetown and the provinces.

The Help Desk and the involvement of mobile phone companies in passing information to farmers is a good idea but the higher level structures in the ministry should not be ignored. A good idea to collate experiences of success and failures in Sierra Leone and a local consultant supported by international experts could undertake this. Had previously tried to do this when he was at the research station. There are bits and pieces of historical data which need to be pulled together. These include documentary sources as well as the experiences of those who have served for over 30 years. There is also a need for some baseline with some targets to facilitate the monitoring of RIU. The WB's experience of contracting out the evaluation of research stations by farmers is an interesting initiative worth replicating. If adopted, RIU could help change the attitudes of researchers towards promoting the adoption of research.

RIU should see itself as coming in to move the process forward in a couple of areas with potential for impact in a few years. Shifting the thinking of researchers in those areas away from doing research for its sake will be useful.

Thinks the use of the voucher system (which can later be redeemed in cash) for organisations to buy information from researchers are worth trying but a write-up on how it might work will be useful.

The JICA funded WB project on private sector development aims to promote agricultural trade and processing is an area of focus.

AW to send: a one-page brief on the visit, an overview of RIU and the draft speech.

Meeting with Jack Ahmed Jalloh, National Co-ordinator - FAO/Ministry of Agriculture and Food Security (FS) Farmer Field Schools (FFS)

Operation Feed the Nation (OFN) was introduced in response to President's declaration on Food Security and FAO was contacted for support to realise this. FFS seen as an instrument for achieving FS. FFS started with a ToT of 280 frontline extension staff. Ten outstanding farmers from the 14 districts were also trained as facilitators.

Since the introduction of FFS, 2 evaluations have been held and a 3rd is in progress. ODI was contracted to do the first assessment and they recommended the upscaling of FFS. An impact assessment spear headed by FAO using international consultants with local counterparts has been carried out the outcome so far is positive. The WB was initially sceptical but has now come on board and proposed to use it as an entry point for their programmes.

UNDP championed FFS with FAO but they were keen on promoting farming as a business enterprise. Now UNDP has promoted a merger between FFS and the Agri-Business Unit (ABUs). FFS are now a training ground for farmers to acquire new skills and knowledge to be applied with business skills acquired through the business unit. This approach has been response to the findings of the evaluation which drew attention to the desire of farmers to get support to implement their skills, increase their acreages or go into large scale production. Many donors are being encouraged to support several components of this new approach of looking at the entire value chain.

Capacity gaps however still exist, partly due to lack of funding, and the approach now is to look at existing structures and explore ways of supporting these structures rather than create new ones. Working closely with the NGOs – the CORAD group – and it started at the beginning when CRS showed interest. They sent some of their staff to the first staff of training who has now become trainers.

A programme on sustainable tree cropping is being carried out in conjunction with the NGOs and the FFS. This initiative is an off-shoot of a DFID funded programme on sustainable tree crops and FFS in cocoa production systems in Ghana which also involved participatory video production. FAO are supporting a pilot programme in the East on organic agriculture by

supporting a local CBO which should form the basis for eventual scaling up. Farmers acquired a lot of skills in Cassava – especially processing – during the war and many young people are switching from rice to cassava because of the possibility of earning a cash income in a shorter period.

Impact assessment carried out could point to clues on technology uptake. However there were some gaps in the assessment – social and economic aspects - which still need to be carried out to determine how people have benefited from FFS. ***The final report will be useful for RIU especially for its MIL work.***

Developing a curriculum with the 2 research institutions. FFS will include fisheries, livestock in addition to crops. Farmers are in networks and the focus now is to develop their business orientation. Inputs have been given on a cost recovery basis to farmers through their network of associations. FFS networks are involved in dispute resolution among members thereby avoiding chiefs and the police. They are also responding to the social welfare needs of their members such as health and education. Predominantly female dominated FFS are doing better than male dominated ones and FFS facilitated by farmers are doing better than those facilitated by extension agents. The trend now is to make farmers the lead facilitators of FFS.

Generally supportive of the information help desk idea. A similar issue came up in their discussion on upscaling FFS. There is a component on information/dissemination and the use of mobile phones was considered especially as a tool for sharing market information. It will be useful for research institutions to put out their research outputs especially as they have done a lot especially in the area of food processing and nutrition. It is only during the open days of these research institutions that one gains an insight into what has been produced. Therefore supportive of the research fair idea but will recommend that IAR consider show casing, on a quarterly basis, their outputs on a region by region basis to farmers and extension agents.

Andrew Ward to get back to Jalloh on the possibility of RIU supportive some events in the hope that others will then take it from region to region. A team to carry out a study on how RIU can add value to FFS can best undertake the assignment in October.

A full time person, even on a year's contract, will be useful to move things forward. And if such a person were found, s/he could be included in the Ministry's steering committee.

Meeting with Professor Edward Rhodes – NARCC

Still supportive of the research fair idea and will collaborate with Dr. Jalloh to bring it to fruition. Keen to highlight the complementarity of their disciplines – crops and soil science. Recognises the importance of knowing what has been done and use farmers have made of the knowledge they have gained. Agrees that a post election (probably around October) stakeholders meeting will be more feasible.

Help desk idea sounds more like information and communication technology. Appreciates the fact that it is also about knowledge management. It will be important to get researchers up to date on the next research fair and about the October meeting which will be crucial since it will provide an idea on how best to operationalise the help desk idea.

Keen to get a copy of DFID's database on 300 research outputs that have been adopted by farmers. An in country comprehensive database will be useful for the help desk.

Data from the agriculture sector review is available and it contains sections on the challenges and outcomes in the sector. It contains research outputs on improved varieties, natural resource management, livestock, extension, research and fisheries. It could be a starting point for identifying additional information of relevance to RIU. There are also annual as well as activity reports. The above can be complimented with information from outside since it is generally accepted that it is more cost-effective to make use of relevant knowledge produced from outside the country rather than re-invent the wheel. Generally surprised by the speed with which SL has recovered. Interested in the DFID funded initiative of making international journals accessible to people in Africa and

Meeting with Mathias Reusing and Andreas Laggis of the EU

The meeting was intended to bring the EU up to date on the RIUP and provide them an opportunity to raise issues which could contribute to the evolution of the RIUP. The questions raised are in response to the presentation by the RIUP team.

EU: Is this trip an appraisal mission? Is it to identify the target group or users? The EU and FAO have jointly supported the FFS and USAID is currently supporting NGOs that are also working with the FFS. What is the added value of focussing on research in the sub-region and within SL when there is in fact a need for technology transfer? The gap between Europe and Africa is wide and widening. The information help desk is a useful idea especially as mobile phones are spreading all over the country. There are however challenges to be overcome and there is a need to develop information centres close to market centres and export outlets.

On the fisheries sector, EU is supporting the development of the sector strategy and the contract with the government of SL will be signed in a week. EU is supporting stock assessment, capacity building of the ministry and management of fisheries policy. A formal and scientific assessment process is envisaged. EU has good contact with Tim Bostock.

There is a lot of indigenous knowledge on fisheries which needs to be tapped soon otherwise it will all be lost. Experience from Benin suggests that local people do have advanced knowledge on certain aspects of fishing (lagoon fishing). There is a need to extract and communicate good traditional practices properly. There is also knowledge in area such as agro-forestry where there is valuable traditional knowledge (especially on medicinal plants) which needs to be catalogued. Research in that direction will be useful. A lot of knowledge was generated in the Soviet era and it will be useful to access the information the Soviets hold.

An effort is being made by the RIUP, in conjunction with the Tropical Agricultural Association of the UK, to catalogue existing knowledge. Such knowledge, if complemented with what exists in SL could be useful for policy makers, donors and EU members of staff appraising new programmes and projects. How much funding is available to the RIUP? £37m is available but the exact allocation across the different regions is yet to be worked out. EU is of the view that it is a lot of money and could make a significant difference.

EU is supporting tree crops, agro-forestry, livelihoods, management (planning and resource allocation), decentralisation, marketing and promotion of export crops. EU is shifting from the relief mode to the promotion of development markets. They are currently running a number of projects with NGOs and this likely to continue under the thematic budget lines. Other new initiatives like the STABEX project will be run through the ministries.

On deforestation, the bigger problem is land management practices hence the need for agro-forestry. A lot of research and knowledge transfer is needed.

17th May 2007

Meeting with the CORAD group of NGOs – CARE, World Vision (WV), Africare, CRS

WV is the lead agency on the agriculture and environment working group.

CARE: Work through partners with the aim of building their capacity.

WV: Their work is ministry driven in the sense that agriculture is viewed as a religious devotion. Have tried the partnership approach and found it more expensive because they require intensive monitoring and support. Currently using the area development approach where they commit to staying in an area for between 10-15 years during which they emphasise CB. There is now a declining emphasis on donor support with the priority being on child sponsorship and private capital. Grants now constitute about 25% of their aid budget.

Africare: Work at local level through Key Partners – village development and Ward Development Committees – and the strategy is to assist them identify their goals and objectives and then ensure that Africare goals/objectives are consistent with communities'.

CRS: Work through partners – mainly CARITAS and chosen partners of the American Refugee Council partners

Farmer Field Schools (FFS)

Tried to encourage researchers to interface with FFS but without much success. Researchers not too keen to interact directly with farmers. The challenge is how to change this attitude and encourage them to value farmers' knowledge. Perhaps the research fairs and information help desk might help achieve this.

Information Help Desk

Something similar – an information management system - is being envisaged with the ministry of agriculture and is going to be linked to a satellite network. It is likely to be piloted in Kenema and Bo and could provide a good opportunity for farmers and researchers. Farmers are often able to come up with penetrating questions derived from their experience with different crop varieties as has been the case in their choice of Nerica (early maturing) and the help desk could provide an opportunity for researchers to engage with farmers. On the voucher system, the issue was discussed at the last agriculture working group meeting. It is deemed a good methodology in the sense that it enables farmers dictate the pace and type of engagement according to their needs. WV, using fairs, have attempted to promote seed varieties by giving farmers to purchase seeds from seed suppliers. Instead farmers have used the vouchers to purchase seed from amongst themselves and have requested that the system be repeated. The voucher system is going to be centralised around Mekení and Kailahun. The quality of seed provided by seed suppliers is often poor. Farmers need to be involved in managing a system which has been effective in keeping resources within a community rather than to middlemen.

Database + MIL

There is a lot of knowledge held with a dying breed of researchers. There is a need to build a database from many retired and retiring researchers such as J.B. George, Dahniya, Koromah, Dunstan Spencer, Rhodes and others. It will be useful to look at the past history of getting research away from the stations to farmers.

M&E capacity in SL is low partly because of the war and also because the area has not been taken seriously in the past hence the tendency to bring in expertise from outside (the desire for objectivity also informs their use). There is for example Sunny Davies, a Liberian with the sustainable tree crop project of IITA/USAID who is quite good but the issue is usually a cost element. M&E is now being taken seriously and a few people are growing into that area of work. More generally, local NGO partner capacity is low and the often require a lot of training especially in M&E to make them more effective. WV have tried the partnership approach and found it more expensive. It involves setting up their systems, reorienting them from the relief mode and providing intensive monitoring support.

Livestock

Work done in this area has been destroyed by the war – rebels devastated the breeding stock and efforts to restock from Guinea have been unsuccessful. A DFID restocking programme 3 years ago showed over 90% mortality rate, much higher than the experience from Liberia. AW to contact some of past DFID livestock staff to tap into their experience on restocking.

Fisheries

WV trying to vitalise inland fishing and fish ponds and this part of the important activities to be undertaken.

Africare are adopted an integrated approach which combines fishponds with chicken rearing.

CRS is including fishing and fish ponds into their farmer field schools (Fishing Field Schools).

Next steps for RIU

Produce a one-pager on the meeting containing the basic ideas. It will include the idea of a hosting of a consultative meeting involving farmers and the CORAD group of NGOs. Plan to take forward the help desk and research fair in 2008. On fisheries, keep in contact with DFID fisheries and probably support work in pilot communities. It could involve bringing in relevant research outputs and empowering communities to organise themselves and demand for information, an area where the CORAD group of NGOs could play a useful role. On FFS, sound out Martin Kimany on his availability to do a study that will identify entry points for RIU. The best time for such a study will be after the harvest period.

Meeting with Kevin Cunningham – Deputy High Commissioner – British High Commission SL.

Private sector is the key to development in the country if the available rich resources are to be effectively harnessed. Mining companies are interested in supporting agriculture related work – for example – Palm Oil. The Lebanese are involved in commerce (mainly importation) and a bit of tourism but not into agriculture. The Voucher system could be a useful way of managing access to support from the Help Desk.

Working lunch with Lucy Balmer – Head of Programmes – DFIDSL

Fisheries programme is essentially a London driven initiative with Tim Bostock leading on the process but with the intention of it being a joint donor initiative. The lead from London is because there is no in-country fisheries advisor and existing staff are over-stretched. Tim is currently appraising the project memorandum and will manage it from his end with some in-country assistance where necessary. Lucy is currently the in-country contact on the fisheries programme but this could change.

DFID's country assistance plan is predicated on a 10 year MoU signed with the SL government. DFID and EC have a joint country assistance plan and this due to the fact that DFID is the single largest bilateral donor and EC the single largest multilateral donor. The country assistance plan is yet to be finalised and signed off by Hillary hopefully May/June. It will then have to be approved by all the EU member countries and this could take up till December.

The country assistance plan which mirrors the 3 pillars of the PRSP focuses on:

- i. Promoting good governance, peace and security
- ii. Promoting pro-poor sustainable growth for food security and job creation
- iii. Promoting human development

The strategy is very broad in the sense that it encompasses several sectors but key gaps include environment and natural resource management. It will not be surprised if DFID increasingly does more work on natural resource management given the issue of climate change. However it is unlikely that DFID will go as far as agriculture especially as EU is into agriculture.

DFID will start a Liberia programme but managed from SL with a one-person office in Monrovia and programme management support from Freetown. Work in Liberia will be similar to work done in SL in previous years.

DFID in-country advisors include: health, infrastructure, governance, social development and economics/private sector development

Debrief with Andrew-pre departure

Livestock

Difficulty with restocking small ruminants due partly to poor handling/transportation of animals brought in from Guinea for the purpose. Forcing them to swallow plastics is alleged to be one of the causes of the high mortality.

Research Fair/Help Desk

There is overwhelming support for the Research Fair and Help Desk idea and agreement on the most appropriate time for a stakeholder meeting (October). There is however a need to synchronise the consultative meeting with the NARCC strategic planning meeting scheduled for this year. Consequently: Venue, determining and sending invitation letters to potential list of invitees should be sorted out by the end of June, with a reminder to invitees after the elections. It may be better for RIU to actively identify the venue and the facilitator.

The consultative meeting should clarify the most appropriate format for the research fair. The ToRs for a good facilitator agreed by the end of July. A good facilitator should be able to capture fresh ideas and manage the expectations of participants by enabling a broad ownership of the outcomes whilst keeping the meeting focused on the RIU objectives.

The consultative meeting should also: Explore a framework for promoting MIL, especially potential indicators and feed back arrangements. Develop a shared understanding of how the Help Desk and Research Fair can be institutionalised and the role and responsibilities of different stakeholders in taking the process forward.

Clarify the in-country capacity needed to take forward the RIU agenda including MoUs, partnership arrangements, management arrangements systems and resources. AW to follow up with Tim Donaldson on the above operational aspects.

Farmer Field Schools

Appropriate entry points for RIU have to be identified. An FFS study should take place early (Jan/Feb) next year but a consultant to be identified and ToRs finalised by end of July. Perhaps a systems specialist may be more appropriate.

MIL

MIL should concentrate on learning about research outputs in SL with potential for RIU in SL and in other regions. A compilation of research outputs that have been put to use in SL and an identification of research outputs in SL and outside that could be put to use by resource poor farmers should be carried. This could start with a simple survey cataloguing existing research with a view to finding out what research outputs have been found to be useful, how the data is intended to be used and the most appropriate format for the information. An overview briefing note could be written highlighting what research outputs exist, the merits of the data that has been collated and the limitations of the data gathered.

18th May

Meeting with Dr. Fornah (IARSL@sierratel.sl) – IAR, Njala

He is the head of outreach and looks at how technologies perform at multilocations. His experience shows that farmers tend to adopt technologies they find useful even before they are formally released. Fornah was closely involved with the ACRE project, a USAID project which conducted a baseline studies on both the agronomic and socio-economic situation in the project areas. ACRE was effective largely because it had adequate logistical support and they were operating the T&V extension system. That project produced a number of technologies that are still well known today (the mini-kit cassava varieties popularly referred to as Milikit).

An important issue which RIU needs to address is how it will mesh with existing structures if the work it is starting is to continue. IAR is currently undertaking some participatory varietal selection. But there are problems with uptake, for example as has been the case with the IITA funded research. Radio announcements on the availability of improved varieties were placed in Kaballah but the response was poor. A study is being proposed to find out how far the varieties have been adopted. What is clear is that the dumping of varieties on farmers does not lead to adoption.

Livestock

There is not much research in this area. An attempt has been made to restock from Guinea but the mortality rates are very high. So far no proven technologies on livestock exist.

IAR Technologies

A nutrition division has been set up and the focus is on processing as part of an attempt to explore the different potentials in local crops. Crop processing centres are being established and small scale machinery being introduced.

Farmer Field Schools

It is a very good framework for promoting technology uptake but FFS tend to respond actively mainly to agencies who fund/support them (ministries and NGOs). There does not appear to be dedication to IAR initiated activities. They should not be the sole extension methodology and it is worth exploring complimentary approaches including setting up your own FFS to enable the agency start from scratch and go through with them on how best to try and promote the technology – from planting to harvest. Just giving technologies to FFS to test is often not received enthusiastically. In any case FFS should be complimented with educational training to enable farmers' better transfer their skills and knowledge.

The researcher – farmer interface is often hindered by poor logistical support hence the weak linkage between researchers and FFS. There is also the issue of scale – where many farmers are left out – and as such FFS are useful in reaching areas where there is poor accessibility.

Research Fair/Help Desk

Research Fair is a good idea and there is the North-Central agricultural project at Mile 91(closed now) experience involving IAR in adaptive research to draw from. Bringing the farmers in direct contact with the researchers (question and answer) proved exciting for the farmers and the researchers. If the research fair is going to be more integrated it will even be more acceptable. However, a day will not be enough to cover the rather wide range of agricultural interests.

When demand and supply is brought together that direct link enables a more rapid response and probable solution is more likely. If farmers are able to come together to link and find solutions to their immediate problems then it will be fantastic but the challenge is how to sustain it. Mobile phones are useful but who will cover the communication costs? Perhaps involving mobile phone companies in a competitive environment might help lower costs. The former minister of agriculture was instrumental in organising the farmers into a national farmers association but it is the political muscle which has kept it alive.

IAR could play a role in the research fair even at the planning stage as well as in displaying their technologies and participating in the discussions. Can be a focal point for the information help desk because there are a few specialists in different areas and the director is working hard to get a VSAT. With a clear understanding of what is required to operationalize the help desk, it will be possible to secure the commitment of management.

Private Sector involvement

We need to be clear about the audience and what outcomes are expected. Is the private sector to be part and what effort is being made to bring them on board? There are many uses of Cassava but investors are needed to make use of the rich potential in Cassava and other commodities. The innovations platform approach of RIU might help encourage private sector involvement when all the stakeholders are brought together to discuss the issue.

MIL

A database on research outputs

A document that compiles what exists is very important and useful in the sense that it will reduce the tendency of reinventing the wheel. Even if it is an abstract, summary of findings or recommendations it will be useful in the sense that it will show the gaps. The research co-ordinator at IAR will be very interested in this and there is no doubt that it will be a worthwhile investment. There is the issue grasshopper damage to crops where does not appear to be solution. Perhaps reviewing what is done and relating it to what happens in the sub-region may end up bringing out a lasting solution. The traditional method of spraying crushed grasshoppers on infected fields has been shown to deter other grasshoppers but there may be other more effective solutions. And the solutions may be an improvement of farmers' own technologies.

The challenge now is to develop the ToRs and find appropriate people to carry out. But so much knowledge on SL is held outside the country. There is a lot of in-country data which got damaged or missing but there are a number of research institutions that have been actively involved in SL. In putting together the agriculture strategy a call was made to representatives of all sectors to put in their inputs. As such the database should attempt to cover all sectors but to do this may require different specialities to do some preliminary work before the consultant pulls it all together. There is also research conducted by students for example at Njala which are kept in the Library. These could also be covered in the database.

The main issue however is to find out what use has been put to all this research or has research been just for research sake. The application of past research needs to be tracked and documented. The first director of IAR's PhD produced outputs one of which is applied (rapid multiplication of cassava) but the other has not been taken up.

National M&E capacity

The M&E arm of the ministry of agriculture (programme monitoring and evaluation department) exists but even when they give their national yield data, these are questionable and it is not clear how these are arrived at. The matter was raised 2 years ago at a national conference where the permanently low yield figures seemed to show that farmers are adopting no technologies at all. It was suggested that M&E should be done together with research institutes to clarify the data in terms of specifying the type of farming system (sole or mixed cropping) which produces which yields. There are surveys being carried out but the reality is that the dream of food security is yet to be realised.

Monitoring is generally very very weak. It is only Prof. Rhodes that is interested in the work of IAR but the ministry appears only in the extension aspect of agriculture (for example district directors) but even then it is inadequate. Even at the level of IAR at Njala, M&E is weak in the sense that monitoring is not frequent and needs to be improved.

19th May 2007

Farmer Field School 1 (Togetherness) – Waterloo

Established in 2004 following ToT in Bo in 2003. There were district co-ordinators for the 13 districts who then trained community facilitators who were then asked to establish the FFS. The coordinator for the district established that field school in addition to another. There are about 25-30 members (but there are sub-groups of 5 each) and there has been an effort to incorporate ex-combatants some of which have moved to other chiefdoms.

FFS is a 16 week programme but now they meet (every Wednesday) as a study group and are involved in a range of things – crop and livestock and there is an attempt to diversify (both in farm areas – upland and lowland) as well as in crops (including cashew), vegetables and afforestation. Ginger for example has been introduced into the zone. They are also into soap making and other income generating activities.

FFS methodology is mainly hands-on by involving farmers directly in the activity. They have learnt when to plant which crops, multiply, weed, apply fertiliser etc. Prior to FFS, lack of knowledge of appropriate farming methods reduced the yield they used to get but with the new methods output has improved. FFS has led to increased income and also promoted unity among farmers. There is a district network of farmers' field schools which meets every month to exchange ideas. Women are mainly involved in vegetable cultivation (some of which is profitable) and have acquired technical knowledge on how to plant.

Their farming activity is threatened by the following diseases and pests – Ciblos, bucks and grasshoppers. They combat the grasshoppers using local technology – using hot water to attract young ones and paying children 100 Leones for 100 grasshoppers caught. A major challenge facing the FFS is marketing (transportation) rather than production.

Overall, the FFS had all the right rhetoric but the visit to their farms did not necessarily demonstrate an application of the knowledge learnt for example in the area of spacing of vegetables and the general maintenance of their farms. Although they have been trained to plant in rows, they have continued to broadcast.

Farmer Field School 2 Mabureh (Come and See)

Started in 2005 and are involved in livestock (rabbitry, grasscutter farming, piggery, poultry, goats and sheep) as well as farming (vegetables, rice, cassava, potato and groundnuts). They have a seed bank and operate a motorized tricycle for transporting their seeds and food items. It was started by a woman farmer rather than a facilitator as is the case in the other FFS. The motivation was to show that it is NOT only poor people who undertake farming. The purpose was to encourage the learning of new farming methods which can increase their productivity and enable them learn how to manage their farming as a business activity with particular emphasis on record keeping.

They report having been trained to handle certain pests (grasshoppers) using local technology such as the bark of neem tree as well as preserve their food. They have gained more knowledge through FFS – e.g. how to make cassava chips – as well as inputs (e.g. thresher). The activity which produces quick returns is vegetable farming. The main challenges facing them are labour constraints, the general poor rural infrastructure and lack of capital.

It appears that the FFS have been encouraged to undertake some activities without appropriate training as was the case in their rabbitry and grasscutter farming initiatives.

21st May 2007

Meeting with Michael Kamara the ED of Cotton Tree Foundation

Generally very enthusiastic about RIU and find all the areas identified as appropriate for the country and directly related to the work of the Foundation. There two main pillars of their work – the economic sector and the education programme. The economic sector attempts to promote a business approach to agriculture activity. They are into ginger and have used imported ginger varieties which have not proven to be easily adaptable. They produced up to 18 metric tons of ginger last year and are targeting 40 metric tons this year. They are also interested in the research angle partly because they have drawn on the services of a researcher for their ginger initiative. Their approach is to deal with small scale producers whom they provide credit to in the form of inputs and also adopt the value chain approach in their work. They are also into livestock – small ruminants (goats) and poultry.

He also finds the research desk/help desk idea interesting and useful. The challenge will be how to overcome the communication difficulties with several languages and many rural farmers not necessarily fluent in Creole.

Cotton Tree Foundation is probably unique in the sense that it is a quasi-NGO – in the sense that although it is engaged in charitable work it also has a business arm (Cotton Tree Ginger Enterprises) which is expected to be managed separately from the Foundation. In terms of RIU, the foundation could be an entry point to engaging with Sierra Leonean private sector operators in the renewable natural resource sector. For example, they are targeting domestic ginger market in the area of confectionary.

SECTION 4: RESEARCH INTO USE IN SIERRA LEONE

Context

Sierra Leone is a country with so much potential but today sits as the second poorest country in the world²¹. During its civil war it became devastated, in addition to the conflict, roads and infrastructure were lost, expertise was lost, supply chains destroyed, livestock killed and even the tools required to farm or fish lost. For those involved in farming and fishing, the clock has been wound back well beyond the advent of the war.

Agricultural issues

Sierra Leone has a huge potential. It has a long continental shelf and so fish can be abundant in its waters and there are plenty of rivers for freshwater fishing as well. There is a long rain season and relatively fertile soil which can lead to excellent crop and tree crop production. Sierra Leone is famous for its rice production and one of its citizens, Monty Jones, has won the world food prize for his work in developing the NERICA rice varieties.

Despite this Sierra Leone imports rice, the price of which is low enough to act as a dis-incentive to the indigenous rice farmers to grow rice. This example shows how complex agricultural issues are in Sierra Leone. Not only do farmers find it hard to receive communication about improved methods for their crops and poorly developed input and output markets but they have to compete with cheap imports. Similarly for the fishers there are knowledge and technology issues affecting their fishing but for the marine fisheries there is also the issue of foreign trawlers entering waters that have been reserved for the small-scale fishers. Unfortunately there are limited resources to police these waters.

Initiatives in place

There are a number of donors and aid agencies in Sierra Leone who are now able to focus on development issues – having moved on from the aid programmes which addressed the absolute poverty that many were left in after the war. The focus can now be upon what can be done to improve the livelihoods of the poor. Likewise, Sierra Leone's private sector is starting to grow; there are initiatives to encourage this sector and it has so much potential for those who work on the land or the water.

Current situation

Maybe calling Sierra Leone a Greenfield sight could be interpreted incorrectly. However, in terms of development there is a golden opportunity to establish structures based on the best of lessons learnt previously. There is widespread support for working together in an integrated manner but stakeholders agree that at the moment there is not sufficient communication between research users, research generators and policy makers. The DFID funded Research into Use programme has been asked to work in Sierra Leone. It is keen to become a partner to catalyse relationships between different groups whilst ensuring that the drive and dynamism come from within the country itself. The programme has held a 'research showcase' event at which those with knowledge of research which might have application in Sierra Leone interacted with those that had problems that could be addressed by the research. It became clear that there was a real need to build on this forum for information exchange. There was also the issue of information management; there has been a tremendous history of natural resources research in Sierra Leone. Unfortunately during the war some of the records were lost. However, there are archives of material in the UK and elsewhere which might help to prevent researchers in Sierra Leone having to 'reinvent the wheel'. Clearly part of getting research into use is knowing what research there is and so knowledge management also has a role to play.

RIU has shared its vision with the organisations that it would like to partner of bringing about organic growth in the linkages within the 'innovation system' in Sierra Leone so that by the end of the programme the private, public, NGO, policy, media and other sectors have developed trust and relationships. These should continue through mutual benefit whilst also serving the needs of the poor.

²¹ Generally blamed on poor rule

Challenges that remain

The Research into Use programme has identified communication and trust building between different stakeholder groups as key to developing an integrated and sustainable approach to getting the poor to benefit from research outputs. However, these will have to be backed up by capacity strengthening and in some instances change in policy to facilitate innovation on the ground. As the budget of the programme is limited there will need to be a method for encouraging financial buy in once successes start to appear. There is a huge potential to bring about real change in Sierra Leone, as the director of the Institute of Agricultural Research 'We know that we are poor but we are determined to do something about it'.

**SECTION 5: RESEARCH INTO USE PROGRAMME AND THE FISHERIES SECTOR IN
SIERRA LEONE**

DR ANDREW WARD

Background

The Research into Use programme is looking to maximise the poverty-reducing impact of previous research on natural resources and, in so doing, to increase understanding of how the promotion and widespread use of research outputs can contribute to poverty reduction and economic growth. Its role will be as a catalyst for change with a view to establishing sustainable research into use systems. To achieve this it is focussing on technical and institutional issues within innovation systems. Capacity building, communication, lesson learning and advocacy will be key elements in its implementation.

Fisheries provide a range of social and economic benefits, and provide food security. They are particularly important in Sierra Leone and provide up to 70% of animal protein consumed. In addition to the marine and coastal fisheries are the highly significant river fisheries. Sierra Leone is traversed by a series of river basins to which the rural poor have direct access. The very active fisheries here go straight into the village communities. The sector as a whole is important economically for both men and women, with women in particular dominating processing and marketing including informal credit. In the inland fisheries they also contribute, along with children, to the actual fishing at the household level. Socio-economically, culturally and in terms of food security, fisheries is undoubtedly a core sector for Sierra Leone.

The fisheries sector in Sierra Leone offers a significant opportunity for RIU to meet its aims working in partnership with local and international organisations. Fisheries offer the potential to integrate the validated outputs of two of the previous RNRRS programmes (FMSP and PHFRP) and furthermore to develop partnerships with existing and planned donor funded initiatives, in particular the DFID Institutional Support to the Fisheries Sector, arising from the recent DFID, World Bank FAO Fisheries Sector Strategy Paper (FSSP). There is also an opportunity to forge linkages with the FAO Regional Fish Loss Assessment programme which currently promoting the uptake of PHFRP outputs in Africa.

Draft RIU Strategy in Sierra Leone

A draft strategy has been developed in Sierra Leone in which there is a clear emphasis on building the relations between research generators and research users (recognising that it is possible to have both roles). It would be expected that these would also include the fisheries sector. Two of the tangible recommended approaches are:

Research Fair - In March 2007 the RIU held a research fair in Sierra Leone which showcased research outputs from the RNRRS. Those that attended the event were incredibly appreciative of it and wanted additional events, with greater input from Sierra Leone experts. The key contacts on this front are the researchers (IAR, RRI, NARCC, Fourah Bay College, University of Njala), the research users (INGOs, NGOs, CSOs, private sector, farmers, fisher communities) and the policy makers (government of Sierra Leone and donors). It would appear that there is support for this initiative from all of these sectors. There are potential additional links to international researchers. These links have not been explored.

Comment [ARW1]: What was the reaction to PHFRP FMSP outputs? Might be useful to say something on this to keep the fisheries theme flowing...

A future research fair would have the aim of institutional change (forging relationships between research generators and research users) as well as the provision of technical information. The format of the event, e.g. what research should be presented and in what form should be decided between the research users and providers, as should the location(s) and timing. It was suggested that a planning meeting for this should be held in October after the election has passed.

Help Desk – The aim would be to develop an ongoing point of interaction between researchers and research users, to provide information when it is required, to capacity strengthen both NGOs and researchers, to enable research to be more orientated towards the needs of the people.

The format of the help desk would have to be such that it was bought into and used by stakeholders. Its limitations need to be recognised and addressed through other activities, e.g. the research fair. To achieve a strategy which is supported by the key users it is suggested to hold a planning meeting (possibly with the research fair planning meeting) in October. Policy makers should be kept informed and included where appropriate to explore whether there are opportunities to use the help desk to help to drive research priorities e.g. through the use of vouchers to put a value on information. The meeting should also consider the most appropriate medium e.g. use of ICT. If ICT is to be involved are ICT companies prepared to put any investment into the help desk?

Historical information – There should be a wealth of knowledge from research in Sierra Leone and experience from efforts to achieve uptake of this research. Unfortunately the war destroyed a lot of records. Information does remain but it is scattered and not catalogued. In addition to any remaining records at the research centres sources of information include: older researchers in Sierra Leone, the Diaspora, international researchers who have worked in Sierra Leone, PhDs and international publications as well as repositories of knowledge around the world. The RIU is keen to explore whether there would be support from policy makers and donors to collate this material and develop it into a point of reference that would guide them in future initiatives which included the natural resources sector.

In addition in Sierra Leone a lot of effort has been invested in reviewing traditional structures (which received blame for the civil conflict). Experience from the RNRRS clearly shows that where communities can be organised and mobilised far greater and broader success is achieved in terms of getting research into use and empowering communities to demand information rather than being passive recipients. Opportunities for building on previous experiences will be acted upon.

DFID Fisheries Sector Strategy for Sierra Leone

It has been proposed that DFID support activities in i) fisheries governance ii) access to markets and iii) role of law/governance so as to generate sustainable developments in the fisheries sector. DFID are keen to be capturing lessons and feeding these into policy. The EU has just started a large project which is focussed on stock assessment. Other donors are also interested in investing in the sector. Although the RIU would only be able to provide small levels of investment if it were able to work with and through these larger programmes it would be able to maximise its impact. Therefore entry points are required so that useful alliances are formed.

Areas of mutual interest

Annex 1 shows that knowledge has been generated from the RNRRS which has a great deal of potential for Sierra Leone. The big issue is how to apply it. Clearly the research fair and information help desk would be able to provide this information and in the case of the research fair demonstrate it but how much of this information can be presented? Would a better approach be for these research outputs to be talked through with the key Sierra Leone fisheries policy makers and feedback sought on what fits in with their and the donor strategies and how this should be implemented. The RIU could fund this initial interaction and then would look to link with other programmes for the implementation.

Comment [ARW2]: I think this is a good idea and has been used by PHFRP in the past to successfully promote uptake of outputs...e.g in Ghana, FAO/DFID SFLP, Indonesia

The experience of the RNRRS has been that when communities are empowered to demand knowledge and change there are a multitude of development benefits (well beyond a single sector). Clearly, DFID and other donors have been working on this side and so there are some lessons that we could build on. But if the RIU could use this as an approach to bring about better organisation in fishing communities this would enable them not just to better demand information but also better organise into marketing units. This will require a stakeholder/institutional analysis of the fisheries sector, especially the artisanal/small business element. An interesting element is that the Western Area has no chiefdoms and no customary land rights, so artisanal fishing rights, boat use and catch landing rights are possibly organised in a different manner to further down the coast. This would lead onto working with a small number of communities, using fishing issues as entry points to bring about social cohesion and a community belief in their ability to improve their own livelihoods. The Sierra Leone Directorate of Fisheries felt that this might also be a way to increase unity across the fishery organisations. RIU would only have the funds for pilot schemes but if this approach was supported by other donors it would be expected that they would fund the scaling up of any successes.

Comment [ARW3]: To a certain extent application of the PHO and PHLAT tools will generate such an analysis

If an investigation into historical research is conducted in Sierra Leone, it is not clear as yet whether research from the different sectors would have to be approached in different ways. However, were this to proceed in the fisheries sector links with the EU and DFID funded programmes would show how appropriate it was for the policy makers in the country to use the historical information. Maybe the fisheries sector should be where this work should focus first?

In terms of lesson learning and advocacy, maybe at this stage before strategies have been agreed, it might not be possible to determine what links will be supported at this stage but we could have an agreement to consider these in the future.

Annex 1 Matching RNRRS Outputs to Sierra Leone's Needs²²

Fisheries Management Science

Sierra Leone's needs	FMSP validated outputs	Relevant donor initiatives
Opportunities for development – Stock assessment and Research	How to Assess and manage a fishery – A collection of tools and guides for fish stock assessment and developing management plans	EU Stock assessment AfDB – Beach landing Centres World Bank – long term plan
	Databases of information: Simple empirical models for lake and river fishery assessments.	
Opportunities for development – fisheries enhancements	Fish aggregating devices for enhancing coastal artisanal fisheries	
	Fisheries enhancement decision support tools: EnhanceFish	
Capacity building – Institutional management capacity	Training courses in fisheries stock assessment and management for capacity building. (Note other FMSP outputs also build capacity through local implementation, e.g. Parfish, Adaptive co-management, etc)	DFID FSSP World Bank EU - Institutional support SFLP AfDB
Management systems for artisanal coastal and inland fisheries	How to Assess and manage a fishery – A collection of tools and guides for fish stock assessment and developing management plans	DFID FSSP World Bank – long term plan SFLP – Co management / participatory management
	Managing fisheries with limited data: technical and participatory approaches	
	Participatory fisheries Monitoring: transparency, sustainability and empowerment.	
	Adaptive co-management: supporting co-managed fisheries	
Management systems for Industrial fisheries and controlling foreign fishing	Optimal control of foreign fishing through improved fisheries governance	World Bank - short term plan DFID FSSP EU - strengthen-ing MCS
	How to Assess and manage a fishery – A collection of tools and guides for fish stock assessment and developing management plans	
	Managing fisheries with limited data: technical and participatory approaches (R6437, Namibia)	

²² From Mees C & Payne I (April 2007) Fisheries Sector issues in Sierra Leone: Augmenting the RIU Sierra Leone Country Assessment. Report commissioned by RIU.

Note that FMSP also explored conflict in fisheries but this was not, on its own, a RiU validated Output. Nevertheless this work, particularly that done in West Africa, is relevant and can also be drawn upon.

Post harvest fisheries

Sierra Leone's needs	PHFRP validated outputs	Relevant donor initiatives
Opportunities for development – Overview	Post harvest fisheries overview (PHO)	AfDB – Beach landing Centres World Bank – short term plan DFID FSSP
	Post harvest livelihoods assessment tool (PHLAT)	
Opportunities for development – Access to markets	Post harvest cash flow model	
	A guide to analysing fish marketing systems	
Capacity Building	A guide to analysing fish marketing systems	DFID FSSP World Bank EU–Inst. support SFLP AfDB
	Training module of FLAC: Fish loss assessment and control tools.	
Fish processing – value addition and preventing fish losses	FLAC: Suit of fish loss, assessment and control tools including software, guidelines and training packs.	EU – fish product health DFID FSSP SFLP World Bank

**SECTION 6: REPORT ON COMMUNICATION AND STRATEGY DEVELOPMENT MEETING
13 – 15 NOVEMBER 2007
KIMBIMA HOTEL**

NOVEMBER 2007

Executive Summary

The RIU programme was commissioned in 2006 to capitalise upon the achievements of DFID's past and current research in renewable natural resources. Whilst there have been some high profile success stories under the RNRRS, the full impact potential of many more research outputs has yet to be realised.

The RIU aims to draw upon a rich legacy of technologies, policies and processes developed by the previous agricultural and natural resources research programmes funded under the RNRRS. The RNRRS ran between 1995 and 2006 and its objective was "to generate new knowledge and to promote its uptake and application such that the livelihoods of poor people are improved through better management of renewable natural resources". The bilateral component was organised as ten research programmes covering the needs of people dependent on agriculture, forestry, livestock and fisheries for their livelihood. The breadth of the strategy reflected the wide variety of environments in which poor people live in poorer countries and the multiple routes by which research can reduce poverty. Whilst the RNRRS provides a rich dataset from which to draw, it is also acknowledged that natural resources research from other sources is also likely to add value to the work of the RIU.

The RIU purpose is two-fold "to maximise the poverty-reducing impact of the RNRRS and other research, and by so doing, to increase understanding of how the promotion and widespread use of research can contribute to poverty reduction and economic growth" This would be linked particularly to delivery of Millennium Development Goal (MDG) one (eradicating poverty and hunger), MDG three (promote gender equality and empower women), MDG seven (ensuring environmental sustainability) and MDG eight (delivering a global partnership for development).

Research into Use (RIU) has received very strong support in Sierra Leone. Its timing is highly opportune as the country moves from a situation of aid to development. Capacity and linkages have been damaged although there are clear opportunities and enthusiasm for moving forward. This means that RIU will have to work towards a situation, which if it evolves sufficiently should allow a 'national systems of innovation' focus.

The RIU commissioned a country assessment in February 2007 which identified 'windows of opportunity' for the programme for getting research into use. One of these 'windows' was the provision of information for the better management of livestock. However, as this study was validated it became clear that there would be benefits to broader provision of information, possibly through an 'information help desk'.

In March 2007 the RIU held a 'research fair' at which research outputs from the previous DFID renewable natural resources research strategy (RNRRS) that might be applicable in Sierra Leone were made available. This event was greatly appreciated and a further event was requested by almost all of those in attendance. However, the majority of respondents requested greater input from Sierra Leone stakeholders in the planning and operation of such a future event.

It has become clear that a major role for the RIU in Sierra Leone should be the strengthening and establishment of linkages between research generators (formal and informal) and research users. The concepts above could be tools in achieving this. However, so that opportunities are not missed there is a need to validate this whole concept with the broad range of stakeholders who are or could have a role in getting research into use in Sierra Leone. In essence there is a need to validate if there is a role for information markets in Sierra Leone and plan what they would look like using resource people who have had previous experience.

The 3 days of deliberations gave all an opportunity to get Sierra Leone ownership of this communication process. There was a number of experts that brought experiences from other countries that we hope would help drive a communication strategy that would be of interest and taken up within Sierra Leone.

Sierra Leone is subject to acute information market failures. The communications infrastructure is fragmented, acutely so in rural areas, and the transaction costs for information exchange correspondingly high. Because the business sector and agricultural value chains are weak, profitable opportunities to take up, use and create value from new technical knowledge are limited; demand in rural areas is also suppressed by limited access and

capacity to engage with 'formal' sources of new technical knowledge including those increasingly available via the world wide web.

Background

Research into Use (RIU) has received very strong support in Sierra Leone. Its timing is highly opportune as the country moves from a situation of aid to development. Capacity and linkages have been damaged although there are clear opportunities and enthusiasm for moving forward. This means that RIU will have to work towards a situation, which if it evolves sufficiently should allow a 'national systems of innovation' focus.

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Over 50 personalities participated in the 3 days stakeholders meeting on communication and strategy development representing public, private and civic organizations – LNGOs, CBOs, INGOs, National Association of Farmers in Sierra Leone, research providers, extension agents, providers of goods and services and policy makers. The official opening of the meeting was graced by the Honourable Minister of Agriculture and Food Security Dr. Joseph Sam Sesay.

The diversity of experts who presented various papers in the area of information market laid solid foundation for the participation to establish communication tools and approaches that could be used to develop relationships that would lead to the poor being better able to demand, access and provide feedback on research outputs.

The 3 days of deliberations was generally very impressive and successful.

Objectives

The objectives of the workshop include:

1. To produce recommendations as to how communication tools and approaches can be used to develop relationships that will lead to the poor being better able to demand, access and provide feedback on research outputs.
2. To feed into the Research into Use country strategy

Day One – Tuesday 13th November 2007

The programme started with prayers – Christian and Muslim prayers were said by Rev Father Mario and Rashid Mohamed Bah respectively.

A. Opening and setting the scene – Chairperson Dr. Andrew Ward

Statement by the Chairperson – Dr. Andrew Ward

In his opening statement, Dr. Ward indicated that so many research initiatives had been developed and with strong recommendations. Yet there was still the need to put those results and recommendations into use in the interest of alleviating poverty. This programme was about filling this gap, using case studies of best practices from countries in other parts of the world as lessons learned. The basic approach was collaborative experience sharing using new communication methods. This consultation was borne partly out of the outcomes of the research fair in March 2007; Mr. Sam King suggested the idea of actualizing the poor farmers' dreams, also recommended from technical perspective by Professor Rhodes. Fundamental among all was the establishment of a relationship between research generators and users by means of an information market.

As an expected outcome of the presentations and their discussions, the development of effective and efficient communication techniques would help us answer the questions of what could be done, how it would be done, who will be involved and this will enhance RIU's country strategy in Sierra Leone.

Statement by the Honorable Minister of Agriculture, Forestry and Food Security – Dr. Joseph Sam Sesay

He emphasized the need to look for better options in utilizing indigenous knowledge, so as to help the farmers move forward. It was his conviction that this workshop was crucial in that direction. He thanked the organizers and donors for such initiative and asked participants to take the workshop serious. The detail of his speech is attached as annex 1

Background to the RIU Programme – Dr. Wyn Richards

According to Dr. Richards, the RIU programme was launched in June this year in South Africa. A video clip was shown and its basic message was the need to make research findings and recommendations useful to the grass root farmers; this was the opinion of various stakeholders in the field. The main message, according to Dr. Richards was as listed in the points below;

- All the statements in the documentary emphasized that the poor had not benefited enough from research
- The message was focusing on top-bottom approach to research communication as against bottom-top approach
- Bottom-top approach was the preferred communication approach.

A basic information participants needed to know was the governance of the RIU programme: an advisory body, an executive comprising of five members (responsible for communication, innovation systems partnership, capacity strengthening, and monitoring & learning), and six target countries (Bangladesh, Malawi, Nigeria, Rwanda, Sierra Leone and Tanzania). This structure was basically set up to strengthen the existing local systems.

Statement by Professor E. R. Rhodes

In his statement Prof. Rhodes emphasized that research is the basis for agricultural revolution in developing countries. He went further to say that research in SL started in the 1910's in Njala station, yet agricultural productivity is still low. The question of what can we do about the problem of research made this workshop necessary. Various approaches could be adopted in addressing the problem. On this note he welcomed all on behalf of the National Agricultural Research Council (NARC). He emphasized the importance of the presence of the international experts as their experiences would serve well for literature review.

Self introductions were made by all followed by a tea break.

Process of Workshop

The workshop was conducted via the following processes:

- Written feedback on the nature of research generator – research user relationships
- Presentations – experience of building research generator – user relationships
- Participants to consider what could be done in Sierra Leone
- Participants to consider how this would be done in Sierra Leone
- How this fits in with the Research Into Use country strategy

The workshop had four plenary sessions with a chairperson per session and a couple of presentations per plenary session. Eleven topics were presented by nine presenters, eight external experts and one local expert.

Presentation Highlights and Feedback from Participants

1st Plenary Session – Was chaired by - Dr. Claire Heffernan

1. Information markets in enabling more effective knowledge update by farmers – Dr. Wyn Richards

Highlights of presentation (see full presentation in annex 2)

- Less than 1% of the research budget is spent on marketing
- Little incentive to get research information down to end users
- In East Africa, the most popular way to relay information is through TV, such as reality TV programmes

Questions/comments/suggestions:

- What can be seen as the best options at donor level
- There was need to spend a little more on extension delivery. This would help combat the problem of lack of incentive for production.
- Understanding the market atmosphere of Sierra Leone was important e.g., the role of rural market in information dissemination, a lesson from Ghana.
- The need for the culture of economic concept out of such ventures so that if donors withdraw, projects would continue.
- The need for an understanding of where to start amidst producers, sellers and users

Feedbacks

- Donors are now looking at the impact of research or other projects on the poor.
- There's need for simple business plan and technical economic guidance.
- It was necessary to integrate all players; producers, users or sellers, all should be involved at all levels. Communication is a sort of grease between them.

2. Information Markets – Why they fail and what can be done? – Steen Joffe

Highlights of presentation (see full presentation in annex 3)

- Information is the lifeblood of innovation
- This information doesn't exist in one place or one person
- But the information system often fails:
- The information market approach
- Why do information/K markets fail?
- Information Market Making
- Notes on National Level Implementation
- Facilitate provision of Knowledge Network Services that are :
- Example: Uganda MPAIS
- RIU Sierra Leone
- Example: Bolivia SICTAF

Feedbacks

- Beneficial to researchers and users
- The need for a small fee paid for service provided, better way of subsidizing information cost
- The need to look at the SL context in discussing information dissemination mechanisms, taking cognizance of the low level of education, low level of IT available leading to about 80% of end users having low access,
- The need for incentives to invest in information dissemination
- Marketing channels need be understood
- The country is dominant with the informal sector; work up a system in which information is disseminated.
- How rural settings can claim ownership of information.
- Time and level at which information becomes valuable is important (renewal of validity of information)
- Establish link between those who have the information and those who use it.
- Provision of means to people to make choice on demand subsidy
- Put in place mechanisms that changes the general frame work of information service with time

3. Linking Research Information with Research Users in the Livestock Sector – Dr. Ian Maudlin

Highlights of presentation (see full presentation in annex 4)

- **African Universities Veterinary e-Learning Consortium**
 - Building capacity across African Veterinary Schools
 - Enabling introduction of e-learning into undergraduate programs
 - Development of joint on-line Masters programs
 - Sharing and exchange of knowledge and human resources among members
 - Developing capacity and infrastructure for delivering and developing e-learning
 - Strong cooperation among member institutions for collaborative advantage
 - AUVEC connects institutions in:
 - Ethiopia, Kenya, Uganda,
 - South Africa, Tanzania, Zambia,
 - Zimbabwe, Malawi and Sudan

Feedbacks

- The need to apply the online courses at community level; although a good idea, the situation at rural level is different. It was necessary, therefore, to make meaningful use of ideas in the interest of the rural level; e.g. Drama.
- It could be better to use technologies that evolve from below.
- The need to domesticate this programme at the university (links and joint research initiatives)
- The need to understand the practical aspects of the online courses as to how satisfactory they may be.
- 85% of livestock was lost during the war. Most restocking did not go through the ministry and so many animal diseases entered the country after the war. There are less than 28 veterinary officers in the country. Cost of training is expensive, computers are not readily accessible.
- The concept of veterinary medicine seem new in Sierra Leone. Even though clinics exist, people hardly take their animals to the clinics.
- In Sierra Leone, livestock farming is not commercialized as in other African countries, like Uganda and Kenya. Cattle farmers rely more on indigenous knowledge in the absence of veterinary services.
- With regard to practical courses, people in practice are more suitable for the course. The people actually teach themselves, stay with their families and minimize cost.
- Basic outcome of the discussion was to look for impact in research. We needed to look at the people, understand what they are doing and we use their level to give them the appropriate learning procedure they needed. The presentation helped to network ideas, how we broaden the network. But we have to look for appropriate techniques.

LUNCH

2nd Plenary Session - Was chaired by Professor Norman Clark

4. Sharing knowledge on fisheries management; some lessons from FMSP – Dr. Chris Mees

Highlights of presentation (see full presentation in annex 5)

Aim of the presentation;

- RIU evaluations in Sierra Leone suggest a requirement for:
 - Greater awareness of research outputs (FMSP fisheries tools)
 - Mechanisms for accessing them
 - Mechanisms for promoting use of those outputs / tools
- Research Fair Freetown Feb 2007 related to 1.
- Now explore lessons from FMSP on communicating research outputs to users and getting them into use.
- Will focus on products relevant to Sierra Leone contributing to the wider debate on how to get research products into use in SL

Feedbacks

- Reflection on the fisheries sector in SL with special reference to the Bo-Pujehun project - GTZ, where 180 fishing communities were developed in fish farming with efficient communication network. But after the war these projects were abandoned. Personnel and information on the project could be sourced for experience sharing.
- How FMSP carry out their monitoring and impact assessment?
- Social aspect of fishing aspect is very essential, not only the technical or commercial aspect
- The need to understand that information needs to be integrated into planning process and not used in ad hoc situations.
- Whether beneficiaries are involved in the assessment process and how can this programme help SL maximize profit in post harvest situations.
- Information was necessary both in the fisheries and communication sectors
- It was crucial and part of their plan to learn from past experiences as a way forward.
- A range of stakeholders are involved in the process depending on what level of intervention is there.
- Monitoring and assessment are always a problem as the impacts are long term, and beneficiaries are usually interested in short term impacts. But the monitoring looks into how appropriate are the steps, as a first phase, followed by the actual outcome of the programme.

5. Improving quality and reducing post-harvest losses in the fishery sector - Use of tools and case studies – Dr. John Esser

Highlights of presentation (see full presentation in annex 6)

Building partnerships and getting the message across

- Fish Loss Assessment and Control (FLAC) packages
 - FLAC Tools
 - Fish loss
 - Cleanse IT
 - Ice IT
 - Log IT
 - Informal Loss Assessment Method (IFLAM)
 - Questionnaire Loss Assessment Method (QLAM)
 - Load Tracking

- Blowfly Project
 - Systems Based Control Strategy
 - Lead Partner
 - Implementation
 - Policy
 - Training
 - Technical
 - Extension

- EU/ACP/OCT – Strengthening of fishery products health conditions project
 - Purpose: improve access of fisheries products to world markets by improving health conditions and generating sustainable systems of sanitary controls and surveillance

Target groups

- Competent authority
- Laboratory services and training institutions
- Private Sector Export Processing Establishment
- Fish Agents
- Small-scale Fisheries

Outputs

- Trained personnel
- Training materials
- Inspection tools
- Updated legislation
- Upstream control strategy

Sierra Leone – Post Harvest Fisheries

RIU Opportunities

- Access to international markets – compliance, certification etc.
- Value added processing – private sector, export market focus – safe products
- Reduction of post-harvest losses – Artisanal sector focus, supply chain assurance

Traditionally Processed Products

- Improve quality and reduce losses
 - Field Based Loss Assessment Methods
 - Systems Based approach to insect control

- Reducing PAH in smoked products

Capacity Building

- DoF
- Competent authority (Food Unit, MOHS)
- Training Institutions
- Laboratories
- Private sector Processing Establishment

Feedbacks

- The need to address electricity problems as well as information technology problems
- The need for national markets in addition to international markets
- Concern raised over the little work done in West Africa (mainly Ghana)
- The need to take cognizance of the Sierra Leone situation: radio networks have improved greatly, the use of mobile phones, training for people who can communicate well.
- The need to improve on the supply of materials and also to alleviate problems of language barrier
- The need to involve other institutions (national standards bureau, etc) other than just the University
- The concern over EU rejecting products from Sierra Leone even when improvements have been made, leveling those provided by third parties; most of the companies are owned by foreigners who claim ownership after adding value.

TEA BREAK

6. New communication strategies and the poor: ICTs for livestock development – Dr. Claire Heffernan

Highlights of presentation (see full presentation in annex 7)

Livestock based livelihoods and the poor

- 2/3rds of households living on less than \$2/day keep livestock.
- Asset dependent poor: dependency upon livestock increases down the poverty line.
- Livestock keeping is particularly vulnerable to exogenous risks: drought, disease etc.
- Livestock Development aimed at lowering exogenous risk.

Dr. Heffernan's presentation was based on various past research conducted in the livestock sector.

No feedback was received from the participants.

7. "Tradenet" A new West African owned market intelligence service – Dr. Wyn Richards

This presentation was made on behalf of Sarah Bartlett by Dr. Richard. He stated the purpose as thus - to find each other online/mobile to connect on business live and free.

Feedbacks

- Similar initiative has started in SL with a desk office established. The intention is to target local prices. It is intended to start with Kenema, in the east, and Makeni, in the north.
- Lack of openness among Sierra Leonean business people could greatly impede growth; there was also concern over global monopoly of information.
- The need to institute policy instruments for tradenet in SL, this can include adult literacy programmes, etc.
- The university can take the lead in transforming research documents to useful materials
- The need to revive/rehabilitate our livestock
- It is better to do what people can afford. The people own their business we are there to provide service to their needs. We should not tell you what to do, but the other way round.
- Information in different languages can be good if the software is robust and simple
- Output of research in SL in 1940 -1950 was done by Professor Rhodes. Researchers can take from there.

8. Practical Answers – Dr. Zbigniew Mikoljuk

Highlights of presentation

Started 40 years back as a result of unsolicited enquiries into issues such as
What is the demand? and What is the impact?

There are currently seven offices, 3 in Africa, 3 in Asia, and the head quarter in the UK.

Basic idea: there is knowledge somewhere, somebody needs that knowledge. So we bridge the gap.

Feedbacks

- The need to know how is the process organized
- The need to know the answers come from the people
- The need to know how we link knowledge providers and users, linkage research institutions and extension (the need to use female extension workers)
- A log book of contacts have been developed
- Stakeholders are integrated in the information dissemination process

END OF DAY ONE

Day Two - Wednesday 14th November 2007

3rd Plenary Session: Information Market and Communication: Chairperson: Dr. Ian Maudlin

9. The Market Place for Agricultural Information Services (MPAIS) - Mr. Bruce Kisitu

Highlights of Bruce Kisitu's presentation (see full presentation in annex 8)

- Why is the Market for information and services necessary
- MPAIS Concept
- How MPAIS works
- The current state of MPAIS in Uganda
- The Challenges

Feedbacks

- How many people have access to the facilities?
- When internet access is difficult, there is need to predict the nature of information needed and posted in the general internet service
- How can poor farmers access information from the internet when they cannot read or write?
- More training is needed in this aspect
- Literacy programmes should be cross cutting in all sectors
- The need to improve access to education
- Who the Informediaries are and how they are selected
- Whether the NADS and other research organizations use public funds to in their sponsorship, what are the coping strategies to problems of cooperation?
- The need to look into new dimensions of making money; licenses, etc
- Illiterate farmers always have the extension workers as their information agents and the extension workers can read and write.
- Started with one café; in less than ten years there are cafes in about 75 out of 80 Districts. ICT is growing and we need to join the trend.
- Currently there are six farmers using the facility. There are 30 Informediaries (those who package information; researchers, extension workers, etc). They add value to information, they are normally found in research institutions, NGOs, government institutions, etc. Most of the registered people are extension workers. There is not

enough electricity but most cafes use solar panels. MPAIS is a business, farmers are funded through farmer groups and they account for the money. Extension workers are contracted. NADS and other agricultural organizations use public funds. This is done to stimulate demand, so that people pay for information they need. MPAIS invests a lot of money; as investors they're looking ahead for heavy turnout. Customers are few now but they are expected to grow in five years time.

TEA BREAK

10. Status of telecommunication services and its role in poverty reduction in Sierra Leone – Mr. A. B. Musa Koroma *et al*

Highlights of presentation (see full presentation in annex 9)

His presentation focused on the rationale behind the establishment of the commission and its role as a regulatory body for all telecommunication activities in Sierra Leone

Feedbacks

- Participants commended the presenter for his brilliant presentation which they referred to as informative and comprehensive.
- Concern over the non internet connections in the interior because of the lack of availability of funds.
- What is the difference between the broad band and optic fibre system and why is SL not benefiting this system? - Optic fibre system has faster speed than the broad band. Lack of benefit to SL was as a result of the war. But avenues are now exploited to hook on to this optic fibre landing.
- Sierratel we heard was going to come with mobile phones, why not? – Because of lack funding.

Group Work and Presentations by Participants

This session was facilitated by Dr. Andrew Ward - Building relationships between research generators and users, the research showcase and information helpdesk concepts and what can be done in Sierra Leone?

The two main questions for the four groups to discuss include

- Why not research into use?
- What are the communication methods

4th Plenary Session – Information/Research Fair: Chairperson Prof. E. R. Rhodes

1st Group Work and Presentations

Presentation by Group 1: Private Sector

List of Group Members

1. Dr. Bockarie Kobba
2. Mariatu Jusu
3. Alie Berry
4. Farrel Elliot
5. B. S. Massaquoi
6. Tanzila Sankoh

Group Facilitators

- 1.
- 2.
- 3.

Why not?

- Lack of coordination (within & across institutions)

- Research supply driven, not demand led
- Agriculture is subsistence, not business focused
- No effective information dissemination mechanism
- No demonstration to show that research actually has positive impacts
- Costs of inputs/using research results
- Culture/Mindset
- Incentives/markets

Communication Methods

- Target few <model farmers>
- Local languages important
- Radio, mass media, better than written products
- Regular monitoring/monitoring with farmers
- Drama
- Demonstration farms/FFS
- Use MAFFS/extension agents or investigate alternatives
- <Clearing house> model
- Co-operative farming/farming town

Presentation by Group 2: Research

List of Group Members

- 1 Dr. Bashiru M. Koroma
- 2 Professor E.R. Rhodes
- 3 Dr. Charles Dixon
- 4 Dr. S.M. Fomba
- 5 Mr. Daniel Fornah
- 6 Dr. Abdulai Jalloh
- 7 Mr. Lamin M.C. Yillah
- 8 Mr. John D.J. Momoh

Group Facilitators

1. Wyn Richards
2. Emmanuel Cleeve
3. Claire Heffernan

Background (S L Context)

- Ministry of Agriculture recognizes the value of Agricultural Research in Sierra Leone.
- Community perception differ from that of the Ministry of Agriculture – Enough research is done; now is the time for production.
- Lack of understanding of what research is about.
- There is need for resources to put information marketing in place
- Promote information needs
- Capacity Building
- Understand WHOM you are selling the information to
- Advocate for policy mainstreaming of the project culture

Why is research not getting into use?

Reasons

- Inadequate partnerships with stakeholders – leading to poor comprehension to research **Goal and Objectives**

- As at now, Research is mainly commodity focused – Trying to look at systems for socio-economic, environmental, etc., inputs
- Inadequate supportive rural infrastructure
- Research outputs are not adequately packaged and delivered to the various audiences – inadequate marketing of research output
- Research is not responding to the needs of the farmers
- Farming communities are not adequately empowered to adopt research outputs (Better partnerships)
- Inadequate response to farmers demands
 - ✓ Identify demands
 - ✓ Respond to demands

What communication methods can we realistically use in Sierra Leone

- We should use participatory approaches

Methods of Communication

- **Radios** – Access, Availability, Cost Effective

Content

- Introduce agricultural information through DRAMA, Current issues, etc.

Technology Drive

- Information Desk based at Research Institutes
- Strengthening the capacity of extension systems
- Gap of Informediaries – With time the group should establish itself from the researchers

Presentation by Group 3: Public Sector

List of Group Members

1. Md. Gladys Hindowa
2. Mr. B. A. Massaquoi
3. Mr. S. S. Kassibo
4. Ms. Victoria Lebbie
5. Mr. Sorie M. Kamara
6. Mr. Sahr P. Komba
7. Mr. M. A. Sheriff
8. Mr. Patrick Barley
9. Mr. Leslie Thomas
10. Mr. S. A. Mansaray
11. Mr. Brima Sowa

Group Facilitators

1. Dr. Dan Kisauzi
2. Ms. Freida McCormack
3. Hugh Goyder

Why Research not getting into USE ?

Some Research is in USE

- a) Why USE ?
 - Extension Service
 - Promotional Activity
 - Increased level of collaboration among Producers and Users
- b) Why no USE
 - Low involvement/participation users in research process

- Low release of information to users
- Search for information(low incentives)
- Logistical barriers
- Lack of communication
- Information and commodity market research lacking
- Audience not properly targeted
- Relevance of research
- Cost element of the research
- For a for regular interaction among researchers, extension, farmers etc missing

Communication Methods

- Traditional Extension Delivery Mechanisms(demonstrations, farmers exchange visits, field days, participatory varietal selection processes etc)
- Trade Fairs
- Media - Print (Newspapers, posters, billboards etc)
- Community Radios
- Drama
- Mobile Phones
- Internet

Presentation by group 4: NGO

List of Group Members

1. Mr. Holima Samai
2. Mr. Lawrence S. Kangayo
3. Ms. Bintu T. Moseray
4. Dr. Julia Roberts
5. Mr. Simeon Jambawai
6. Mr. Gerald D. Aruna
7. Mr. Mustapha Katta

Group Facilitators

- 1.
- 2.
- 3.

Why is research not getting into Use?

- Gap between researchers and users
- Presentation format and level can be complex for users to digest
- Relevance of research to users
- Method of carrying out the research
- Innovation research lacking
- Follow-up with NGOs is lacking
- Inability to find solutions to problems without further research
- Lack of capacity to access information(farmers)
- Lack of appropriate and practical ways of applying research results
- Research results not designed for use by farmers
- Inadequate and weak link in extension services
- Lack of participation in the research process
- Insufficient roles of NGOs(link)

What communication methods should be used for getting research into use ?

- Train extension workers and provide remunerations for the information and services they provide(using Bruce's model)
- FFS training of trainers for more extension information to farmers
- Mass communication methods to target larger groups
- Building trust for effective communication
- Engage in out reach and field activities and use the forum as information centre
- FFS graduation ceremonies
- Mobile phones and internet
- Audio-visual methods(films, CD-Rom)
- Radio talk shows(informidiaries and farmers)
- Internet browsing via TV on request
- Old and traditional methods(Religious houses, schools, prisons ,rural market, folklore)

Issues raised from the presentations

- A point of clarification that farmers do understand research but they do not understand research procedures
- Another point for clarification that research demonstrators are useful
- The establishment of clear houses

Feedbacks

- Research is not responding to the needs of the farmers; it is not a matter of whether they understand research or not.
- Trained women are not utilizing the training because of no follow-up support
- There is a clearing house but farmers are not utilizing the clearing house.
- It is good to provide an extension package, so as to help bridge the gap between farmers and extension workers.

2nd Group Work and Presentations

The following questions were posed by Dr. Ward.....

- Who should be involved in the systems to communicate research into use? Are they prepared to partner?
- What, in terms of the communication aspect?
- How to catalyze/strengthen systems on the ground?

Group Presentations

Group One

WHO?
WHAT?
HOW?

Background

- Partnership focus
- Information Needed – commodities, practices, basics of business
- How is information relayed and how sustainable in short-term and long-term?

WHO?

- **Research:** Current situation in Operation (NARCC, IAR, RRS, IARCs, Universities, etc.)
- **Public Sector:** MAFFS, MOFMR, MIC, MLCE
- **Civil Society Sector:** CSOs, CBOs, INGOs, LNGOs, NAFSL, CDCs, Farmers Organizations, Community Leaders
- **Parastatals:** SL Telecom, National Petroleum, SLPMB?, SLRA, Rural Banks, Development Bank
- **Private Sector:** Commercial Banks, Traders, Processors, Exporters/Importers

- **Media:** Drama Groups, Publishing Houses, TV, Radios, etc.
- **Movers and Shakers:** Policy Makers, and others
- **End Users:** Farmers, Consumers, Farmer Organizations, etc.

WHAT? Processes and Practices

Processes

- Demand-Driven Participatory Research/Extension
- Market-oriented approach promotion

Practices

- Technologies, new practices, policies
- Community/Social Relationships
- Indigenous Knowledge/Practices
- Business Skills

HOW? In Sustainable Way

- Engendering ownership of new partnerships: Whole process of MAPPING WHO
- Technology use-efficiency: generation, promotion, adoption/adaptation,
- Winning hearts and minds
- Follow-up activities in support of adopted technologies: markets, credits, etc. (long-term)
- Gender balanced technologies/practices

Group Two

Who should be involved?

- Farmer (end users)
- People with the relevant technical knowledge (researchers)
- Private sector
- Local government including traditional leaders
- Extension workers
- The media
- Theatre Groups

WHAT?

- Assessment of the need of the farmers
- Translating research into simple forms (language, visual aids, drama etc)
- Demonstrating best practices (role models)
- Monitor farmers over time
- Building the capacity of government (extension workers)
- Encourage farmers resource capacity
- Information about micro-credit
- Building the capacity of National Farmers Associations to represent effectively

HOW?

- Ownership of the process
- Formulate policy that promote and foster private sector and an enabling environment
- Promoting of success stories
- Link to profit

Group Three

WHO?

- Ward committees
- Village Development Committee
- CBOs
- Research Groups
- NGOs
- ICT and Media Providers
- Rural Enterprises – Private Sectors

WHAT?

- Awareness building for source of knowledge
- Forum of discussion for farmers and extension
- Establish knowledge Brokers functions

HOW?

Pilot scheme

- Who operate the knowledge broker?
- How is it going to be financed?
- What media to be used?
- Feasibility

Group Four

It was realized that it was difficult to answer the who without knowing the what

WHO?

- Researchers
- Extension workers
- Input providers (processors, transporters)
- CBOs
- NGOs
- Farmers
- Private sectors
- Micro Finance institutions
- Capital suppliers
- Youths
- Women groups
- Local councilors and policy makers

WHAT?

- Value addition / protection i. e. natural resources, livestock
- Environmental protection

HOW?

- Bringing the right partners together
- Capacity building is crucial to sustainability i. e. networking , capacity building and human capital
- Proper knowledge i.e. appropriate knowledge and information systems is also crucial to sustainability of innovation

Day Three: Thursday 15th November 2007

5th Plenary Session – Country Strategy Development: Chairperson Dr. Dan Kisauzi

11. Country strategy development (Sierra Leone Draft) – Prof. Norman Clark

The following areas were his focus during the presentation. See full presentation in annex 10

- “Innovation Systems” concept
- Its use in the country assessment
- Identified constraints
- Draft proposals

Pilot schemes

National information market

Programme management

Coalition building

Roll out plans

Discussion points

Clarifications:

- Not livestock alone, but we need to start some where
- The main target should be the needy groups
- Expected outcomes are many: great product, great profit, effective communication, etc. Support is needed however.

Feedback

- The line ministry should be the lead agency not the CBOs, NGOs, or INGOs for coordinating and facilitating purposes
- The project need to highlight significant attention to the fishery sector: preservation, marketing, and export
- The project should not be commodity focused. It should focus on the farmers/people and how the commodities contribute in there
- Identify projects in various areas and link with research agents. This will benefit the farmer
- Some additional pilot project on post harvest loss and energy use may be relevant.
- Some projects have been going on in this direction (FARA), the focus is not the commodity as such but the value change. Research on livestock has not been extensive in SL so there is need to import knowledge from elsewhere
- Livestock must be regarded as a business enterprise. It provides the opportunity to link with other areas
- It is useful to know how people learn, how they absorb to adapt what.
- Statistics Sierra Leone should be thought about in the data analysis
- Focus now no implementation. Strengthen the local ownership, as we need to monitor the process. Ensure fast track activities, start with a very strong management arrangement and move forward

Closing remarks (Professor Rhodes)

The closing remarks were made by Prof. Rhodes. In his remarks, he congratulated the participants for their wonderful contributions. He asserted our reaching of some consensus: pilot approach, livestock value changes, marketing information which seemed open, the formation of a steering committee. He thanked all.

Conclusions and Recommendations

The general impression of the 3 days of deliberations was regarded as very useful and successful. The meeting attracted a diversity of attendee who have not met to share ideas and information for quite sometime and expressed their appreciation for the various contributions made by colleagues during the group work and discussion sessions.

Sierra Leone is subject to acute information market failures. The communications infrastructure is fragmented, acutely so in rural areas, and the transaction costs for information exchange correspondingly high. Because the business sector and agricultural value chains are weak, profitable opportunities to take up, use and create value from new technical knowledge are limited; demand in rural areas is also suppressed by limited access and capacity to engage with ‘formal’ sources of new technical knowledge including those increasingly available via the world wide web.

The presentation of papers from experiences in other parts of the world in the communication sector by the external experts provided guidance to the participants to analyze their context in order to come up with communication tools and approaches that could be used to develop relationships that would lead to the poor being better able to demand, access and provide feedback on research outputs.

There is however a need to keep the momentum going by organizing such meeting 1-2 times in a year.

David Sam Suale
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November 2007
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**SECTION 7: PROPOSED INTEGRATED PILOT INTERVENTION FOR THE RIU SIERRA
LEONE COUNTRY STRATEGY CENTRED ON THE LIVELIHOOD DEVELOPMENT OF
PREDOMINANTLY ARTISANAL FISHING COMMUNITIES.**

CHRISTOPHER MEES AND JOHN ESSER

DECEMBER 2007

Executive Summary

This report provides the findings and recommendations resulting from a brief visit to Sierra Leone by 2 fisheries consultants engaged by the Research into Use Programme to explore and report on how outputs from the RNRRS could add value to fisheries initiatives in Sierra Leone and provide an integrated way forward.

Taking into account the importance of fisheries to livelihoods and economic recovery of Sierra Leone, the report presents a case for the RIU programme adopting an integrated pilot intervention that is centred around developing the livelihoods of artisanal fishing communities as a priority in applying its innovation systems approach to Sierra Leone. It is recommended that an integrated approach be used to strengthen selected artisanal fishery based supply chains in terms of enhancing resource management, sustainability and achieving compliance with sanitary requirements imposed by major export markets. It is believed that such an intervention will assist Sierra Leone realise the full economic potential of its fishery resources, help secure the livelihoods of poor stakeholders whose livelihoods are centred around fishing communities, and fully complement existing donor funded initiatives to support the fishery sector.

Background

This report relates to the following terms of reference associated with a brief visit by Dr John Esser (post harvest fisheries) and Dr Chris Mees (fisheries management) to Sierra Leone in November 2007 for a RiU Communications workshop:

- Explore with relevant stakeholders whether and how outputs from the RNRRS fisheries projects could add value to fisheries initiatives in Sierra Leone, providing an integrated way forward. (See Section 2 and Annex 1)
- Co-author a report of the fisheries opportunities in Sierra Leone and a recommendation as to the next steps (this report, see Section 3).

Prior to this workshop, a research fair held in Freetown in February 2007 showcased RNRRS outputs including those from the three fisheries programmes^{TP23PT}. Subsequently, MRAG was also commissioned to develop a paper augmenting the Sierra Leone RIU Country Assessment detailing fisheries sector issues in Sierra Leone (Mees and Payne, April 2007). That document, appended separately to this report for ease of reference, indicated that there was considerable scope for an RiU intervention that would include management and post harvest aspects of capture fisheries, but there was less scope for aquaculture at the current time.

During the November workshop the consultants presented details of the communications approaches adopted in the FMSP and PHFRP. These followed an innovation approach, and details of communication strategy planning at project and programme levels were presented that had resulted in the engagement of, and development of partnerships between a range of relevant actors. The strategy discussion on Day 3 of the workshop outlined an approach whereby a number of pilot interventions would be undertaken adopting a similar innovation systems approach that would be broader than a sectoral approach^{TP24PT}. A pilot study on livestock was highlighted. We proposed that fisheries would also represent a particularly relevant pilot study^{TP25PT} as part of a wider coastal zone innovation systems approach integrating issues arising from a number of different sectors. This report explores these issues further.

Synthesis of stakeholder discussions

The consultants undertook a limited number of stakeholder visits between 14-16th November. At each interview we explained the DFID/RiU poverty focus and that in the case of fisheries this would suggest that any interventions should therefore relate to the artisanal sector rather than the industrial sector. The key points arising from each visit are given in

²³ AFGRP – Aquaculture and fish Genetics Research Programme; FMSP – Fisheries Management Science Programme; PHFRP – Post Harvest Fisheries Research Programme

²⁴ Note that one of the authors (CM) was on the management steering group of the Natural Resources Systems Programme (NRSP) and was responsible for managing the Land-Water Interface component of that programme. That programme adopted an innovation systems approach that cross cut sectoral issues.

²⁵ Fish provide 70% animal protein in Sierra Leone and before the civil war contributed 50% of GDP; there has been an increase in artisanal fish catches since the war suggesting people have been displaced into this livelihood of last resort (See also Mees and Payne 2007).

Annex 1. Subsequent to the workshop, one of the consultants (CM) also met with DFID's Tim Bostock to discuss the DFID Fisheries Sector Strategy Paper (see footnote 29 in Annex 1). It was unfortunate that we were unable to visit the AfDB office or any of the industrial fish processing establishments in the time available; given more time it would have been possible to consult more widely. Furthermore, the consultations undertaken were entirely related to the fisheries sector and so this document needs to be considered in conjunction with the wider country strategy to inform inter-sectoral linkages. Nevertheless, the consultations we undertook confirmed that an intervention along the lines proposed in Mees and Payne (2007) was feasible and would meet locally expressed demand – i.e. Ua project to strengthen artisanal fisheries supply chains and to tackle associated management issues in order to ensure sustainability of supply.U We would propose to broaden this to explore the interactions between sectors in the fishing communities in order to explore an integrated way forward.

With respect to fisheries, the loudest and most consistent message from the various stakeholders consulted was the urgent need regain access to the EU market through achieving compliance with the sanitary and control requirements of EC feed and food safety legislation governing imports of fishery products from third countries. A number of interventions to develop post harvest fisheries are necessary for the current EC ban to be lifted. Associated with the supply of fish for export marketing are a number of management issues that are not confined solely to fisheries and therefore present an ideal entry point for an integrated systems based management intervention for artisanal fishing communities that includes aspects related to forestry, public health, and linkages between artisanal and industrial fisheries to ensure their sustainability. In the time available we were unable to evaluate any other associated or alternative livelihoods that would also need to be considered within such an integrated management approach²⁶PT. It is proposed that we work with artisanal fishers currently supplying iced fish for export primarily to Asian markets. This would initially be in Freetown, but as the AfDB fish landing facilities develop there is scope to scale the interventions out to four more sites. By working with some of the larger processors (Alpha Fishing Company, Sierra Fishing Company) it may in fact be possible to accelerate this process in partnership with the private sector, and also to further develop ice storage facilities and the use of collector vessels and fish transport trucks working with artisanal communities. With those communities, as well as developing assured iced fish supply chains that are compliant with EC food safety regulations, we would explore wider systems based integrated management issues – the fishers are unlikely to exclusively supply iced fish and within the community not all fishers would be doing so.

The proposed intervention would also seek to develop the capacity of relevant actors in the fishing communities and within intermediate bodies (Njala University, INMO, MMFR, MOHS, NGOs etc) for fisheries assessment, management, processing and marketing.

The FSSP suggested the need for fisheries related interventions at a number of levels, and the ways in which the RNRSS outputs map to those needs was described in Mees and Payne (2007) (Appended for convenience; We do not plan to reiterate that material in this document see Section 2.4.2). The specific intervention that presented itself from our discussions would relate to a number of the sub outputs of the FSSP (note we have augmented the FSSP Outputs with specific reference to the proposed RiU intervention. These details are indicated in italics within parentheses):

Opportunities for fisheries development:

- Fish products and markets understood

Enabling environment for fisheries created and enhanced over time

- Structure and function of MFMR revised; fisher organisations created and enhanced to participate in policy process.

Capacity building for fisheries development and management

- MFMR capacity increased in areas of policy analysis and design; fisheries economics and planning; and fisheries development and management
(MFMR and MOHS capacity increased in upstream inspection and control)
- *(Njala University capacity to provide educational / training support to fisheries stakeholders increased)*
- Fisher communities and fisher organisations capacity increased in *(improved fish handling, access to affordable credit, access to export markets,)* fisheries management and development....

²⁶ There is also potential to explore alternative livelihood strategies as was done in NRSP for coastal communities, and in the longer term to look at small scale tourism potential. The details in the main body text, however, represent the best scope for immediate intervention.

- Private sector capacity increased (*to achieve compliance with EC food safety regulations throughout the fish supply chain*)

Effective fisheries management systems established and made operational

- Fisheries management plan for one fisheries management unit (FMU) fully operational in 4-5 years
- Fisheries protected for the future, IUU stopped and certain FMUs on hold for future intervention.

Clearly, the RiU intervention cannot hope to fully address all these issues, but as a pilot study working towards developing the supply chain for high value demersal fish and towards an integrated fisheries management plan for that fishery it could provide a useful indicator and catalyst for the full FSSP once it is initiated. It would certainly address most of the above outputs in part. There is a clearly significant opportunity here for RiU to undertake an initial pilot that will inform the future FSSPU.

Additionally, the proposed intervention would be working with the existing AfDB artisanal fisheries project, the EU Institutional Strengthening for Fisheries Management project and the recently extended EU / ACP Strengthening of Fisheries Products Health Conditions in ACP / OCT Countries Project. There is also scope to engage with the DFID Private Sector development Programme. Although the FSSP has not yet been initiated these existing initiatives would enable RiU to begin a pilot fisheries intervention with immediate effect that would build on and contribute to them significantly.

Proposed Pilot Intervention

Summary of proposed intervention

The proposed pilot intervention is centred around addressing the livelihood constraints faced within poor artisanal fishing communities in Sierra Leone. We propose an integrated innovation systems approach that will include forestry, fisheries and public health issues, and in the longer term could potentially be widened further. The intervention will involve private sector participation (industrial fish processors) as the main driver of change encouraging economic growth and stability. There will be a strong element of capacity building at all levels necessary to develop decentralised local management bodies within fishing communities, but at the same time working with policy makers and the public sector to ensure that a supportive policy environment exists. The intervention will link with four existing donor funded initiatives, and will provide invaluable lessons for the forthcoming FSSP, informing its development and implementation.

Mees and Payne (2007) proposed the following intervention for fisheries:

- a) In partnership with fishers, government and other locally relevant bodies (*Innovation platform*), developing and implementing a fisheries management plan for a selected fisheries management unit (FMU). This would involve using lessons from FMSP to inform / validate rational small-scale fisheries management systems.
- b) Increasing the capacity of Ministry of Fisheries and Marine Resources (MFMR), other relevant intermediary bodies and fisher communities in fisheries assessment and management.
- c) Exploring opportunities and markets for fish products.
- d) Increasing the capacity of MFMR and fisher communities in fisheries development and the private sector in processing and trade enterprises.

The stakeholder consultation undertaken did not substantially change this broad approach, but it highlighted specific opportunities:

1. The focus will be a supply chain intervention strengthening linkages between artisanal fishers and export fish processing establishments e.g. Alpha Fishing Company, Sierra Fishing Company, to produce iced fish for export markets (particularly the lucrative EU market). Similar supply chain models operate successfully elsewhere in the region and in East Africa.
2. The management plan in (a) above will be broadened into an integrated management approach for the communities providing fish into the supply chain in order to address some wider issues including fisheries, forestry

(smoking – timber supply) and public health (condition of fish landing beaches, sanitary facilities, access to clean water, smoke inhalation etc)

Additionally Mees and Payne (2007) proposed value chain promotion through achieving Marine Stewardship Council (MSC) certification of the selected fishery management unit (FMU). Such certification guarantees that the fish sold in our supermarkets has come from sustainably managed fish stocks, for which consumers will pay a premium enabling a higher price to suppliers. This would still be relevant but is a longer term objective and will follow from the development and implementation of a functional management plan for the fishery. MSC has developed a risk based assessment methodology that is applicable for the certification of artisanal fisheries where data is frequently lacking. We would take into account these criteria from project inception in order to move towards the goal of a certified fishery in conjunction with compliance with public health standards for export. Also, it is becoming increasingly a requirement of the most developed markets for fishery products that product is sourced from supply chains that can be assured (ideally certified) in respect of traceability, food safety in addition to sustainability. The EC food safety legislation which came into effect January 2006 requires exporting countries to demonstrate that the whole supply chain (fishing vessels, transport vessels, landing sites, fish transport trucks, ice plants etc) are effectively under control and compliant with food safety regulations. In the absence of such compliance, Sierra Leone will continue to be denied access to the EU market and fail to realise the full economic potential of its fishery resources. It is also the case that importers and retailers of fish products are coming under increased pressure from consumers in developed countries to provide guarantees that imported fish products are sourced from sustainable, properly managed fisheries. It is therefore anticipated that the supply chain intervention being proposed here will generate economic, environmental and public health benefits to a wide range of fishery sector stakeholders in Sierra Leone. The intervention fulfils the elements of an innovation system in that:

- it provides a common platform (development of an assured fish supply chain linking artisanal suppliers to export markets) that will develop partnerships linking knowledge suppliers (international experts, Njala University) with knowledge users (artisanal fishing communities, fish processors / exporters, MOSH, MFMR)
- by fully involving the principal target beneficiaries (artisanal fishing communities, fish processing establishments) in project design and implementation, effective linkages will be established with policy makers / regulators leading (MOSH, MFMR) leading to continuous improvement (supported by Njala University) and elimination of 'innovation bottlenecks'
- active involvement of 'bottom line' driven private sector fish business operators and fish box / ice plant manufacturers, together with service providers and credit suppliers should lead to financially viable and sustainable business models being developed
- new technologies developed by the RNRRS and other research programmes will be introduced
- new institutional arrangements should evolve that will result in a fishery management structure that fully integrates pre and post harvest components and is compliant with export market requirements.

Purpose and Objectives.

The purpose is to apply selected RNRRS and other tools to improve the livelihoods of artisanal fishing communities through better integrated management of resources and the fish supply and production chain, linking them to fishery products supply chains that are compliant with EU and MSC criteria for approved exports in terms of resource sustainability, food safety, traceability etc.

Proposed partnerships

Mees and Payne (2007) indicated potential partners. An initial stakeholder analysis would confirm the partners in the innovation platform, but this is anticipated to include:

- The fishing communities, to include fishers, small scale processors, wood suppliers, etc
- Industrial fish processors such as Alpha Fishing Company, Sierra Fishing Company
- Community groups and organisations such as the Artisanal Fishers Union, other relevant cooperatives and unions
- Industrial fishing companies who exploit the same resources as those taken by artisanal fishers in the pilot.
- Infomediaries and managers: Ministry of Fisheries and Marine Resources, Ministry of Health and Sanitation; Forestry Department; Institute of Marine Biology and Oceanography; Njala University

- Donors and existing project managers and teams: AfDB artisanal fisheries project, the EU Institutional strengthening for fisheries management project; the renewed EU ACP project; the DFID Private Sector Development Programme (and in future the FSSP)
- Research providers: FMSP, PHFRP; FRP teams; Practical Action/Practical Answers

Proposed implementation plan

1. **Stakeholder analysis** to fully define and engage with the innovations platform - expected to include all those listed in proposed partnerships. The fishing communities selected will include those that already supply fish to iced fish processors, and those where AfDB fish landing centres are being developed.
2. **Institutional analysis** to investigate the current functionality of fisher organisations, the existing linkages between relevant departments and ministries towards developing an integrated management approach etc
3. A **Review of Fisheries Legislation** (both pre-harvest and post-harvest) would be undertaken to explore the extent to which it currently would support a decentralised co-management framework, and the extent to which it supports private sector activity. The
4. A comprehensive **Communication Strategy** will be developed which will be closely linked with, and will inform the further development and refinement of the implementation plan. This will further define the innovation platform and confirm that all necessary actors are engaged in our coalition. The Communications strategy will generate increased social dialogue between partners so that they fully understand each others needs. The strategy will work at a number of different levels. There needs to be good communication at the local level and enhanced communication or dialogue with meso-level actors. There will also need to be communication (or advocacy) up to the policy level to illustrate the benefits of the integrated management approach and better fish processing and marketing and to ensure that policy can provide an enabling environment.
5. **Situation analysis:** Appraisal of the current situation in the field for management and post harvest fisheries aspects, forestry and public health. A participatory evaluation of the fisheries and existing capacity will identify the options for resource assessment and the capacity development needs. This will also identify which of the suite of FMSP management tools and other RNRRS tools are most applicable, and will develop the capacity of the local partners to do this independently. In parallel the Post Harvest Fisheries Overview tool will be applied to identify the situation and needs for post harvest fisheries.
6. **Capacity building:** We would enhance the capacity of local partners to select, adapt, adopt and employ relevant RNRRS and other products (PHFRP, FMSP, FRP; other relevant products through Practical Answers)²⁷PT. A combination of techniques will be used including formal teaching, training of trainers, learning by doing guided by initially experts, electronic information markets provided in villages via computers linked to solar power (Practical Answers; MP AIS approaches etc). Thus the pilot initiative will work on many different levels – strengthening capacity at the local level but also mainstreaming into local development and national policy. The precise details will be informed through the development of the communications strategy.
7. As the artisanal fishery will only exploit part of a wider fish stock, data from the artisanal fisheries alone will not be adequate to undertake **stock assessments** for management. The pilot initiative will therefore link with the EU Institutional strengthening for fisheries management project. In respect of FMSP interventions therefore, the emphasis of the RiU inputs will focus on the integrated management and knowledge sharing aspects. Nevertheless, capacity development in resource assessment using FMSP tools remains relevant. This would substantially relate to infomediaries, but certain tools are directly relevant at the community level also.
8. **Develop an integrated management plan:** A systems based approach for integrated management that is not focused on commodities but on resource users will be developed. This will draw on a number of relevant tools from FMSP (see Mees and Payne 2007) and NRSPTP²⁸PT and will require a multidisciplinary approach. Relevant existing local

²⁷ Note that for fisheries products Mees and Payne (2007) indicate the specific RNRRS outputs that would be relevant.

²⁸ E.g. Participatory Action Plan Development; Pro-poor policies and institutional arrangements for coastal zone management (in the Caribbean)

institutional arrangements will have been identified and these will be developed or strengthened as appropriate in order to develop a locally relevant management approach for fisheries management, coastal zone and environmental management, forestry and public health. Forestry and public health issues will be focussed on those issues that relate to fishing communities. Specifically the use of wood for the smoking process and the cleanliness of beach landing sites. Wider issues such as the recognised association between the spread of HIV-AIDS and the movement of fishers could be included although are likely to be beyond the immediate scope of the intervention.

9. A particular **link between the management and post harvest** marketing components of the initiative occurs through the MSC certification of sustainably managed fisheries whereby additional value can be gained from selling fish that are from sustainable sources. This is a longer term goal of the project once sustainable management systems have been developed. The initiative will from the outset work to ensure that the correct elements are in place to meet the MSC assessment criteria for small scale fisheries. This is a new area for MSC, but a potentially very important one for developing countries wishing to compete in the rapidly evolving international market for fish products. The initiative will explore the issues surrounding application of the certification process for data deficient and small scale fisheries.
10. **Post harvest implementation** –The primary aim of the post harvest intervention will be to involve all relevant stakeholders in developing a model fish supply chain that is fully compliant with the food safety regulations of major export markets e.g. EU, USA. Previous work undertaken by the EU / ACP Strengthening of Fisheries Products Health Conditions project will be further developed, particularly with regard to bringing about improvements to the upstream part of the fish supply chain. Linkages will be established with the EU / ACP project to capitalise on synergies and develop an integrated approach to bringing the supply chain and associated inspection systems into compliance with EC feed and food safety legislation that came into effect in January 2006. It is expected that the intervention should lead to Sierra Leone's fishery products being readmitted to the EU market. It is also anticipated that problems leading to post-harvest losses / poor quality of fish products destined for local and regional markets will be addressed
11. **Monitoring and evaluation** will occur at a range of levels and will be an integral part of all project activities in order to monitor and learn from both the process and the outcomes of the initiative. With respect to the supply side, the capacity of resource users and 'infomediaries' to undertake participatory monitoring and evaluation of the outcomes of applying improved management approaches on the resources will be developed and existing FMSP products are relevant here (See Mees and Payne 2007). The capacity development of the different actors and their ability to identify future evaluative requirements will also be monitored. Specifically for fisheries, the MSC certification process is also a rigorous evaluation against criteria already defined by MSC, not of the resource status, but rather of the performance of management and the risk that certain activities may pose to the sustainability of fisheries, and this will be applied either by them or an appointed independent body.
12. Regarding **M&E** on the commodity side, evaluation of fish quality and progress through the value chain is an integral part of implementing the post harvest related activities. Tools developed by the PHFRP will be used to monitor cost of control of technical interventions and checklists developed to measure progress against meeting EC food safety standards for upstream handling and control. Competent Authority (MOHS) and MFMR inspectors will be trained in relevant auditing and reporting techniques and they in turn will be subjecting external auditing. Inspectors of the Food and Veterinary Office of DG Sanco shall have ultimate responsibility for judging of whether the project has resulted in bringing about the SPS improvements necessary for Sierra Leone's re-admittance to the EU market.

Expected outputs

Focussing on fishing communities, and for a cluster of products generated under the FMSP, FRP and the PHFRP, this initiative will support delivery of RNRRS products through capacity building at a range of levels. It will create understanding of why integrated resource assessments are needed and enhance the capacity of resource users to voice this demand. It will develop their capacity to participate in fisheries assessment and wider integrated management, and develop the capacity of relevant government and NGO agencies to undertake assessments integrating them into management, thus together providing a framework for integrated co-management. This will provide the basis for sustainable fishery management and sustainable use of forestry resources needed to support fish processing locally. It will improve public health focussing on smoke related issues and beach cleanliness. It is anticipated to generate positive environmental impacts.

In order to generate rural growth and poverty reduction, learning from the PHFRP will be applied to ensure a value added marketable product from these fisheries by developing pro-poor marketing structures. The value chains linking producers (fishers) with fish suppliers will be developed, highlighting the additional value to be gained from selling fish from sustainable

sources. A number of certification schemes for fisheries exist that respond to consumer demand for eco-friendly fish products, and in the longer term we will make linkages outside the RNRRS with the Marine Stewardship Council to apply their certification process for data-deficient and small-scale fisheries. It will explore and develop the pro-poor marketing opportunities that exist for fish products derived from sustainably managed sources, thereby generating rural growth and poverty reduction, and explore how the benefits of better management and marketing are distributed amongst poor men and women. It will develop a certified fish supply chain, provide access to the EU market for fish, develop improved fish handling, strengthened inspection capacity, and strengthened training capacity. It will scale out RNRRS outputs to locations where they have not yet been applied.

Annex 1: Summaries of meetings with stakeholders

1. The Competent Authority

Staff consulted: Mr Gibrilla Bundu, Senior Health Superintendent and Head of Competent Authority, Mr Ibrahim, Manager of Environmental Health Division

The Food Unit, located within the Environmental Health Division of the Ministry of Health and Sanitation (MOHS) is the designated Competent Authority (CA) responsible for inspection and control of fishery products destined for export. Regaining access to the EU for Sierra Leone's fishery products is the CA's top priority. The CA has received support in terms of advice and training during phase 1 of the EU / ACP Strengthening of Fishery Products Health Conditions project and has recently harmonised Sierra Leone's fishery products regulations with those of the European Commission. A significant amount of work remains to be done in terms of strengthening capacity of fish business operations to comply with EC food safety regulations and developing effective inspection and control systems. The 'farm to fork' approach to food safety adopted by the EC requires that the whole fishery products supply chain be compliant with EC regulations and that standards and food safety control systems be at least equivalent to those that apply to EU member states. The scope for linking artisanal fisheries to export markets through developing a certified (in terms of food safety, traceability and sustainability), model supply chain was discussed. It was agreed that the key players in developing an assured supply chain would be the MOHS, the Ministry of Fisheries and Marine Resources, artisanal fishing groups and commercial fish processors / exporters. It was felt that development of such a model supply chain would help strengthen Sierra Leone's case for resuming exports of its fishery products to the EU market.

2. Institute of Home Sciences Njala University

Staff consulted: Rosaline Tijani, Head of Institute of Home Sciences; Dr John Abu-Kapawoh, Senior Lecturer in Food Science.

The Institute offers 3 teaching programmes – Home Economics Education, Nutrition and Dietetics, B.Sc Nutrition and Food Technology (commences next year). Research interests include development of affordable nutritional products for poor children using local products e.g. fish based powder products. It was felt that the Institute could make a useful contribution to the RIU innovation platform and should receive support to help strengthen its capability as a provider of food science / technology education and research in Sierra Leone.

3. Animal Science Department, Njala University

Staff consulted: Dr Yayah Sankoh / Dr Sheku K Moiforay

The principal interest of staff in this department related to animal nutrition, reproduction and disease prevention. They were particularly interested in feed formulation for livestock and for aquaculture. They indicated that currently in Sierra Leone aquaculture only occurs on a small scale and for direct consumption. There was scope for tilapia enhancement in the valley swamp area, and they were interested in developing fish feeds to promote future aquaculture.

We do not consider that aquaculture offers sufficient scope for immediate intervention by RiU, and is a lower immediate priority relative to the post harvest and management aspects of fisheries.

4. Njala University, Bo and Njala campuses

Staff consulted: Bashiru Koroma

Dr Koroma provided contact details of those university departments that could usefully contribute to the innovation platform and provide educational support to RIU interventions in Sierra Leone.

Dr Bashira Koroma, Head of Chemistry Department and Acting Director of Institute Environmental Management and Quality Control, School of Environmental Science, Njala University, SLBS Building, New England, Freetown, Sierra Leone. Tel +23276706819, +23233546953. Email HTU bashirukoroma@yahoo.co.uk UTH.

Bo Campus. Prof. Abdul Mansaray, Deputy Vice Chancellor. School of Community Health sciences, School of Education, School of Social Sciences.

Njala Campus. Prof S.P.T. Gbamanja, Deputy Vice Chancellor. School of Environmental Sciences, School of Agriculture, School of Technology, School of Forestry and Horticulture.

Prof E. Thompson, Vice Chancellor and Principal, Directorate of Planning, Research and Development.

We believe that Njala University has the potential to become a valuable partner in the Sierra Leone innovation platform and should receive support from the RIU project. Training of trainers in fisheries stock assessment and management planning was cited as a specific intervention they would require to develop existing course modules. Similarly courses in the post harvest sector would benefit from RNRRS inputs.

5. Institute of Marine Biology and Oceanography (IMBO)

Staff consulted: Dr Ernest Ndomahina / Ms Elizabeth George

The largest single problem faced by the fisheries sector relates to post harvest losses of fish and in meeting standards for the export of fish. The country and its relevant institutions lack capacity in post harvest fisheries for quality control, processing and marketing. This lack of capacity is holding back the development of both the artisanal and industrial sectors of the fisheries. IMBO is trying to develop that capacity and aims to become a centre of excellence in this area.

Current post harvest activities include a scheme operated by Alpha fishing company whereby they provide ice and ice boxes to artisanal fishers and purchase the catch of demersal white fish from them for export to Korea. Species include *Pseudotoletus senegalensis* / *P. elongatus* (*Gwa Gwa*) (a croaker). These fish are also taken by other fleets including the industrial fleets and as a by-catch for the shrimpers. This activity is currently confined to Freetown and fishing villages located nearby. Constraints faced by fishers located at more distant locations along the coast include their remoteness and a lack of infrastructure (roads, power etc) to move fish around. An African Development Bank project focussed on artisanal fisheries will develop four pilot fish receiving centres and demonstrate their use. It is then anticipated that the private sector will follow this up.

Whilst the immediate problem relates to post harvest fisheries, a number of issues related to fisheries and wider natural resource management were highlighted. These include illegal fishing by industrial vessels within zones set aside for artisanal fishers, high levels of discards by shrimpers and ecological issues related to the destruction of mangrove forests to provide wood for smoking fish. These also highlight some of the research interests within IMBO that include assessment of stocks exploited by a range of fleets (they have submitted a proposal to the EU project, Institutional support for fisheries management); alternative uses for spoiled fish; discards at sea to investigate both alternative uses for discards and the impacts on the artisanal sector of discards and resultant overfishing.

IMBO runs courses in population dynamics, economics and resources management for which the FMSP tools would be relevant.

Whilst the DFID/RIU focus on the artisanal sector was understood, it was recommended that the industrial sector should also be included.

6. Ministry of Fisheries and Marine Resources

Staff consulted: Mr Moses Kapu (Minister of Fisheries), Mrs Kamara (Deputy Permanent Secretary); Mr ABC Jones (Director of Fisheries), Mr Mohamed Sheriff (Deputy Director of Fisheries); Mr Winston Gbondo (Assistant Director of Fisheries)

MFMR was involved in developing the (DFID) Fisheries Sector Strategy Paper which they fully support and consider to be a priority for the country. This has been on hold pending the recent elections but the expectation is that this can now move ahead²⁹PT. They highlighted some significant issues related to the industrial sector including

²⁹ CM has subsequently met with Tim Bostock at DFID who confirmed that the FSSP is still a live document although currently on hold within DFID. It may be, as the EU representative suggested, that another donor may take this up but no details have been confirmed at the current time. He also noted that the DFID Office in Sierra Leone has a Private Sector Development Programme that could have potential for fisheries and linkages

- Monitoring Control and Surveillance (MCS) capacity to prevent illegal unregulated and unreported (IUU) fishing – currently the Navy undertakes this task but is confined to coastal areas whilst substantial IUU activity occurs offshore;
- The lack of a dedicated fisheries harbour;
- The lack of a consistent power supply which was a constraint for fish processing establishments;
- The current EU ban on fish products from Sierra Leone, the lifting of which is regarded as a priority.

Other significant fisheries initiatives include the EU / ACP Strengthening of Fishery Products Health Conditions project, the EU Institutional Strengthening for Fisheries Management; and the AfDB Artisanal Fisheries projects (see also the FSSP, and Mees and Payne 2007). A paper has also been prepared for the EU on the potential for developing a Fisheries Partnership Agreement between Sierra Leone and EU and this should be available in March 2008.

MFMR undertakes annual research and statistical programmes and will work with the new EU project (Inst strengthening for management) to assess the status of fish stocks. Based on stock assessments they operate an effort based management approach (rather than one based on catch), and provide a limited number of licences for each fishery. They also have an inshore exclusion zone for shrimp fisheries although in the past there have been concessionary areas allowing the shrimpers in. Enforcement is a significant issue, and conflicts occur between artisanal and industrial fleets. There is potential to build capacity of local staff in the use of FMSP assessment and management tools.

With respect to possible interventions for the artisanal sector, strengthening the artisanal fisheries supply chain whilst addressing sustainable management issues was considered a useful approach. The arrangement with Alpha fishing company was discussed (see IMBO above). This is a small company and interventions with Sierra Fishing would also be worth exploring. In addition to the four artisanal fish landing facilities the AfDB will also develop a facility for iced export of fish at the airport at Lungi.

MFMR would be keen to see interventions that link the artisanal and industrial sectors and that develop a semi-industrial sector. They have also licensed supply vessels operated by co-operatives from Senegal, which buy high value fish from artisanal fishers. Schemes for technology transfer have also been tried, bringing fishers from Senegal to demonstrate techniques, but it has become necessary now to restrict the number of foreign fishers per beach.

Local management arrangements for fisheries include a master fisherman designated for each beach landing site, fisher cooperatives and Unions. MFMR also has fisheries extension officers based at major fishing sites. Whilst it is the Food Unit of the Ministry of Health and Sanitation that is currently the designated CA responsible for fishery products, it is believed that MFMR has an important role to play in bringing the upstream part of the supply chain into compliance and consequently should be fully involved in the proposed fishery product supply chain intervention.

7. Fish Processor, Tombo fishing village

Persons consulted: Mrs Dixon and neighbours, Tombo Village

Mrs Dixon runs a fish smoking business. She works primarily with three boats purchasing their catch for processing and resale. There are no ice facilities in Tombo, and there are many similar processors smoking fish. Wood in Tombo is bought from the 'timber merchants' who harvest trees from the forest and sell wood in bundles. This group of people are mostly from Guinea (in the case of Tombo). Mangrove wood is not used here. Cash flow is the biggest single problem she faces. In good times she will provide credit to the fishermen on the 3 boats she works with, but at other times she does not have sufficient funds to buy the fish and wood for her business. During the rainy season no fish are landed and she has no alternative livelihood for those periods.

She was not part of a fish processors cooperative and she did not consider that the fishers cooperative in Tombo was functional, citing financial problems. However she believed that cooperatives would be useful if they were adequately managed and controlled. In walking around the village however, we did see the fishers union office and an adjacent smoking facility that was in use. It would be useful to further explore the functionality of local institutional arrangements for fisheries.

should be explored. Finally he indicated that there is a UK IMAT initiative to raise the profile of fisheries amongst donors and an event is planned that will include the new President.

There is a public health issue related to the conditions under which the fish smokers work. It is necessary for them to stay awake all night during the smoking process to ensure that the fires neither go out nor flare up, and smoke inhalation is an issue.

In terms of the smoked fish product, it would be possible to introduce more efficient smokers, but this has been tried in the past with little success and the quality of the existing product is fit for purpose, though not for export. As would be expected, there was no evidence of fish losses during production, as losses due to fragmentation and insect infestation tend to occur further down the supply chain during distribution and retail. The loss assessment tools developed by the PHFRP could undoubtedly be put to good use in informing the development of a loss reduction strategy for traditionally processed fish products.

8. EC Delegation to Sierra Leone

Staff consulted: Mr Matthias Reusing, Head of Rural Development Section.

JE provided an update on developments with the EU/ACP project and advised that the delegation and MFMR should directly contact the PMU in Brussels for support under phase 2 of the project. Proposed collaboration between DFID and the EU/ACP in assisting Sierra Leone develop the sanitary controls necessary for the current EC ban on fishery products to be lifted was discussed. It is our view that the amount of work necessary to bring the export fishery sector into compliance will require both DFID and EU/ACP support, and that an integrated strategy to strengthen the whole fish supply chain and associated controls should be developed without delay. A possible model would be for the EU/ACP project to assume responsibility for strengthening processing establishments and laboratories, with DFID having responsibility for fishing vessels, transporters, landing sites, ice factories and training institutions..

The EU Institutional Strengthening for Fisheries Management project was also discussed. It is implemented by GOPA, and there are clear opportunities for linkages with FMSP fisheries stock assessment tools and for linkages with a fisheries related RIU intervention in Sierra Leone.

A feasibility report for developing a Fisheries Partnership Agreement between EU and Sierra Leone is due to be published in March 2008. It is anticipated that steps to lift the EU ban on fish exports would be implemented in advance of the agreement.

It was indicated that EU may be the implementing agency for the DFID FSSP through a co-financing agreement, but no details had been firmed up at this stage.

SECTION 8: HISTORICAL STUDY OF CROPS RESEARCH BASED IN SIERRA LEONE

CHARLIE RICHES

MAY 2007

1. Introduction

The civil war in Sierra Leone in the 1990s resulted in a significant loss of institutional physical assets and migration of professional human resources. Agricultural research activities largely ceased with the evacuation of staff from research stations to Freetown. Associated with this has been the loss of the “institutional memory” of much of the agricultural research that has been conducted in the country. Library materials within the country at locations outside of Freetown suffered considerable damage during the war.

The DFID Research into Use Programme seeks to promote in Sierra Leone the outputs of natural resources research conducted over the past 10 years in similar environments elsewhere in sub-Saharan Africa and South Asia. It is vital however that staff of implementing partners are fully aware of the previous research and development activities that were undertaken in Sierra Leone before the civil war. This understanding will allow synergy of efforts so that new initiatives that aim at increasing agricultural productivity for poor households are fully informed of the outputs from research that has previously been undertaken in Sierra Leone.

This report results from a survey of literature resources on crop production issues.

2. Agricultural Research in Sierra Leone: A historical perspective

Research in Sierra Leone has had long-term bases at Rokupr Rice Research Institute (rice-based systems) and the Institute of Agricultural Research at Njala (dryland crops). Some agricultural development studies were based with in Njala University and Forah Bay College, particularly for post-graduate projects. Other relevant work has been undertaken by individuals associated with various donor funded area development projects and UN supported agricultural projects that were operational during the 1980s.

The Rice Research Station (RRS) Rokupr, Northern province is funded by the Government of Sierra Leone. The station was established in 1934 as Rice Experimental Station administered by the Sierra Leone Department of Agriculture. In 1953 the station's responsibility was extended to include the other English speaking West African territories. It became the West African Rice Research Station (WARRS). Between 1964 and 1971 the station was attached to the faculty of Agriculture, Njala University College and renamed Rokupr Rice Research Station. In 1971 it assumed its present status as a semi-autonomous institution. During the 1980s Rokupr operated as the Mangrove Rice Research station for West Africa Rice Development Association (WARDA) and subsequently maintained close links with WARDA programmes, particularly for rice cultivar development.

The present mandate of RRS is to conduct research into the constraints affecting rice production in all ecologies as well as sorghum, millet, yam, potato and vegetables and to conduct investigations into Farming Systems Research in the North-western, North-central, Northern and Western Area Agricultural regions. It conducts both on-station and on-farm research and demonstration and also multiplies improved seeds for farmers.

ACRE and the Institute of Agricultural Research (IAR): The Sierra Leone Adaptive Crop Research and Extension (ACRE) Project (1979-86) focused on the development and dissemination of information through field demonstrations of adaptive research trials on smallholder farms. Southern University was the lead institution for the ACRE project under a contract issued to the Southern University-Louisiana State University (SULSU) Consortium by USAID. A summary of technology transfer activities of ACRE is provided in Appendix 1. When the project terminated the Government of Sierra Leone established the Institute of Agricultural research at Njala. The institute is mandated to research into some of the major food crops grown and consumed in the country and presently emphasis is placed on the improvement of cassava, sweet potato, maize, cowpea, and ground-nuts. Research is also conducted on the economics of the production of these crops, gender issues as related to farming, soil management, post-harvest technology and the nutrition particularly of the rural people.

The institute operates in six demarcated zones distributed throughout the country. Funds for research and other activities are provided by the Government of Sierra Leone but other international bodies including FAO, EU and IITA have supported research projects in the past. The IAR has its headquarter at Njala in the southern part of Sierra Leone and has substations in Bo, Kenema, Makeni, Kabala, Magbosi, Rokupr, and Lungi. As of May 2007 IAR staff had relocated back to Njala

following a period of refurbishment of the institute, New laboratories, including molecular biology facilities are under construction with assistance from the International Atomic Energy Agency.

3. Developing a bibliography

The bibliography of Sierra Leone crops research was developed from resources available in the UK. An attempt was made to contact members of the Tropical Agriculture Association who have residential experience of Sierra Leone. Only three replies were received from the 11 members contacted. One has provided reports and further feedback is awaited from a second who is currently overseas.

The bibliography relies largely on internet searches for publications produced since 1970 listed in the Web of Knowledge and CABI abstracts. Further internet searching was undertaken for information on the crops grown in the country and for PhD thesis reports. A further source of information lies in data bases of projects funded through FAO/UNDP and IDRC (Canada). These provide a listing of projects and indicate availability of reports. These are available for purchase on microfiche. Information on the occurrence of crop pests, diseases and weeds in Sierra Leone can be found in the CABI Crop Protection Compendium (searchable CD). The pests listed in the country in the 2002 edition are shown in Appendix 2. Copies of annual reports from the WARDA sub-station at Rokupr from the 1980s were consulted at the Rothamsted library. The entire series of WARDA reports should be available from WARDA HQ in Benin.

4. The bibliography

Publications and reports are listed by crop or other agricultural topic.

Cassava

Achidi AU, Ajayi OA, Bokanga M, Maziya-Dixon B 2005 The use of cassava leaves as food in Africa. *ECOLOGY OF FOOD AND NUTRITION* 44 (6): 423-435

Abstract: The rate of cassava leaf consumption in Africa was assessed by a combination of informal interviews, the use of questionnaires and information from the literature. Countries were rated to have high, average, low, or no consumption of cassava leaves. The mode of cassava leaf preparation was studied with six housewives who are nationals of Congo (3), Sierra Leone (1), Madagascar (1), and Nigeria (1). In each case, the procedure was observed from leaf-picking in the field to serving the cooked dish. The first matured leaf up to leaf position 9 or 10 were selected for consumption. The tender petioles and stem were also taken. There were country variations in the preference for particular varieties based on petiole color and mild mosaic infection. Prior to cooking, cassava leaves are usually pounded or ground but pounding is the most popular method. The recipes from Sierra Leone and Nigeria took 40-60 minutes while the standard Congolese recipe took 90 minutes. However, there is a Congolese recipe using sodium bicarbonate that cooks in only 20 minutes. From the comments made by 50 interview respondents from different African countries, it appears that there is a wide variety of cassava leaf-based recipes suggesting that cassava leaves are a major food in Africa.

BLANSHARD AFJ, DAHNIYA MT, POULTER NH, TAYLOR AJ 1994 QUALITY OF CASSAVA FOODS IN SIERRA-LEONE. *JOURNAL OF THE SCIENCE OF FOOD AND AGRICULTURE* 64 (4): 425-432

Abstract: Gari and fofofo (fermented cassava foods) were purchased in the Freetown markets of Sierra Leone and analysed for factors associated with quality. Sellers were generally knowledgeable about the source of the products which all originated from the country areas outside Freetown. The mean cyanide contents were higher (8.6 mg kg⁻¹ DM for gari and 28.2 mg kg⁻¹ DM for fofofo) than the amounts suggested by the Coder specification and, because of the distribution of the values around the mean, some samples necessarily contained unacceptable amounts of cyanide. Cyanogens were present as the cyanohydrin or as free cyanide; no glucoside was detected. Microbiological analysis of the samples showed high counts for total organisms, fungi and Enterobacteriaceae (10(6)-10(7) g⁻¹). The mean water content of gari was 119 g kg⁻¹ which falls within the recommended limit of 120 g kg⁻¹ but again, due to the distribution of values around the mean, some samples had considerably higher water contents than that limit. Titratable acidity and pH were measured and the mean pH values were 4.18 for fofofo and 4.55 for gari. The particle size and swelling power of gari samples were also

measured as these relate to consumer acceptance. The data show the quality of current cassava foods marketed in a major urban centre in Sierra Leone. As centralised processing develops, improvements can be made to those quality parameters which have been identified as important.

BLANSHARD AFJ, DAHNIYA MT, POULTER NH, TAYLOR AJ 1994. FERMENTATION OF CASSAVA INTO FOOFUO - EFFECT OF TIME AND TEMPERATURE ON PROCESSING AND STORAGE QUALITY. JOURNAL OF THE SCIENCE OF FOOD AND AGRICULTURE 66 (4): 485-492

Abstract: The preparation and distribution of foofuoo comprises several stages, namely soaking, dewatering and storage prior to sale. The effects of four different time/temperature soaking processes on the quality of foofuoo (pH, microbial load, residual cyanogens) were determined. The processes were chosen as they gave roughly equivalent degrees of retting (the softening of cassava during soaking) by which the progress of the initial fermentation is normally judged. Instrumental measurement of cassava hardness confirmed that the processes were equivalent within experimental limits. The four soaking processes had no significant effect on the water content of foofuoo, nor did this change during storage. Processing did affect the pH, total titratable acidity and microbial profiles. Analysis of the aqueous extracts from the processes showed that the glucose present in the fresh cassava was fermented into a mixture of acetic, butyric, isobutyric and lactic acids with some ethanol. The lowering of the pH reduced the number of Enterobacteriaceae to the limit of detection and also affected the types of microbe present. The different processes also affected the removal of cyanogens from the product and the processes at 20 degrees C and 35 degrees C led to unacceptable levels of cyanogens (mainly cyanohydrin) in foofuoo.

Dahniya,-M-T; Jalloh,-A; Ezumah,-H-C 1994 Intercrop yields of cassava and rice as influenced by cassava variety and population. Acta-Horticulturae. 380: 194-199

Abstract: In a field trial in 1989-90 at Njala, Sierra Leone, cassava cv. Cocoa (local) and 80/40 (improved) were planted at 6666, 10 000, 13 333 or 16 666 plants/ha and 4 weeks after planting rice cv. Rok 16 was sown in the cassava crop. Cassava root yield was significantly higher in cv. 80/40 (17.2 t/ha) than Cocoa (4.1 t). Cassava yield was not significantly affected by intercropping with rice. Tuberous root yield increased with increase in plant population. Rice grain yield was unaffected by cassava cultivar and it decreased with increase in cassava population. Land equivalent ratio (LER) was >1 in all intercropping systems. LER was highest when rice was intercropped with cassava at 6666 plants/ha (1.85 for 80/40 and 1.73 for Cocoa). LER decreased with increase in cassava population.

Jalloh A 1998 Cassava plant population and leaf harvesting effects on the productivity of cassava-rice intercrop on the upland in Sierra Leone 1998 TROPICAL AGRICULTURE 75 (1-2): 67-71.

Abstract: An experiment was conducted to determine the appropriate cassava plant population to be intercropped with rice and the time of first harvesting of the cassava leaves for improved productivity of the intercrops. The cassava variety 80/40 was planted at four plant populations (3333, 6666, 10 000, and 13 333 plants ha⁻¹) in mid-May of 1996 on the upland in Sierra Leone. The cassava was intercropped with the rice variety Rok16 at a spacing of 25 cm x 25 cm one month later. For each of the cassava populations, there were four leaf harvesting regimes: no leaf harvesting and first leaf harvesting at two, three, and four months after planting (MAP). Subsequent leaf harvesting was done after every two months. A total of three leaf harvests were carried out for each regime. The results revealed that root and leaf yield of cassava did not significantly increase after 10 000 plants ha⁻¹. Grain yield of rice decreased as was increased from 6666 to 13 333 plants ha⁻¹. Harvest- intercropped cassava plant population was increased from 6666 to 13 333 plants ha⁻¹. Harvesting the cassava leaves at 2 and 3 MAP which was at mid-vegetative stage and panicle initiation stage of intercropped rice, respectively, resulted in similar rice grain yield which was significantly higher than when first leaf harvesting was at 4 MAP cassava, which was at late flowering stage of the rice. Tuberous root yield of cassava increased as the time of first leaf harvesting was delayed from 2 to 4 MAP. The highest net return was obtained when rice was intercropped with 10 000 cassava plants and leaf harvesting started at 3 MAP.

Jalloh A 1998 Cassava plant population and leaf harvesting effects on the productivity of cassava-rice intercrop on the upland in Sierra Leone. TROPICAL AGRICULTURE 75 (1-2): 67-71 JAN-APR

Abstract: An experiment was conducted to determine the appropriate cassava plant population to be intercropped with rice and the time of first harvesting of the cassava leaves for improved productivity of the intercrops. The cassava variety 80/40 was planted at four plant populations (3333, 6666, 10 000, and 13 333 plants ha⁻¹) in mid-May of 1996 on the upland in

Sierra Leone. The cassava was intercropped with the rice variety Rok16 at a spacing of 25 cm x 25 cm one month later. For each of the cassava populations, there were four leaf harvesting regimes: no leaf harvesting and first leaf harvesting at two, three, and four months after planting (MAP). Subsequent leaf harvesting was done after every two months. A total of three leaf harvests were carried out for each regime. The results revealed that root and leaf yield of cassava did not significantly increase after 10 000 plants ha⁻¹. Grain yield of rice decreased as was increased from 6666 to 13 333 plants ha⁻¹. Harvest- intercropped cassava plant population was increased from 6666 to 13 333 plants ha⁻¹. Harvesting the cassava leaves at 2 and 3 MAP which was at mid-vegetative stage and panicle initiation stage of intercropped rice, respectively, resulted in similar rice grain yield which was significantly higher than when first leaf harvesting was at 4 MAP cassava, which was at late flowering stage of the rice. Tuberos root yield of cassava increased as the time of first leaf harvesting was delayed from 2 to 4 MAP. The highest net return was obtained when rice was intercropped with 10 000 cassava plants and leaf harvesting started at 3 MAP.

Jalloh,-A; Dahniya,-M-T; Ezumah,-H-C 1994 Production of cassava-rice intercrop as influenced by cassava variety and time of introducing rice into cassava. *Acta-Horticulturae*. 380: 200-204

Abstract: In a field trial in 1989/90 at Njala, Sierra Leone, cassava cv. 80/40 (improved) and Cocoa (local) were planted at 10 000 plants/ha and rice cv. Rok 16 was intercropped into the cassava at 2, 4 or 6 weeks after planting cassava. Cv. 80/40 gave higher yields than Cocoa and cassava tuberous root yield increased the later the rice was introduced. Rice grain yield decreased with delay in sowing date. At each sowing date, rice yield was higher when sown alone than intercropped and was unaffected by cassava cultivar. Land equivalent ratio increased with delay in rice sowing. It was recommended that rice should be introduced between 4 and 6 weeks after planting cassava.

Jalloh, A; Dahniya, M T 2000 Productivity of cassava as influenced by time of intercropping cassava with rice in Sierra Leone: 1. Leaf production and yield. *African-Journal-of-Root-and-Tuber-Crops*. 4(1): 24-29

Abstract: A cassava/rice intercropping field trial was conducted at Njala in Sierra Leone during the 1990/91 cropping season and repeated during the 1993/94 cropping season. During the 1990/91 cropping season, an improved cassava variety and a local cassava variety were each intercropped with rice at four different sequences: the same date, 2, 4 and 6 weeks after planting cassava. During the 1993/94 season only the improved cassava variety was intercropped with rice on the same date and then 4 and 8 weeks after planting. Destructive sampling of five plants per plot was done bimonthly starting at 2 months after planting. The plants were detopped at about 20 cm below the apex. The results showed that in the 1990/91 season, the improved cassava variety had a wider canopy and higher number of leaves than the local variety and for both varieties optimum leaf number was produced at 6 months after planting. During the two cropping seasons, canopy width, leaf area, leaf number, leaf area index, and leaf yield of intercropped cassava were adversely affected when cassava and rice were intercropped on the same date. There was a significant improvement in these characters when rice was intercropped with 4 week old cassava. Cassava intercropped with rice at either 4 or 8 WAP produced similar leaf yield like sole cassava. However, sole cassava produced its highest fresh leaf yield at 6 MAP while all intercropped cassava had their highest fresh leaf yield at 12 MAP.

Jalloh, A; Dahniya, M T Productivity of cassava as influenced by time of intercropping cassava with rice in Sierra Leone: 2. Root development and yield. *African Journal of Root and Tuber Crops*. 4(1): 30-34

Abstract: Cassava and rice were intercropped in a field trial at Njala in Sierra Leone during two cropping seasons. During the 1990/91 cropping season an improved cassava variety with a relatively wider canopy and a local cassava variety were grown separately at a plant population of 10,000 plants per hectare and intercropped with rice at four different sequences: on the same date, and then 2, 4 and 6 weeks after planting cassava. During the 1993/94 cropping season, the improved cassava variety was grown at a plant population of 6666 plants/ha and intercropped with rice on the same date 4 and 8 weeks after planting (WAP). The improved cassava variety outyielded the local variety. Cassava intercropped with rice on the same date produced the lowest number of roots per plant. Delaying the introduction of rice by 4 or 8 weeks after planting resulted in intercropped cassava producing similar root number as sole cassava. At 2 months after planting (MAP), all roots were under 1 cm in diameter. Cassava intercropped with rice at 4 WAP, like sole cassava, already had marketable roots at 4 MAP. At 6 MAP, at least 50% of the roots were marketable. The roots had grown up to 9 cm in diameter at 12 MAP, but the majority of the roots were between 3 and 5 cm in diameter. Total fresh and dry root yield of cassava intercropped with rice at either 4 or 8 WAP was similar to that of sole cassava. Land equivalent ratio (LER) indicates that intercropping rice with 4 week old cassava is most beneficial.

JAMES BD, FOFANAH M 1992 POPULATION-GROWTH PATTERNS FOR PHENACOCCLUS-MANIHOTI MAT-FERR ON CASSAVA IN SIERRA-LEONE. TROPICAL PEST MANAGEMENT 38 (1): 89-92

Abstract: The population growth pattern of the cassava mealybug *Phenacoccus manihoti* Mat-Ferr was studied over two population cycles of the pest in Freetown, Sierra Leone. The numbers and rate of dispersal of the insect were higher and the damage it produced more severe in the dry season than in the rainy season. During the rainy season the mealybug population consisted mainly of adults. Even though rain is an important known abiotic natural control factor for the pest the decline in the insect's numbers started before the rainy season. This was attributed to reduction in the carrying capacity of the habitat. The indigenous natural enemies adopted the pest as a food source but did not control its population growth. The other mealybugs observed on the crop, *P. madeirensis* (Green) and *Ferrisia virgata* (Cockerell) were economically insignificant.

Lahai BN An evaluation of the level of female participation in cassava and sweet potato on-farm trials and demonstrations in Sierra Leone **ISHS Acta Horticulturae 380: [Symposium on Tropical Root Crops in a Developing Economy](#)**

Abstract: The study evaluated the level of female participation in cassava and sweet potato on-farm trials and demonstrations (TADs) in two (Njala and Magbosi) of the six operational zones of the Institute of Agricultural Research (IAR) in Sierra Leone, utilizing interviews with 34 women farmers. The study revealed that majority of the women knew the number of varieties in their previous year's TADs as well as the overall objective of the on-farm research. However, their knowledge about the specific objectives varied, with more women having full knowledge of them in Magbosi (52%) than in Njala zone (44.4%). Most of them also had no or partial knowledge about the names of the varieties in the TADs. The decision to cooperate in the on-farm research was the prerogative of the husband, who usually sought the concurrence of their wives. Women were, however, little involved in the final decision regarding trial location. Also, even though they contributed significantly to the labor for on-farm research, the focus of the extension instructors was on their husbands. The chi-square test revealed significant relationships between participation and age, educational status, and marriage type. Based on the results, a number of conclusions and recommendations are made.

Lahai MT, George JB, Ekanayake IJ 1999 Cassava (*Manihot esculenta* Crantz) growth indices, root yield and its components in upland and inland valley ecologies of Sierra Leone. JOURNAL OF AGRONOMY AND CROP SCIENCE-ZEITSCHRIFT FUR ACKER UND PFLANZENBAU 182 (4): 239-247

Abstract: Cassava is predominantly an upland crop that is also cultivated in inland valley swamps (IVS). Identifying physiological traits that can withstand excess moisture stress can aid in the selection and use of stable cassava cultivars in IVS. Three cassava cultivars were evaluated for growth and yield in the upland and IVS ecologies in the 1993-94 crop seasons using a randomized complete block design. In the upland, 80/40 outyielded 87/29 and 'coco', while in the IVS, 87/29 had the highest yield. Highest yielding cultivars in each ecology also had the highest tuberous root bulking rate (TBR), dry matter (DM) production, crop growth rate (CGR), relative growth rate, net assimilation rate (NAR), leaf area index, leaf production rate and leaf life. Positive correlations between these parameters and tuberous root yield were noted. High yield of 87/29 in IVS was partly due to its low tuberous root rotting. High root rotting in 80/40 was partly as a result of the greater depth of tuberous roots in the soil (0.3-0.6 m) as compared to the other cultivars (0.15-0.3 m) where roots were in contact with stressful water levels earlier than others. The yield and yield components, growth and leaf characters were all drastically reduced when the cultivars were grown in IVS as compared to upland. For example, root yields of 'coco', 87/29 and 80/40 were reduced by 53 %, 60 % and 92 %, respectively, in IVS. Selection of cassava cultivars with longer leaf life and leaf area maintenance leading to high CGR, TBR, NAR and harvest index (in IVS and upland), coupled with a shallow tuberous root formation zone (in IVS) can give higher root and leaf yields in the two ecologies.

Rhodes ER. 2003 Trends in food crop production in Sierra Leone and options for meeting food energy requirements JOURNAL OF SUSTAINABLE AGRICULTURE 22 (4): 125-142.

Abstract: Changes in the production of major food crops, available calories and protein for human consumption in Sierra Leone over a ten year period were studied. Estimates were made of nutrients taken up by harvested produce and present in crop residues. Plant sources provided 1,840 kcal/caput/day to 2,041 kcal/caput/day accounting for about 96% of total available calories. Rice, maize, millet, sorghum, cassava, sweet potato and groundnut provided a total of 1,084

kcal/caput/day to 1,305 kcal/caput/day. The difference between available calories and the minimum requirement in 1996 was 363 kcal/caput/day. Between 1987 and 1996 available calories from rice declined from 978 kcal/caput/day to 876 kcal/caput/day, while that from cassava increased from 90 kcal/caput/day to 205 kcal/caput/day. Rice was the most important supplier of proteins; it provided 16.4 g/caput/day to 18.9 g/caput/day. The data indicated that large amounts of nitrogen, phosphorus and potassium were removed by the crops from cultivated soils. Use of high yielding cassava and rice varieties with little or no fertilizers is a low input option that would bridge about 94% of the minimum energy gap. To minimize nutrient mining and completely fill the gap, these varieties would have to be used in conjunction with good soil management practices. (C) 2003 by The Haworth Press, Inc. All rights reserved.

Zannou ID, de Moraes GJ, Ueckermann EA, Oliveira AR, Yaninek JS, Hanna R 2006 Phytoseiid mites of the genus *Neoseiulus* Hughes (Acari : Phytoseiidae) from sub-Saharan Africa. INTERNATIONAL JOURNAL OF ACAROLGY 32 (3): 241-276 SEP 2006

Abstract: Thirty phytoseiid mite species of the genus *Neoseiulus* Hughes are reported from sub-Saharan Africa. Ten of these species are described for the first time and 14 nominal species are redescribed. Most of the species were collected from cassava groves in tropical Africa and from other habitats in South Africa. A key is included to distinguish these species and six other species known to occur in the region but not evaluated in this study.

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Thomas, H. M. 1972. Some aspects of food and nutrition in Sierra Leone. *World Review of Nutrition and Dietetics* 14:48–58.

Cocoa and Coffee

HAQUE I, GODFREYSAMAGGREY W 1980 NUTRITIONAL SURVEY OF COFFEE AND CACAO GROVES IN SIERRA-LEONE COMMUNICATIONS IN SOIL SCIENCE AND PLANT ANALYSIS 11 (5): 485- 505

KASSIM A 1992 THE EFFECT OF KOCIDE-101 AND KOKOTINE ON COCOA REHABILITATION IN THE EASTERN REGION IN SIERRA-LEONE. TROPICAL PEST MANAGEMENT 38 (2): 206-209

Abstract: Most cocoa plantations in the eastern region of Sierra Leone are ageing, with a gradual drop in the yield. The main problem is due to high pest and disease incidence. A trial to determine the effect of Kocide 101 (copper oxide) and Kokotone (Lindane) on rehabilitating (bringing back into bearing) the old plantations was carried out in a site spreading in the three districts of Kailahun, Kenema, and Kono. The profitability analysis showed that a rehabilitated tree produced about 94% more healthy pods than a non-rehabilitated tree.

PEPERKAMP G 1984 SPATIAL CONSTRAINTS AND THE FUNCTIONING OF A MARKETING SYSTEM, EXEMPLIFIED BY THE MARKETING OF COFFEE AND COCOA IN SIERRA-LEONE. TIJDSCHRIFT VOOR ECONOMISCHE EN SOCIALE GEOGRAFIE 75 (3): 186-195

Cowpea

Amara DS, Sanginga N, Danso SKA, Suale DS 1996 Nitrogen contribution by multipurpose trees to rice and cowpea in an alley cropping system in Sierra Leone. *AGROFORESTRY SYSTEMS* 34 (2): 119-128

Abstract: In an alley cropping experiment, a study was carried out on N₂ fixation by *Gliricidia sepium*, nitrogen (N) accumulation by prunings of *Gliricidia*, *Senna siamea* (formerly *Cassia siamea*) and *Gmelina arborea*, and the N contribution to associated crops of rice and cowpea.

Total N accumulated by the hedgerow trees ranged from 297-524 kg N ha⁻¹ on average but varied between tree species and depended on the growing season. *Gliricidia sepium* accumulated 370 kg N ha⁻¹ on average and more than half of this came from fixation. *Senna siamea* and *Gmelina arborea* served as reference trees for estimating N₂ fixation. The estimates of N₂ fixation using *Gmelina* as a reference gave higher estimates than those using *Senna*.

Although the dry matter and nitrogen yields of prunings from the hedgerow trees were high, their relative nitrogen contribution to the associated crops was generally low ranging from 5 to 29%. Higher crop yields and nitrogen contribution were observed with *Gliricidia sepium* prunings. The low N contribution from prunings was attributed to the lack of synchronization between the N released from the prunings and the crop's demand for N.

GODFREYSAMAGGREY W, FRANCIS BJ, KAMARA CS 1976 PROTEIN EVALUATION OF COWPEA (*VIGNA-UNGUICULATA*) AND BENNISEED (*SESAMUM-INDICUM*) FROM SIERRA LEONE. *TROPICAL SCIENCE* 18 (3): 147-154

HAQUE I, GODFREYSAMAGGREY W. 1980 RESPONSE OF COWPEA (*VIGNA-UNGUICULATA*) TO PHOSPHORUS SOURCES OF DIFFERENT CITRATE SOLUBILITY IN SIERRA-LEONE. *ZEITSCHRIFT FUR ACKER UND PFLANZENBAU-JOURNAL OF AGRONOMY AND CROP SCIENCE* 149 (1): 14-20

KAMARA CS 1981 EFFECTS OF PLANTING DATE AND MULCHING ON COWPEA IN SIERRA-LEONE. *EXPERIMENTAL AGRICULTURE* 17 (1): 25-31

KARIM AB, SAVILL PS, RHODES ER 1991 THE EFFECT OF YOUNG *LEUCAENA-LEUCOCEPHALA* (LAM) DEWIT HEDGES ON THE GROWTH AND YIELD OF MAIZE, SWEET-POTATO AND COWPEA IN AN AGROFORESTRY SYSTEM IN SIERRA-LEONE. *AGROFORESTRY SYSTEMS* 16 (3): 203-211

Abstract: An investigation was undertaken at Senehun - Kamajei, a high rainfall region in Sierra Leone, to assess the effects of *Leucaena leucocephala*, on the growth and productivity of maize, cowpea and sweet potato. The experiment was laid out in a completely randomised design with four replicates of each treatment. The treatments and controls were: (i) pure crops of maize, cowpea, sweet potato, *Leucaena* clean weeded and unweeded and (ii) intercrops of *Leucaena* with the food crops, both (iii) with and without applied fertilizers after the first year. The growth of *Leucaena* was slow but nevertheless tended to reduce grain yields of maize, and tuber and vine yields of sweet potato in the rows in the immediate vicinity of the trees, especially in the nitrogen-treated plots. The maize, in particular, caused an improvement in the early height growth of the trees.

Groundnut

DASGUPTA DK 1975 EFFECTS OF CYCOCEL ON CROP PLANTS IN SIERRA-LEONE .1. **GROUNDNUT** (*ARACHIS-HYPOGAEA*) *EXPERIMENTAL AGRICULTURE* 11 (3): 209-213

SESAY A 1992 PLANT INFECTION AND YIELD LOSS ASSOCIATED WITH *CERCOSPORA* LEAF SPOTS OF GROUNDNUT (*ARACHIS-HYPOGAEA* L) IN SIERRA-LEONE. *TROPICAL PEST MANAGEMENT* 38 (1): 52-55

Abstract: Infection and yield loss induced by groundnut leaf spots were determined with benomyl during the 1989 and 1990 crop seasons under natural disease pressure in the field in Sierra Leone. Weather conditions in both years were highly favourable to leaf spot infection and development. In 1989 benomyl, applied at weekly intervals and at the rate of 0.15 kg a.i. ha⁻¹ for a total of 10 applications, effectively controlled leaf spots and increased both pod and haulm yields by 85%. An estimated potential pod yield loss of 46% was recorded, indicating the importance of the diseases as major constraints to

groundnut production in Sierra Leone. In 1990, however, a higher level of leaf spots severity was observed causing extensive damage of the foliage. Benomyl, applied at bi-weekly intervals and at the rate of 0.225 kg a.i. ha⁻¹ for a total of five applications failed to effectively control the diseases, increasing pod yield by only 27%.

Sesay A 1997 **Weed growth and groundnut (*Arachis hypogaea* L.) performance in response to timing and frequency of weeding** in Sierra Leone. TROPICAL AGRICULTURE 74 (3): 221-225

Abstract: A two-year (1991 and 1992) field study was conducted at Njala in the forest-savanna transitional zone of southern **Sierra Leone** to examine the effects of timing and frequency of weed removal on **groundnut** (*Arachis hypogaea* L.) yield and weed growth. Removing weeds once, at 10, 15, 20, 25, or 30 days after sowing (DAS), twice at 15 and 25 DAS, or three times at 15, 25, and 40 DAS resulted in significantly ($P < 0.01$) larger **groundnut** pod yield. Weeding also significantly ($P < 0.01$) reduced weed biomass in the weeded plots relative to the unweeded plots. Calculated pod yield reductions due to uncontrolled weed growth was 75 and 55% in 1991 and 1992, respectively. The number of pods per plant and kernel weight contributed to the pod yield differences among the weeding treatments. Weeding once at 20 DAS produced yields that were comparable to those of the clean-weeded control in both years.

Sesay A, Yarmah A 1996 Growth, yield performance and market quality of groundnut (*Arachis hypogaea*) as affected by cropping season in southern Sierra Leone. JOURNAL OF AGRICULTURAL SCIENCE 127: 201-206

Abstract: Traditionally, only one groundnut (*Arachis hypogaea*) crop is grown in the uplands during the rainy season (May-October) in Sierra Leone, with sowing starting at the beginning of the rains. However, a recent trend among groundnut farmers is to sow a second crop in September after harvesting the first crop. Thus a system comprising a first (major) and a second (minor) cropping season is being adopted, with the second season crop having to depend largely on moisture stored in the soil. Experiments were conducted in 1993 at the Institute of Agricultural Research Experimental Farm, Njala, to assess the agronomic potential of growing two crops a year. Crop phenology, growth and productivity were strongly influenced by cropping season. Pod yield ranged from 1.63 to 2.58 and from 1.16 to 1.95 t ha⁻¹ in the major season, declining to 0.72-1.29 and 0.57-1.07 t ha⁻¹ in the minor season. Haulm yield, number of mature pods, crop growth rate and partitioning were lower in the minor season by 58, 57, 40 and 13 %, respectively. However, kernel quality was higher in the minor season. The results suggest that the growing of two groundnut crops in the uplands is a potentially viable management option in Sierra Leone, and could represent a more efficient utilization of the growing period.

Maize

Haque I. 1979 TIMING THE APPLICATION OF N TO MAIZE IN SIERRA-LEONE
EXPERIMENTAL AGRICULTURE 15 (3): 247-251 1979

KARIM AB, SAVILL PS, RHODES ER 1993 THE EFFECTS OF BETWEEN-ROW (ALLEY WIDTHS) AND WITHIN-ROW SPACINGS OF GLIRICIDIA-SEPIUM ON ALLEY-CROPPED MAIZE IN SIERRA-LEONE - GROWTH AND YIELD OF MAIZE
AGROFORESTRY SYSTEMS 24 (1): 81-93.

Abstract: The effects of spacings between hedgerows (alley widths) and the spacings of trees within hedgerows of *Gliricidia sepium* on growth and grain yield of maize were investigated at Senehun in southern Sierra Leone. Four between-row spacings (2, 4, 6 and 8 m) were combined with three within-row spacings (0.25, 0.50 and 1.00 m) in a split block design. Maize, at densities of 20,000, 40,000 and 53,333 plants ha⁻¹, was established in the alleys and also as pure crops. N, P and K fertilizers were applied to all plots before pruning of the trees began. When pruning started, only the pure maize plots received fertilizer; prunings from the hedgerows were returned to the appropriate alleys in the other plots.

Plots with the highest maize populations consistently gave the best yields before pruning started, but lower populations gave improved yields after pruning. Yields of maize increased with increasing alley widths before the start of pruning, after which the narrower alleys of 2 and 4 m outyielded the wider ones by almost double, probably because of the large amount of nutrients applied in prunings. Lack of light limited grain yields before the start of pruning, when there was some shading by the hedgerows. Alleys of 2-4 m wide, planted no closer than 0.50 m within rows, resulted in more than twice the yields of maize than in the 8-m alleys planted at 0.25 m within rows, once the hedgerows were well established and were being managed.

KARIM AB, SAVILL PS, RHODES ER 1991 THE EFFECT OF YOUNG LEUCAENA-LEUCOCEPHALA (LAM) DEWIT HEDGES ON THE GROWTH AND YIELD OF MAIZE, SWEET-POTATO AND COWPEA IN AN AGROFORESTRY SYSTEM IN SIERRA-LEONE. AGROFORESTRY SYSTEMS 16 (3): 203-211 1991

Abstract: An investigation was undertaken at Senehun - Kamajei, a high rainfall region in Sierra Leone, to assess the effects of *Leucaena leucocephala*, on the growth and productivity of maize, cowpea and sweet potato. The experiment was laid out in a completely randomised design with four replicates of each treatment. The treatments and controls were: (i) pure crops of maize, cowpea, sweet potato, *Leucaena* clean weeded and unweeded and (ii) intercrops of *Leucaena* with the food crops, both (iii) with and without applied fertilizers after the first year.

The growth of *Leucaena* was slow but nevertheless tended to reduce grain yields of maize, and tuber and vine yields of sweet potato in the rows in the immediate vicinity of the trees, especially in the nitrogen-treated plots. The maize, in particular, caused an improvement in the early height growth of the trees.

Haque I. 1979 TIMING THE APPLICATION OF N TO MAIZE IN SIERRA-LEONE EXPERIMENTAL AGRICULTURE 15 (3): 247-251 1979

OIL PALM

Burlingame, B. 2003. The food of Near East, North West and Western African regions. ASIA PACIFIC JOURNAL OF CLINICAL NUTRITION, 12 (3): 309-312

Abstract: Among the countries that can be classified as Near East Africa, North West Africa, and Western Africa, there is a great diversity of foods and dietary patterns. Prevalence of undernourishment as defined by FAO using dietary energy supply data, varies dramatically among these countries, with Tunisia in the lowest prevalence category (<2.5%), and Sierra Leone in the highest prevalence category (>35%). Throughout the 1960's, the dietary energy supply of North West African and Western African countries was similar. However, since the 1970s a great and consistent improvement has been seen in North and North West African countries. Both the proportion and number of undernourished in North Africa is now very similar to that of North America. Oil use, energy from fat, and protein from plant versus animal sources account for a large part of the food pattern differences between countries in these regions. Using Tunisia and Sierra Leone as examples again, dietary diversity as measured by the percentage of energy from foods other than starchy staples, is about 50% in the former, while in the latter, it is only 36%. Fatty fruits such as olives, cocoa and palm fruit have a special role in both the diet and the economies of the region.

Hayati, A; Wickneswari, R; Maizura, I; Rajanaidu, N. 2004. Genetic diversity of oil palm (*Elaeis guineensis* Jacq.) germplasm collections from Africa: implications for improvement and conservation of genetic resources. THEORETICAL AND APPLIED GENETICS, 108 (7): 1274-1284

Abstract: A total of 723 accessions of oil palm (*Elaeis guineensis* Jacq.) from 26 populations representing ten countries in Africa and one *Deli dura* family were screened for allelic variation at seven enzyme loci from six enzyme systems using starch gel electrophoresis. On average, 54.5% of the loci were polymorphic (0.99 criterion). The average and effective number of alleles per locus was 1.80 and 1.35, respectively. Mean expected heterozygosity was 0.184, with values ranging from 0.109 (population 8, Senegal) to 0.261 (population 29, Cameroon). The genetic differentiation among populations was high ($F_{ST}=0.301$), indicating high genetic divergence. The calculation of F_{ST} by geographic zones revealed that the high F_{ST} was largely due to F_{ST} among populations in West Africa, suggesting diversifying selection in this region. The mean genetic distance across populations was 0.113. The lowest genetic distance (D) was observed between population 5 from Tanzania and population 7 from the Democratic Republic of the Congo (0.000) and the highest was found between population 4 from Madagascar and population 13 from Sierra Leone (0.568). The total gene flow across oil palm populations was low, with an Nm of 0.576, enhancing genetic structuring, as evident from the high F_{ST} values. UPGMA cluster analysis revealed three main clusters; the western outlying populations from Senegal and Sierra Leone were in one cluster but separated into two distinct sub-clusters; the eastern outlying populations from Madagascar were in one cluster; the populations from Angola, Cameroon, The Democratic Republic of the Congo, Ghana, Tanzania, Nigeria and Guinea were in one cluster. The *Deli dura* family seems to be closely related to population 6 from Guinea. Oil palm populations with high

genetic diversity-i.e. all of the populations from Nigeria, Cameroon and Sierra Leone, population 6 of Guinea, population 1 of Madagascar and population 2 of Senegal should be used in improvement programmes, whereas for conservation purposes, oil palm populations with high allelic diversity (A(e)), which include populations 22 and 29 from Cameroon, populations 39 and 45 from Nigeria, population 6 from Guinea, populations 5 and 13 from Sierra Leone and population 1 from Madagascar should be selected for capturing as much genetic variation as possible.

Maizura, I; Rajanaidu, N; Zakri, AH; Cheah, SC 2006. Assessment of genetic diversity in oil palm (*Elaeis guineensis* Jacq.) using Restriction Fragment Length Polymorphism (RFLP). GENETIC RESOURCES AND CROP EVOLUTION, 53 (1): 187-195.

Abstract: A total of 359 accessions of oil palm (*Elaeis guineensis* Jacq.) originating from 11 African countries (Nigeria, Cameroon, Congo DR, Tanzania, Angola, Senegal, Sierra Leone, Guinea, Ghana, Madagascar and Gambia) were characterized using the RFLP method using the standard Deli dura as the check. Genomic DNA from each sample was digested using five restriction enzymes and hybridized with four oil palm cDNA probes. Data were analyzed using Biosys-1 computer software to calculate the genetic variability parameters. In general, all the collections exhibited higher levels of diversity than the standard variety, Deli dura. The standard variety, Deli dura, lost 36 alleles as compared to the natural populations indicating a reduction in genetic variability. Material from Nigeria showed the highest mean number of alleles per locus (1.9) and percentage of polymorphic loci (67.2%). These findings, combined with others, suggest that Nigeria may be the center of diversity of wild oil palm. It further suggests that oil palm natural populations maybe possessing adequate genetic variability that are potentially useful for improvement programs.

WALKER, WM 1971 EFFECTS OF N, P, MG, K AND SOILS UPON OIL PALM YIELDS IN SIERRA-LEONE. TROPICAL AGRICULTURE, 48 (3): 23

Rice

Abo, ME; Alegbejo, MD; Sy, AA; Misari, SM. 2000. An overview of the mode of transmission, host plants and methods of detection of rice yellow mottle virus. JOURNAL OF SUSTAINABLE AGRICULTURE, 17 (1): 19-36

Abo, ME; Sy, AA; Alegbejo, MD. 1998. Rice Yellow Mottle Virus (RYMV) in Africa: Evolution, distribution, economic significance on sustainable rice production and management strategies. JOURNAL OF SUSTAINABLE AGRICULTURE, 11 (2-3): 85-111.

Abstract: Rice Yellow Mottle Virus is specific to Africa. It was first noticed in Kenya, East Africa in 1966. It is said to have come to the foreground with the introductions of exotic rice (*Oryza sativa* L.) from Asia into the continent. It is evident that the indigenous rices (*Oryza glaberrima* Steud., *O. longistaminata* Chev. et Roehr., *O. barthii* Chev., *Leersia* spp., *O. punctata* Kotsky et Steud.), are more tolerant of the virus. The virus belongs to the Sobemovirus group and is very stable and highly infectious. It is Very destructive and therefore threatening rice production in Africa. Thus, hypotheses on how it evolved, and information on its distribution, economic significance an sustainable rice production and management strategies are discussed.

Adesina, A., Zinnah, M. 1993: Technology characteristics, farmers' perceptions and adoption decisions: A tobit model application in Sierra Leone. Agricultural Economics, 9, 297-311.

Agyen-Sampong, M., S. Anoop, K. Sandu, M.P. Prakah-Asante, C.A. Jones, S.F. Dixon, W.A.E. Fannah, W.A.E. Cole, and H. M. Bernard, 1986: A Guide to Better Mangrove Swamp Rice Cultivation in the WARDA Region. WARDA Regional Mangrove Swamp Rice Research Station, Rokupr, Sierra Leone.

ADESINA, AA; ZINNAH, MM. 1993. TECHNOLOGY CHARACTERISTICS, FARMERS PERCEPTIONS AND ADOPTION DECISIONS - A TOBIT-MODEL APPLICATION IN SIERRA-LEONE. AGRICULTURAL ECONOMICS, 9 (4): 297-311.

Abstract: The objective of this paper is to test the hypothesis that farmer perceptions of technology-specific characteristics significantly condition technology adoption decisions. Earlier adoption studies have not considered this in the analysis of the

determinants of adoption decisions. The omission of farmers' evaluation of technology-specific attributes may bias the results of factors conditioning adoption choices. A Tobit model was used to test this hypothesis using a stratified random sample of 124 mangrove swamp rice farmers in Sierra Leone. The issue investigated is the adoption of improved mangrove swamp rice varieties. The estimated model results show that farmer perceptions of the technology-specific attributes of the varieties are the major factors determining adoption and use intensities. Indicators of adoption determinants traditionally used in adoption-diffusion studies were found not to be important in driving adoption decisions. Therefore, there is need for adoption studies to consider farmers' perceptions of technology-specific attributes in the assessment of technology adoption decisions.

AGYENSAMPONG, M. VARIETAL RESISTANCE IN RICE TO THE CRAB, SESARMA-HUZARDI, IN SIERRA-LEONE. INSECT SCIENCE AND ITS APPLICATION, 6 (3): 413-415

Akibo-Betts, D. T. and S. A. Raymundo. 1978. A handbook of insect pests of rice in Sierra Leone. Rice Research Station, Rokupr, Sierra Leone 1978:1-62. [Techn. Bull. No. 3. Rice Res. Stn, Rokupr, Kambia distr., Sierra Leone, W. Afr.; Zool. Rec. 1980]

Amara, DS; Sanginga, N; Danso, SKA; Suale, DS. 1996. Nitrogen contribution by multipurpose trees to rice and cowpea in an alley cropping system in Sierra Leone. AGROFORESTRY SYSTEMS, 34 (2): 119-128.

Abstract: In an alley cropping experiment, a study was carried out on N-2 fixation by *Gliricidia sepium*, nitrogen (N) accumulation by prunings of *Gliricidia*, *Senna siamea* (formerly *Cassia siamea*) and *Gmelina arborea*, and the N contribution to associated crops of rice and cowpea.

Total N accumulated by the hedgerow trees ranged from 297-524 kg N ha⁻¹ on average but varied between tree species and depended on the growing season. *Gliricidia sepium* accumulated 370 kg N ha⁻¹ on average and more than half of this came from fixation. *Senna siamea* and *Gmelina arborea* served as reference trees for estimating N-2 fixation. The estimates of N-2 fixation using *Gmelina* as a reference gave higher estimates than those using *Senna*. Although the dry matter and nitrogen yields of prunings of the hedgerow trees were high, their relative nitrogen contribution to the associated crops was generally low ranging from 5 to 29%. Higher crop yields and nitrogen contribution were observed with *Gliricidia sepium* prunings. The low N contribution from prunings was attributed to the lack of synchronization between the N released from the prunings and the crop's demand for N.

Baggie, I; Monde, S S; Jalloh, A B 1990. Effect of nursery management on performance of inland valley swamp rice in Sierra Leone. International-Rice-Research-Newsletter. 15(4): 20-21

Abstract: In field experiments in the 1988 wet season in Sierra Leone, rice cv. ROK11, ROK5 and ROK10 were sown randomly or in rows at 40 or 60 g seed/m², with no fertilizer or 40 kg N + 40 kg P + 40 kg K/ha on a clay soil (pH 3.9) on an upland site and then transplanted to an inland valley swamp at 2 seedlings/hill with 0.15 x 0.2 m hill spacing at 27 d after sowing. In cv. ROK11, 40 g seed/m² sown in rows with NPK gave the highest grain yield of 2.0 t; yield was lowest at 1.3 t with 60 g seed randomly sown without NPK. In cv. ROK5, 60 g seed randomly sown with NPK gave the highest yield of 2.4 t compared with the lowest yield of 1.7 t with 60 g seed randomly sown without NPK. In cv. ROK10 the highest grain yield of 2.2 t was achieved with NPK and either 40 g seed sown in rows or 60 g seed randomly sown and lowest at 1.4 t with 60 g seed sown in rows without NPK.

Baggie, I; Monde, S S; Jalloh, A B 1990. Effect of nursery management on performance of inland valley swamp rice in Sierra Leone. International-Rice-Research-Newsletter. 15(4): 20-21

Abstract: In field experiments in the 1988 wet season in Sierra Leone, rice cv. ROK11, ROK5 and ROK10 were sown randomly or in rows at 40 or 60 g seed/m², with no fertilizer or 40 kg N + 40 kg P + 40 kg K/ha on a clay soil (pH 3.9) on an upland site and then transplanted to an inland valley swamp at 2 seedlings/hill with 0.15 x 0.2 m hill spacing at 27 d after sowing. In cv. ROK11, 40 g seed/m² sown in rows with NPK gave the highest grain yield of 2.0 t; yield was lowest at 1.3 t with 60 g seed randomly sown without NPK. In cv. ROK5, 60 g seed randomly sown with NPK gave the highest yield of 2.4 t compared with the lowest yield of 1.7 t with 60 g seed randomly sown without NPK. In cv. ROK10 the highest grain yield of 2.2 t was achieved with NPK and either 40 g seed sown in rows or 60 g seed randomly sown and lowest at 1.4 t with 60 g seed sown in rows without NPK.

Baggie, I; Zapata, F; Sanginga, N; Danso, SKA. 2000. Ameliorating acid infertile rice soil with organic residue from nitrogen fixing trees. *NUTRIENT CYCLING IN AGROECOSYSTEMS*, 57 (2): 183-190.

Abstract: Residues from two nitrogen fixing trees, *Albizia zygia* and *Gliricidia sepium* and one non nitrogen fixing tree *Samania dinklagei* and their combination with 50% of rice husk, were evaluated for their effect on growth and yield of rice (*Oryza sativa*) varieties (Rok 10 and Rok 23) grown in an Oxisol collected from a rice paddy in Inland valley swamps of Sierra Leone, West Africa. Ground and dried residues were mixed with soil and labelled with N-15 ammonium sulfate (9.855% atom excess) at a rate of 10 mg N kg⁻¹ soil. The P-32 isotopic exchange method was used to determine the effect of organic residue incorporation on the bioavailable soil P status at five levels of P application. *Albizia zygia* and *G. sepium* had higher quality leaf litter (with relatively lower C/N, lignin/N and cellulose/N ratios) whereas *Semania dinklagei* and rice husk had high carbon, lignin and polyphenolic contents. Application of organic residue had positive effects on the soil available P status at varying degrees. Higher adsorption capacity, kinetic value and mean solution time of phosphates in solution were obtained with the *A. zygia*, and *G. sepium* residues. These values were lower with rice husk and *S. dinklagei* *Gliricidia sepium* and *A. zygia* contributed more nitrogen derived from organic residue than rice husk and *S. dinklagei* but the mixture of *A. zygia* and *G. sepium* with rice husk enhanced N utilization.

Bar, AR; Baggie, I; Sanginga, N. 2000. The use of *Sesbania* (*Sesbania rostrata*) and urea in lowland rice production in Sierra Leone. *AGROFORESTRY SYSTEMS*, 48 (2): 111-118.

Abstract: The suitability of *sesbania* (*Sesbania rostrata*) as green manure for lowland rice was evaluated in the Inland Valley Swamp (IVS) of Sierra Leone, and attempts were made to identify appropriate methods of its management in combination with urea. *Sesbania* - rice intercropping and *sesbania* - rice rotation treatments were compared with 60 kg N ha⁻¹ applied in two splits and 30 kg N ha⁻¹ as basal or top dressed to rice grown in the two cropping systems. The N-15 isotope dilution technique was used to quantify N uptake from the green manure and urea and its utilization by rice. Rotating 40-50 days old *sesbania* two days prior to transplanting and top dressing with 30 kg N ha⁻¹ as urea at nine weeks after transplanting gave highest rice grain yield (121% over the control without *sesbania* and urea). However intercropping *sesbania* with rice tended to increase N uptake and N fertilizer utilization more than the rotation treatments. The higher grain yield of rice in rotation despite lower N uptake than intercropping shows that other effects than only N explain the beneficial effect of *sesbania* on rice.

Bernard, H M 1988. The biology and control of *Paspalum vaginatum* (SW), a weed destructive to mangrove swamp rice in Sierra Leone. *Weedwatcher*, 4-5: 9

Abstract: Seeds of *P. vaginatum* did not germinate under laboratory conditions. *P. vaginatum* growth was characterized by a more rapid increase in shoot length and shoot, leaf and node production in soft-textured than in hard-textured mangrove swamp soil. Sprouted rhizomes did not emerge from planting depths of ≥ 5 cm and deep flooding reduced weed growth. Planting distances of 15 x 20 cm gave better weed control than distances of 20 x 20 cm and 25 x 25 cm for rice cv. ROK 5 and ROK 10. The former cultivar was more competitive against the weed. Slashing *P. vaginatum* followed by paraquat or glyphosate at 4 kg/ha gave the best control. Dalapon at 5-25 kg failed to control the weed. Glyphosate at 4 kg followed by burning or slashing followed by burning, before ploughing and puddling gave effective *P. vaginatum* control. These treatments gave better weed control between Apr. and June than in Mar. Ploughing and puddling the first year followed by 6 kg glyphosate and puddling the second year also gave effective *P. vaginatum* control..

Brandt, H; Jahnke, H E; Mechtel, M; Schulze, 1996. A Intensity aspects of rice production in West Africa - a case study from Sierra Leone. Working-Paper-Wirtschafts-und-Sozialwissenschaften-an-der-Landwirtschaftlich-Gartnerischen-Fakultat,-Humboldt-Universitat-zu-Berlin. 1996; (30): 25 pp.

Abstract: Countries in sub-Saharan Africa currently import about 25% of their food requirements. A brief review of research on agricultural and trade policies suggests either a purely 'green revolution' solution or the broader need for a stabilization and improvement of agricultural policies combined with more intensive production by tried and tested methods. The development potential of the Sierra Leone rice sector over the next 25 years is discussed and a case study in the Makeni district of north east Sierra Leone is used to show how, in cases where there is no information on the aggregate supply response of the agricultural sector, concrete proposals for intensification strategies can be made with the help of production

economic analyses. In addition Malassis model scenarios are used to make clear that comparatively slight technical improvements would make possible a considerable increase in production. The reasons for the current situation are outside the field of rice production.

CORK, A; AGYENSAMPONG, M; FANNAH, SJ; BEEVOR, PS; HALL, DR. 1991. SEX-PHEROMONE OF FEMALE AFRICAN WHITE RICE STEM BORER, MALIARPHA-SEPARATELLA (LEPIDOPTERA, PYRALIDAE) FROM SIERRA-LEONE - IDENTIFICATION AND FIELD TESTING. JOURNAL OF CHEMICAL ECOLOGY, 17 (6): 1205-1219.

Abstract: Analysis of ovipositor washings of female *Maliarpha separata* from Sierra Leone by high-resolution gas chromatography (GC) linked to a male electroantennograph (EAG) indicated the presence of three electrophysiologically active compounds. The GC retention times of these compounds were consistent with those of (Z)-9-tetradecen-1-ol, (Z,E)-9,12-tetradecadien-1-ol, and (E,E)-10,12-tetradecadien-1-ol. Analysis by EI and CI mass spectrometry of ovipositor washings confirmed these identifications and also indicated the presence of the saturated analog, tetradecan-1-ol. There was no evidence, from these analyses, of the corresponding aldehydes or acetates. The EAG-active compounds were present in the ovipositor washings in a ratio of approximately 2:3.5:1, with the major component constituting approximately 0.4 ng per ovipositor. GC-MS analysis of entrained female effluvia confirmed that the EAG-active compounds were released by virgin females. Field testing of the EAG-active compounds indicated that (Z,E)-9,12-tetradecadien-1-ol and (E,E)-10,12-tetradecadien-1-ol were attractive to male moths in ratios of between 9:1 and 39:1, while (Z)-9-tetradecen-1-ol was found to reduce trap catch when added to blends of the other two compounds.

DASGUPTA, DK. 1971. EFFECTS OF CYCOCEL ON LODGING AND GRAIN YIELD OF UPLAND AND SWAMP RICE IN SIERRA LEONE. EXPERIMENTAL AGRICULTURE, 7 (2): 157.

DASGUPTA, DKD. 1972. EFFECTS OF NITROGEN APPLICATION ON NITROGEN CONTENT OF GRAINS OF SWAMP RICE IN SIERRA-LEONE. EXPERIMENTAL AGRICULTURE, 8 (2): 155

Doering, O. ROK-5 Mangrove Rice Variety in Sierra Leone 1999. In: Methodological and Technological issues in Technology Transfer (Case study 29) Intergovernmental Panel on climate change.

Abstract: The development of a new mangrove rice variety in Africa is an important case study of technology development and diffusion that relates to the opportunity for agriculture to contribute to increased output of food while at the same time reducing the impact of agriculture on global climate change per unit of food produced. This development involved both international cooperation and a critical commitment of local resources to be successful and has proved itself to be an important contributor to increasing rice production in Sierra Leone with important potential contributions to similar areas in Africa.

The impact was an increase in rice output from mangrove rice production where climate change was beginning to reduce yields from this agricultural resource. This led to improved conditions for farmers and more rice available beyond farm-family subsistence for distribution and sale to local consumers. This case is replicable, but the key was the existence of local research and development capacity such as the Rokupr rice research station with a critical mass of competent staff. (Due to civil war, this institution is no longer a viable operation.) Its viability was also a result of the willingness of WARDA to give it the marginal resources to do the job that the government of Sierra Leone was unwilling or unable to supply.

DRIES, I. 1991. DEVELOPMENT OF WETLANDS IN SIERRA-LEONE - FARMERS RATIONALITY OPPOSED TO GOVERNMENT POLICY. LANDSCAPE AND URBAN PLANNING, 20 (1-3): 223-229.

Abstract: Over 100 years of government development efforts to stimulate wet rice cultivation in the wetlands of Sierra Leone is reviewed. New technologies such as drainage of mangrove swamps, intensive drainage of inland swamps and mechanized soil management were unable to achieve the desired objectives, to make the country self-sufficient in rice. The introduction of these new technologies frequently had opposite results: acidification, drying out and economic disaster. Only those innovations which fitted into the traditional rice cultivation and which proved to be a success were adapted, namely transplanting methods and the construction of mounds to allow the growing of dryland crops in the wetlands during the dry season, but only after long-term adaptation and trying out by the farmers themselves, following which spontaneous adoption took place. This is substantiated by a case study carried out in inland swamps through Farming Systems Research methods.

Government policies appear to run contrary to the objectives of farmers, the former striving to reach national self-sufficiency in rice by introduction of large schemes and completely new and/or alien production systems, whereas the latter attempt to sustain their subsistence production levels through stepwise innovation. The suggestion is made that government in formulating its development policies should take into account the traditional knowledge system of farmers and stimulate participatory research. This would ultimately and more successfully lead to sustainable yield increases without deterioration of the physical environment.

Due JM, Karr GL. 1973. Strategies for Increasing Rice Production in Sierra Leone African Studies Review, 16: 23-71

FASHUYI, SA. 1981. OBSERVATIONS ON THE ECOLOGY OF BULINUS (PHYSOPSIS) GLOBOSUS (MORELET), B (BULINUS) FORSKALII (EHRENBERG) AND LYMNAEA-NATALENSIS (KRAUSS) IN RICE SWAMPS IN SIERRA-LEONE. JOURNAL OF MOLLUSCAN STUDIES, 47 (DEC): 328-333.

Fofie, A.S.Raymundo, S.A. 1979. Parasitic nematodes in continuously cropped uplands. International rice research newsletter. 4 (5):17-19.

FOMBA, SN. 1984. RICE DISEASE SITUATION IN MANGROVE AND ASSOCIATED SWAMPS IN SIERRA-LEONE. 1984. TROPICAL PEST MANAGEMENT, 30 (1): 73-81

FOMBA, SN. 1988. SCREENING FOR SEEDLING RESISTANCE TO RICE YELLOW MOTTLE VIRUS IN SOME RICE CULTIVARS IN SIERRA-LEONE. PLANT DISEASE, 72 (7): 641-642

Fomba, S N. 1988. Incidence of white tip nematode (*Aphelenchoides besseyi* Christie) in mangrove swamps at Rokupr, Sierra Leone. WARDA-Technical-Newsletter. 8(1): 12-13.

Abstract: A trial was conducted to assess the incidence of *Aphelenchoides besseyi*, in mangrove swamp rice in Sierra Leone. Twelve recommended and promising mangrove swamp rice varieties were tested. No white tip symptoms were observed in the field, however, 6 varieties had malformed panicles and grains. Nematodes were recovered from these diseased plants and from all the seed samples. Only the white tip nematode was recovered.

FOMBA, SN; SINGH, N. 1990. CROP LOSSES CAUSED BY RICE BROWN SPOT DISEASE IN MANGROVE SWAMPS OF NORTHWESTERN SIERRA-LEONE. TROPICAL PEST MANAGEMENT, 36 (4): 387-393

FOMBA, SN; SINGH, N. 1991. OBSERVATIONS ON THE INCIDENCE OF RICE BROWN SPOT, LEAF SCALD AND LEAF SMUT DISEASES IN A TIDAL MANGROVE SWAMP AT ROKUPR, NORTHWESTERN SIERRA-LEONE. TROPICAL PEST MANAGEMENT, 37 (4): 349-355.

Abstract: The ecological behaviour of *Cochliobolus miyabeanus* (Ito et Kurib.) Drechsl. ex Dast. (*Bipolaris oryzae* (Breda de Haan) Shoem.), causal agent of brown spot of rice (*Oryza sativa* L.), was investigated in a tidal mangrove swamp at Rokupr Experimental Farm, northwestern Sierra Leone. Disease increased where transplanting was delayed. This was probably due to the coincidence of flowering with favourable environmental conditions for disease development from November to February. Nitrogen fertilization at 40 kg N ha⁻¹ significantly ($P = 0.05$) reduced *C. miyabeanus* incidence in 1983, but not in 1984 and 1985 cropping seasons at the same site. Grain yields of ROK 5, a medium-duration improved rice cultivar (ca. 150 days) were significantly reduced in late-transplanted rice crops (September to November) in spite of adequate N fertilization. Mangrove mud was not an important source of *C. miyabeanus* propagules. Incidence of leaf scald caused by *Monographella albescens* (Thum) Parkinson, Sivanesan and Booth (*Microdochium oryzae* (Hashioka and Yokogi) Samuels and Hallet) and leaf smut caused by *Entyloma oryzae* Miyake were generally stimulated by N application.

Fomba, S N. 1996. Incidence and distribution of *Aphelenchoides besseyi* in mangrove rice in Sierra Leone and Guinea. Afro-Asian-Journal-of-Nematology. 6(2): 179-183

Abstract: A collection of 375 seed samples of both improved and farmer's local rice from north and southwestern Sierra Leone and Coyah District of Guinea were assessed for the incidence of *Aphelenchoides besseyi*. The nematode was found to be more widely distributed in 1988 seed samples than in 1989 and 1990 samples. Seed samples originating from tidal

mangrove swamp environments with two exceptions contained more nematodes per 100 rice seeds than those from associated mangrove or seasonally flooded grass/sedge swamp adjacent to the former.

Haque, I. 1977. Iron toxicity in Sierra Leone rice. *International Rice Research Newsletter*, 2: 10.

Haque, I. 1977. Zinc deficiency in Sierra Leone rice. *International Rice Research Newsletter*, 2: 23.

HAQUE, I; ODELL, RT; WALKER, WM; KAMARA, CS. 1979. MICRONUTRIENT CATION SURVEY OF LOWLAND RICE IN SIERRA-LEONE. *COMMUNICATIONS IN SOIL SCIENCE AND PLANT ANALYSIS*, 10 (6): 981-992

HAQUE, I; ODELL, RT; WALKER, WM; KAMARA, CS. 1981. MICRONUTRIENT CATION STATUS OF SOME LOWLAND SOILS USED FOR RICE PRODUCTION IN SIERRA-LEONE. *TROPICAL AGRICULTURE*, 58 (1): 81-88

HOOPER, DJ; IBRAHIM, SK. 1994. APHELENCHOIDES-NECHALEOS N-SP AND A-PARANECHEALEOS N-SP (NEMATODA, APHELENCHOIDIDAE) FROM RICE PLANTS. *FUNDAMENTAL AND APPLIED NEMATOLOGY*, 17 (2): 153-160.

Abstract: *Aphelenchoides nechaleos* n. sp. and *A. paranecchaleos* n. sp., originally from rice stems from Sierra Leone and Vietnam respectively, are described and figured. Their general appearance and biology are very similar to those of *A. besseyi* Christie, 1942 but the females of the new species have a single, simple tail mucro and a longer post-vulval sac; the males have more robust spicules with a hooked tip and a simple tail mucro. The two new species are almost identical in appearance but differ slightly in female tail shape and curvature of the male spicules. Both new species swim vigorously in water, are readily cultured on fungi and can survive drying to some extent.

JOOF, AE. 1980 INVESTIGATION OF THE SPATIAL DIFFUSION OF AGRICULTURAL INNOVATIONS IN SIERRA LEONE: THE CASE OF SWAMP RICE FARMING **PhD** (?), Columbia University

Abstract: Diffusion studies in Africa as in many other developing regions are still in their infancy. Although many of the diffusion research studies are rural agriculture oriented, yet the focus has been primarily on export crops. To bridge the gap in the paucity of studies on African agriculture, this study has focused on the diffusion dynamics of the staple food crop--rice.

Over the past three decades, Sierra Leone has been faced with the serious problem of rice shortage--its staple food and the most important domestic crop. Although many measures have been tried, yet the lag between demand and supply at the marketplace has remained largely an unresolved national problem.

This study is a attempt to help identify constraints in the production system and possible strategies for change and development planning. It traces the development patterns and trends in rice production that led to the present situation, the measures taken to introduce major agro-technological innovations, and the barriers obstructing the impact of such innovations on raising the productivity level of Sierra Leone rice farmers.

A field survey of 260 swamp rice farming families in various 'agricultural circles' was performed in the 1974/75 crop seasons. Diffusion dynamics framework was employed to describe and analyze data collected on swamp rice farming and associated agro-technological inputs. Hagerstrand's model of spatial diffusion, a widely used geographical theory, was one of the useful tools for conceptualization. Stages in the diffusion process, barriers and the spatial-temporal characteristics were discerned. The distance decay concept when applied to the study area showed that proximity to node (experimental stations) led to early use of agro-technologies. It is supported the hypothesis that swamp rice farming as an innovation will

spread rapidly in the source area where the idea originated and its intensity will diminish with the frictional effects of distance. It also showed that poor and less accessible farmers were deprived of such privileges.

The chi square tests conducted to show relationships between cultural and socio-economic variables supported the assumption that 'the percentage of farmers practicing swamp rice cultivation is directly related to (i) exposure to information and (ii) acceptance of social change.' Farmers' perceptions were instrumental in their behavioral change and their decisions to innovate and increase output. The results also indicated that the use of modern innovative techniques such as fertilizer, pesticides and herbicides, hybrid rice seed and machinery were directly related to the adoption of swamp rice farming. Significant decision making variables which influenced farmers in adopting technical changes were extra labor, human capital investment, wealth, radio communication, elite and local influential, cosmopolitaness and extension contact.

Parameters that could predict output were identified through a multiple regression analysis. They were farm size, seed cost, extra labor, 'agri-fair' attendance, pesticides, and participation in the swamp rice development scheme package programs.

To conclude, Sierra Leone farmers are receptive to change and economic incentives when the trade-off does not threaten their livelihood. However, there is need for better management and workable strategies to add dynamism to the diffusion-adoption processes over space and time.

JOHNNY, M; KARIMU, J; RICHARDS, P. 1981. UPLAND AND SWAMP RICE FARMING SYSTEMS IN SIERRA - LEONE - THE SOCIAL-CONTEXT OF TECHNOLOGICAL-CHANGE
AFRICA, 51 (2): 596-620

JONES RAD. 1991. CULTURAL AND FERTILIZER REQUIREMENTS FOR **RICE** PRODUCTION ON MANGROVE SWAMPS IN **SIERRA-LEONE**. INTERNATIONAL SYMP ON RICE PRODUCTION ON ACID SOILS OF THE TROPICS, JUN 26-30, 1989. RICE PRODUCTION ON ACID SOILS OF THE TROPICS - PROCEEDINGS OF AN INTERNATIONAL SYMPOSIUM : 139-143.

Jusu, M S 1999. Management of genetic variability in rice (*Oryza sativa* L. and *O. glaberrima* Steud.) by breeders and farmers in Sierra Leone. xv + 198 pp.

PhD Thesis, Landbouwniversiteit Wageningen. Netherlands.

Abstract: The development of appropriate rice varieties and local landrace management practices in the difficult cultivation conditions of northwestern Sierra Leone are considered. Studies on farmer low resource selections of *Oryza glaberrima*, and selections morphologically intermediate between *O. glaberrima* and *O. sativa* are also reported.

Kouassi, NK; N'Guessan, P; Albar, L; Fauquet, CM; Brugidou, C. 2005. Distribution and characterization of Rice yellow mottle virus: A threat to African farmers. PLANT DISEASE, 89 (2): 124-133

Kroma, M M 2002 The gender division of labor in rice post-harvest processing in Sierra Leone: implications for extension and technology development. Journal of Agricultural Education and Extension. 8(4): 181-194

Abstract: Gender is an important organizing principle in the production and post-harvest processing of rice in Sierra Leone. Gender relations shape access to technologies and information services that can benefit women in their productive activities. Because public sector extension has historically maintained a narrow focus on mainly production activities, the patterns of participation in rice processing and the gender barriers to information and technology access have largely remained invisible. This paper draws on an inland valley swamp rice production study in northern Sierra Leone to explore patterns of participation in relation to location and extension contact among the social actors in post harvest processing. It examines the nature of existing post-harvest technologies, and the labour and health implications for women. In concluding, it reflects on the implications of a gender and technology development focus for extension policy, and argues for participatory extension practice that incorporates women's interests, local skills, and knowledge as critical resources in post-harvest technology innovation..

LAWSON, RM. 1978. EMPLOYMENT, EFFICIENCY AND INCOME IN RICE PROCESSING-INDUSTRY OF SIERRA-LEONE. AFRICA, 48 (3): 309-311

Mahapatra, I.C. Bapat, S.R.1980. Soil fertility trials in farmers' fields in Sierra Leone. International rice research newsletter. 5: 19-20.

MANSOUR, AN; BAILLIS, KW. 1994. SEROLOGICAL RELATIONSHIPS AMONG RICE YELLOW MOTTLE VIRUS ISOLATES. ANNALS OF APPLIED BIOLOGY, 125 (1): 133-140.

Abstract: Serological studies on five isolates of RYMV collected from the Ivory Coast (IC), Sierra-Leone (SL), Niger (Nr), Kenya (K) and Nigeria (N) indicated that these isolates are serologically related. Gel double diffusion and direct ELISA tests showed that the five isolates could be arranged into three serological groups here designated RYMV-N, SL-IC and K-NR. However, the ISEM studies did not reveal any clear grouping of the heterologous isolates tested.

F. E. Nwilene, F.F. Williams, C.T. Ukwungwu Dakouo, D. Nacro, S. Hamadoun, A. Kamara, S.I. Okhidievbie, O. Abamu, F.J. Adam A. (2002) Reactions of differential rice genotypes to African rice gall midge in West Africa .International Journal of Pest Management 48:195-201

NYOKA, GC 1982. THE INFLUENCE OF FALLOW PERIOD ON WEED VEGETATION AND RICE YIELDS IN SIERRA-LEONE. TROPICAL PEST MANAGEMENT, 28 (1): 1-9

Parker, C. 1978. Report on a visit to Sierra Leone to advise on the problem of Paspalum vaginatum. Weed Research Organisation, Internal Report No. 129.

Richards, P. 2002. Wide crossing: The West Africa Rice Development Association in transition, 1985-2000. JOURNAL OF AFRICAN HISTORY, 43 (2): 362-364

Phelps, RH; Shand, CR. 1995. Brown leaf spot disease and fertilizer interaction in irrigated rice growing on different soil types. FERTILIZER RESEARCH, 42 (1-3): 117-121

Abstract: Studies have been undertaken in a 1000 ha area of irrigated rice (*Oryzica sativa*) at Caroni (1975) Limited to determine the effect of the fertilizer programme on-the incidence of important diseases. Over a period of three years higher levels of brown leaf spot (*Cochliobolus miyabeanus*) on rice varieties *Oryzica* 1 and *Oryzica* 5 on three different soil types were associated with increasing levels of leaf P, from a low of 0.149% of dry matter (DM) to a high of 0.396% DM. On the Washington silty clay loam series (Inceptisol) brown leaf spot incidence was lowest when leaf P was between 0.135% and 0.149% of DM. However, disease incidence was higher when leaf P levels fell to 0.133% of DM or rose above 0.149%, under conditions where N was more than adequate. The moderate levels of the disease experienced over the period had no effect on yield, as grain infection was minimal. The results support the conclusion that the incidence of brown leaf spot on irrigated rice at Caroni is influenced by sub-optimal levels particularly of P. Careful monitoring and management of P nutrition is seen as an important part in the overall strategy for controlling the disease.

Prakah-Asante, K., and D.S.C. Spencer, 1986: Mangrove swamp rice production in the Great Scarcies Area of Sierra Leone: socio-economic implications. Socio-Economic Survey Report Part 1, WARDA, Rokupr, Sierra Leone.

Richards P. 1995. The versatility of the poor: Indigenous wetland management systems in Sierra Leone *Geojournal* 35 (2)

Abstract Indigenous wetland management systems, rice cultivation, and technological change are described for two areas in Sierra Leone. Management involves knowledge-intensive versus capital-intensive manipulation of water and soil. Irrigation is as much "brain work" as it is "ground work". Sensitive observation and use is made of variable soil conditions up and down slopes. A suite of numerous rice varieties and supplementary crops is maintained and used as appropriate under different physical conditions. The paper also explores the reasons why certain technological changes such as the introduction of tractors in one area in the 1950s and the introduction of a specific rice cultivar in another area by the author in 1983 succeeded (ie persist without outside encouragement), while other innovations have disappeared.

Successful technologies were highly compatible with pre-existing patterns of thought, social relations, and ecological practices.

The cases contradict the view that development must shape landscape with machines on a massive scale. If the electronic future really is all about lightness, modularity, and the kind of standardization that permits maximal flexibility in combination and communication, then the poor, forced to dodge and weave with great mental agility on their refractory wetlands, are in touch with the future.

Richards, P 1997 *Toward an African green revolution? An anthropology of rice research in Sierra Leone*. Ed. Nyerges, A E *The ecology of practice: studies of food crop production-in-Sub-Saharan-West-Africa*. 201-252 Amsterdam, Netherlands: Gordon and Breach Publishers.

Abstract: A case study of rice research and its impact on the nodal country of the West African rice region, Sierra Leone, is presented. Some of the strengths and weaknesses of the Green Revolution approach to plant improvement in Africa are assessed. Alternative approaches are considered. The Green Revolution model for rice plant improvement is explored. Attempts to introduce the Green Revolution into Sierra Leone are outlined. The impact of the rice research programme on farming in Sierra Leone in the 1970s and 1980s is assessed.

Richards, P 2006 *The history and future of African Rice Food security and survival in a West African war zone*. *AFRIKA SPECTRUM*, 41 (1): 77-93

Abstract: The paper analyses farmer coping strategies under war-time conditions in Sierra Leone in order to identify why food-insecure farmers continue to value African Rice. African Rice has an important association with sokoihun (forest enclaves). These enclaves - written in the history of the landscape became once again important as war swept over rural communities in Liberia, Guinea and Sierra Leone in the 1990s. The sokoihun teach a lesson about innovation under adversity. War-affected rural populations might benefit from improving African Rice through genetic contribution from Asian Rice, reversing a mainstream institutional breeding strategy. In general, it is concluded that pro-poor plant improvement would benefit from careful contextual analysis and prior consultation with the food-insecure.

Rhodes ER 2003 *Trends in food crop production in Sierra Leone and options for meeting food energy requirements* *JOURNAL OF SUSTAINABLE AGRICULTURE* 22 (4): 125-142.

Abstract: Changes in the production of major food crops, available calories and protein for human consumption in Sierra Leone over a ten year period were studied. Estimates were made of nutrients taken up by harvested produce and present in crop residues. Plant sources provided 1,840 kcal/caput/day to 2,041 kcal/caput/day accounting for about 96% of total available calories. Rice, maize, millet, sorghum, cassava, sweet potato and groundnut provided a total of 1,084 kcal/caput/day to 1,305 kcal/caput/day. The difference between available calories and the minimum requirement in 1996 was 363 kcal/caput/day. Between 1987 and 1996 available calories from rice declined from 978 kcal/caput/day to 876 kcal/caput/day, while that from cassava increased from 90 kcal/caput/day to 205 kcal/caput/day. Rice was the most important supplier of proteins; it provided 16.4 g/caput/day to 18.9 g/caput/day. The data indicated that large amounts of nitrogen, phosphorus and potassium were removed by the crops from cultivated soils. Use of high yielding cassava and rice varieties with little or no fertilizers is a low input option that would bridge about 94% of the minimum energy gap. To minimize nutrient mining and completely fill the gap, these varieties would have to be used in conjunction with good soil management practices. (C) 2003 by The Haworth Press, Inc. All rights reserved.

Rhodes E.R 1988. *Africa — how much fertilizer needed: Case study of Sierra Leone. Nutrient Cycling in Agroecosystems*. 17, 101-118.

SANTANIELLO, V 1979. *TRANSFORMATION OF RICE PRODUCTION IN SIERRA-LEONE - APPLICATION OF COST-BENEFIT-ANALYSIS*. *RIVISTA DI ECONOMIA AGRARIA*, 34 (2): 341-380.

Spencer, S.C., 1975: *The Economics of Rice Production in Sierra Leone*: Part 2 Mangrove Swamp, Bulletin No. 2, Dept of Agricultural Economics and Extension, Njala University College, Sierra Leone.

Spencer, S.C., D. Byerlee 1976 Technical Change, Labor Use, and Small Farmer Development: Evidence from Sierra Leone *American Journal of Agricultural Economics*, 58, No. 5: 874-880

Spencer D. and S. Franzel, 1979: Annual Costs, Returns and Seasonal Labor Requirements for Selected Farm and on-Farm Enterprises in Rural Sierra Leone. MSU, African Rural Economy Working Paper, No. 27.

SYLLA, M; STEIN, A; VANBREEMEN, N; FRESCO, LO. 1995. SPATIAL VARIABILITY OF SOIL-SALINITY AT DIFFERENT SCALES IN THE MANGROVE RICE AGROECOSYSTEM IN WEST-AFRICA. *AGRICULTURE ECOSYSTEMS & ENVIRONMENT*, 54 (1-2): 1-15

Abstract: Spatial variability of soil salinity in coastal low lands results from a complex interaction of climate, river hydrology, topography and tidal flooding. The aim of this study was to determine the significant effects of these causal factors at different scales in the West African mangrove environment. The driving forces are the penetration of tidal saline waters and subsequent water evaporation in the flood plain, of which the magnitude is controlled by the causal factors. A hierarchical framework of the different factors was designed. Four river basins were selected: the Gambia, the Casamance (Senegal), the Geba (Guinea Bissau) and the Great Scarcies (Sierra Leone). Within each river basin, three strips of land (80 m wide, 500 to 1800 m long), perpendicular to the river at different distances from the mouth, were selected. In the dry season of 1991, soil samples were taken from the strips using a 40 m x 20 m grid at five soil depths to be analyzed for salinity. The contribution of the different sources to salinity spatial variability was analyzed with a nested ANOVA. Geostatistics were used to model spatial variability at micro-scale. As a result, main environments at macro scale (between river basins), sub-environments at meso scale (within river basins) and salinity classes at micro scale (within catena) were defined. Nested regression and geostatistics were found complementary to disentangle the complexity of the factors influencing salinity spatial variability.

Taylor, D R; Fofie, A S; Suma, M 1990 Natural infection of rice yellow mottle virus disease (RYMV) on rice in Sierra Leone. *International Rice Research Newsletter*. 1990; 15(5): 19.

Abstract: Natural infection by RYMV in the cv. IR65 resulted in 17% stunting, 72% increase in spikelet sterility, 66% increase in grain discoloration and 82% reduction in yield. Infection increased tiller production but did not significantly affect the number of panicles/hill.

Tilburg, A van; Hamming, I. 1999. Primary rice marketing in north-west Sierra Leone: market and non-market transactions. Eds.: Laan,-H-L-van-der; ,H-Dijkstra,-T; Tilburg,-A-van *Agricultural marketing in tropical Africa Contributions from the Netherlands*. 131-152

Abstract: Unlike many other West African countries, in Sierra Leone rice is the staple food crop. It is widely cultivated in most parts of the country under a variety of ecological conditions. This study analyses the types of rice transactions of rice-farming households (n=372) in north-west Sierra Leone by studying their 'Annual Rice Accounts'. An Annual Rice Account includes both the ways in which rice is obtained (sources) and the ways in which it is used and applied (uses). Several categories of operations and transactions are identified. They include subsistence operations (e.g. rice harvesting, rice consumption), social security transactions (e.g. giving rice as gifts), transactions compensating for resource use (e.g. rents in kind for the use of land or capital), and commercial transactions (e.g. sales or purchases of rice). Until now, little has been published about such transactions in this area. Three types of rice-farming households are distinguished corresponding to the rice-farming system(s) they employ, and their geographical location: those in the upland area, those in the upstream area and those in the midstream area of the Great Scarcies River. Subsistence-oriented rice-farming households are mainly found in the upland area, whereas commercially-oriented households are primarily located in the upstream and midstream sections of the river. Finally, possible implications for decision makers regarding the institutional infrastructure in north-west Sierra Leone are discussed.

West Africa Rice Development Association Regional Mangrove Swamp Rice Research Station Annual Reports (1980, 1985, 1986, 1987).

These reports summaries work on rice cultivar and systems development for the mangrove and associated swamps. There are detailed accounts of germplasm collection, evaluation and cultivar breeding work including screening for salt and crab

tolerance and resistance to a range of diseases including balst, leaf scald, narrow brown leaf spot, sheath rot, neck blast and blight. Crop loss assessments established the importance of stem borer (*Maliarpha separatella*). Studies were undertaken in the ecology of the pest and economic of chemical control. Use of pheromones for trapping the pest was also developed. Efforts were also committed to understanding the optimum time and tillage regime for weed control, particularly for management of the dominant salt tolerant species *Paspalum vaginatum*. Long term tillage and herbicide trials were undertaken in a range of rice ecologies. Soil nutrient studies focused on time of nitrogen application. The importance of using young seedlings for transplanting was also established. A farming systems survey was undertaken in the Little Scarcies area. Technology transfer through on-farm demonstrations was undertaken in collaboration with the North Western Irrigated Agricultural Development Project, ACRE and the Moyamba Irrigated Rural Development Project. This led to adoption of ROK 5 by 90% of farmers in the Moyamba project area. Post harvest losses in rice of up to 10% led to development of better threshing practices with a mechanical thresher. Crab damage was reduced by improved nursery management to provide vigorous seedlings. Spacing was also shown to be an important determinant of damage.

Zinnah M.M. Linking Research, Extension and Farmers: The case of mangrove swamp rice cultivation in Sierra Leone. Journal of Agricultural Education, 35: 50-54.

Zinnah, M.M.,1992: The Adoption and Impact of Improved Mangrove Swamp Rice Varieties in West Africa: The Case of Guinea and Sierra Leone. Ph.D. Thesis, University of Wisconsin, Madison, WI.

Sweet Potato

ALGHALI AM, BOCKARIE A 1994. CULTURAL-PRACTICES AND PERCEPTIONS IN SWEET-POTATO FARMING AND THEIR IMPLICATIONS FOR PEST-MANAGEMENT IN SOUTHERN SIERRA-LEONE. INTERNATIONAL JOURNAL OF PEST MANAGEMENT 40 (1): 27-30

Abstract: Survey questionnaires were given to 50 farm families in three villages in south Sierra Leone. The purpose of the study was to gain an insight into indigenous farming practices for sweet potato with an emphasis on pest management. This insight was to serve as a guide in the drawing up of a research programme for the on-farm control of pests. The survey revealed that sweet potato is grown mostly as an intercrop in small farm-holdings, mainly for subsistence and a small marketable surplus. Both insect and vertebrate pests affect the crop in the field, with insects reported as being the more serious. The methods employed for controlling insects are mostly cultural and are limited by lack of finance and labour. For vertebrates, methods such as fencing, trapping and hunting, which incorporate locally available materials are used. Therefore a rational pest management approach for this area should be integrative, locale specific, low cost and aware of the socio-economic realities of the farming communities. It should include: (1) educating the farmers on control options; (2) identifying and developing effective pest management strategies that are low cost, less intensive and scale neutral; and (3) creating an awareness on the necessity for inputs to be accessible and affordable.

George, T B., Kanu, P.A. Dahniya M.T. 1985 EVALUATION OF THE STORAGE POTENTIAL OF TEN SWEET POTATO CLONES (*IPOMOEA BATATAS* L) AT AMBIENT CONDITIONS IN SIERRA LEONE ISHS Acta Horticulturae 158: [X African Symposium on Horticultural Crops](#)

Abstract: A preliminary study on sweet potato shows that eight out of the ten clones stored at ambient temperature and humidity had storage periods of less than five weeks. Ropot 2, the most widely cultivated clone in Sierra Leone had the poorest storage characteristics. Microbial infections, dehydration and sprouting were the main causes of the poor storability. No weevil damage was observed in the field or during storage. In Sierra Leone both dehydration and sprouting are usually considered not a serious post-harvest problem for sweet potatoes as they cause little or no economic loss to the potato farmer. The data are discussed and suggestions made for further work

George, J.B., Kamara, J. 1988. LOSSES IN SEVEN SWEET POTATO (*IPOMOEA BATATAS*) CLONES STORED UNDER TRADITIONAL CONDITIONS IN SIERRA LEONE. Acta Hort. (ISHS) 218:375-384

Abstract: Tubers from seven sweet potato clones were stored in baskets or on earthen floors in a well-ventilated building. Nearly all had storage periods not exceeding 20 days. In general, for the same storage periods, the percentage mean weight losses for the tubers stored on the floors were higher than the mean weight losses for tubers stored in the baskets. The differences were, however, significant only after 12, 16 and 20 days. There was no significant interaction between

clones and treatments. Clones 81/10 and 80/29 had the lowest amount of rotted tubers irrespective whether the tubers were stored in baskets or on floors. The highest percentage mean reduction in dry matter occurred in clone 81/87 which was 23.7% for basket and 26.6% for floor. There was no significant interaction between clones and treatments in respect of dry matter loss. After storage, there was no significant increase in boiling or frying time due to the storage method used. The tubers from clone 80/29, however, had an undesirable fried taste. In terms of resistance to microbial infection, clones 80/29 and Makabie had the best storage characteristics.

GODFREYS.W 1974 EFFECTS OF CUTTING LENGTHS ON SWEET-POTATO YIELDS IN SIERRA-LEONE. EXPERIMENTAL AGRICULTURE 10 (1): 33-37.

GODFREYS A. MAGGREY W. 1976 EFFECTS OF POTASH FERTILIZERS ON SWEET-POTATO IN SIERRA-LEONE. EXPERIMENTAL AGRICULTURE 12 (1): 87-94

Kamara AY, Lahai MT 1997 Differential response of sweet potato (*Ipomoea batata*) to green manuring with elephant grass (*Pennisetum purpureum*) and spear grass (*Imperata cylindrica*) on a ferrallitic soil in Sierra Leone. TROPENLANDWIRT 98 (2): 229-235 OCT

Abstract: Two separate field studies were conducted to evaluate the response of sweet potato to green manuring with elephant grass (*Pennisetum purpureum*) and spear grass (*Imperata cylindrica*).

The yield and yield components of sweet potato increased consistently with increasing quantities of elephant grass before levelling up between 20, and 30 t ha⁻¹. This suggests the suitability of elephant grass as green manure in sweet potato production.

Yield and yield components of sweet potato increased with green manure rates of spear grass up to 10 t ha⁻¹ but progressively declined beyond this rate. This may be due to low N availability resulting from high C:N and consequent poor mineralization. Moreover phytotoxicity of spear grass at higher rates of application beyond 10 t ha⁻¹ could be responsible for the low yield. Thus for higher yield, manure rates of spear grass above 10 t ha⁻¹ can not be recommended. Further studies to separate phytotoxic effects of decomposing speargrass residues from poor mineralization effects are needed.

KARIM AB, SAVILL PS, RHODES ER 1991 THE EFFECT OF YOUNG LEUCAENA-LEUCOCEPHALA (LAM) DEWIT HEDGES ON THE GROWTH AND YIELD OF MAIZE, SWEET-POTATO AND COWPEA IN AN AGROFORESTRY SYSTEM IN SIERRA-LEONE
AGROFORESTRY SYSTEMS 16 (3): 203-211

Abstract: An investigation was undertaken at Senehun - Kamajei, a high rainfall region in Sierra Leone, to assess the effects of *Leucaena leucocephala*, on the growth and productivity of maize, cowpea and sweet potato. The experiment was laid out in a completely randomised design with four replicates of each treatment. The treatments and controls were: (i) pure crops of maize, cowpea, sweet potato, *Leucaena* clean weeded and unweeded and (ii) intercrops of *Leucaena* with the food crops, both (iii) with and without applied fertilizers after the first year.

The growth of *Leucaena* was slow but nevertheless tended to reduce grain yields of maize, and tuber and vine yields of sweet potato in the rows in the immediate vicinity of the trees, especially in the nitrogen-treated plots. The maize, in particular, caused an improvement in the early height growth of the trees.

Seed Systems

Kreul, W 1984. Improved seed production: a recent example of a seed multiplication project in Sierra Leone. Zeitschrift für ausländische Landwirtschaft. 23 (1): 51-64.

Longley, C. 1997. Effects of war and displacement on local seed systems in Sierra Leone. In L. Sperling (ed.) *AgREN Network Paper No. 75*. Overseas Development Institute.

Longley, C. 1998a. Seed management strategies of farmers affected by war: a case study from northern Sierra Leone. Report to ESCOR, UK Department for International Development.

Longley, C. 1998b. *A social life of seeds: local management of crop variability in north-western Sierra Leone*. PhD Thesis, University of London.

Longley, C. and Sellu-Jusu M. 1999. Farmers management of genetic variability in rice. *Ileia Newsletter*, December.

Sperling L. War and crop diversity. Overseas Development institute Network Paper No. 75.

5. Research projects

The following lists some of the many agricultural research and development projects undertaken in Sierra Leone for which reports should be available but have not been found. Some reports will be obtainable for IDRC or FAO, others may possibly be available at IAR, Njala or from archives/libraries of implementing agencies.

NOTE: This list is not exhaustive.

Funded by FAO

Strengthening of Crop Protection - Sierra Leone: Operated with in the Crop Protect Service of the Ministry of Agriculture (1986-1990). Produced a number of reports from staff and consultants. These will be available form FAO archives in Rome.

Davies G. 1990 Mammal ecology, crop damage and pest control.

El Tonsi A. M. and Watt W. 1990 Pest, disease and Weed control in crops. Koinadugu district, Sierra Leone.

Hussaini S.H. and Watt W. 1990 Pest, disease and Weed control in crops. Eastern Province Sierra Leone.

James B.D. 1988 Insect pest of rice in inland valley swamps and their control: pests at the vegetative stage.

James B.D. 1990 Control of rodent (*Thyromys swinderianus*) in rice.

James B.D. 1991 Insect pests of crops and their control in Sierra Leone.

Lamberti F. 1989 Nematology consultancy report.

Riches C.R. 1989 Weed control in Sierra Leone. Interim Report. pp 55.

Riches C.R. 1990 Weed control in Sierra Leone. Final Technical Report. pp 24.

Taylor, K.D. 1989 Rodent control consultancy report.

Thompson H. Bird pests and their control in Sierra Leone.

Tin Win and Watt M. 1990 Plant pathology UNV assignment report.

Watt M. 1989 Pesticide control.

Watt M. 1989 Plant quarantine regulations

Funded by USAID

The Sierra Leone Adaptive Crop Research and Extension (ACRE) Project: (1979-86). Southern University was the lead institution for the ACRE project under a contract issued to the Southern University-Louisiana State University (SULSU) Consortium, The project focused on the development and dissemination of information through field demonstrations of adaptive research trials on smallholder farms. USAID \$4.48 million.

The Solar Box Cooker Project in Sierra Leone (1988-1990). The purpose was to improve the nutritional status of Adaptive Crop Research and Extension (ACRE) farm families and to promote the development of appropriate labor saving devices for use by rural women. USAID subcontract: \$95,882.

Transportation and Marketing of Cassava in Sierra Leone (1992-94). The purpose of this project is to increase the production of cassava and improve the availability of cassava based food production through the transportation and marketing of cassava. USAID: \$100,000.

Funded by IDRC

Economics of cassava in Sierra Leone – University of Sierra Leone

1980-1981

Summary: This project focused on a social and economic study of cassava producers in four districts in the northern and southern provinces of Sierra Leone. A series of three surveys was conducted to obtain an overview of the area (reconnaissance); record basic household characteristics; and assess household participation in both farm and nonfarm activities. A study of the farming and cropping systems showed that for about 58% of farmers, the major goals were to meet household consumption needs and generate cash for other household demands. Researchers noted farm size; labour patterns; and cassava cultivation and management practices. Major production constraints were noted as weeds, disease, and lack of means to invest in yield-increasing technology. Other studies related to differences in cassava processing in the northern and southern provinces; and methods of cassava processing. It was noted that further data analysis regarding all aspects of cassava production, processing, and marketing was to be done in England as part of a researcher's doctoral thesis.

Upland Rice Storage - Ministry of Agriculture, Natural Resources and Forestry

1984-1987

Summary: Rice is the most important food crop in Sierra Leone. Improvements in the post-harvest management of rice to minimize losses are considered of great importance. Results of phase I of this project indicate the potential benefits of improved storage systems in reducing levels of insect and rat infestation and contamination. However, since phase I results indicate that less than one percent of stored rice is lost due to insects and moulds, phase II will attempt to determine exactly where rice harvest and post-harvest losses occur, in what quantities, and develop improved handling methods to reduce them. Improved storage systems developed in phase I will be tested at farm level and extension staff will be trained in methods of improved rice handling.

Post Project Abstract

A post-project abstract could not be written because of insufficient project documentation.

Available report:

Joint upland rice storage project II : progress report, Mar. 1, 1985 - Feb. 28, 1987 Freetown , SL : Rice Research Station , 1987 69 p. : ill.

WARDA collaborative projects

Sierra Leone IPM project 05: Controlling African rice gall midge, *Orseolia oryzivora* (Diptera: Cecidomyiidae) in lowland rice environments by integrating host plant resistance, cropping pattern, crop residue management, biological control and nursery application of low persistent chemical pesticide (Carbamates)

Project Duration: 2 Years (2006 – 2008)

Purpose of the project: To develop and test at farm level IPM packages based on an understanding of the interaction of host plant resistance, cropping patterns, crop residue management, natural enemies and nursery application of carbofuran for the control of *O. oryzivora* in lowland rice habitats in West Africa

Background/description: The WARDA/CABI Project on Management of the African rice gall midge (AfRGM) has conducted an extensive survey on the distribution, host range and natural enemies of the African rice gall midge. Two parasitoids, viz, a polyembryonic endoparasitoid, *Platygaster diplosisae* Risbec and a solitary ectoparasitoid, *Aprocetus procerae* were identified as potential biocontrol agents for AfRGM. The project also screened 600 rice accessions and several improved rice genotypes were identified but manageable resistance levels were not achieved for AfRGM. It is likely that a combination of IPM components including host plant resistance, biological control, habitat management and nursery application of low persistence insecticides will be needed to provide adequate suppression of *O. oryzivora* in West Africa.

Agro-ecological zones and locations: Northern savana grassland and Southern tropical rain forest in Sierra Leone

Expected Output: 1) Relationship between *O. oryzivora* incidence and natural enemy population dynamics in different rice-based cropping systems in lowland environments is established and this can help identify new and more effective natural enemies that can be introduced in new areas, 2) Host plant–insect–natural enemy interactions are assessed and improved as both components can effectively control *O. oryzivora*, especially in low input subsistence farming systems, 3) Efficient crop residue management that suppress AfRGM populations and enhance natural enemy activity is developed and recommended for use, 4) The effectiveness of selective systemic insecticides and optimum dose and time of application are known, an information critical for developing IPM appropriate to different agroecosystems.

Potential impact and beneficiaries: Small-scale lowland rice farmers, who constitute the majority of rice producers in West Africa will be the beneficiaries of the results, notably, host plant resistance, cultural practices and biological control–having many advantages such as sustainability and environmental safety. In addition, the technologies will reduce quantitative losses due to rice gall midge damage, increase rice yields leading to increased farmers' incomes and rural family well being. All of these would eventually lead to food security and poverty alleviation in Sub-Saharan Africa.

Partners: a) Njala University; b) West Africa Rice Development Association (WARDA)

Principal investor(s): Gatsby Charitable Foundation

Project Contact Person(s)/Principal Investigator(s): Samuel I. Kamara, sikamara2001@ yahoo.com, S.S. Harding, rokupr@sierratel.sl and C. K. Charles, rokupr@sierratel.sl

Sierra Leone IPM project 04: Towards the development of an integrated approach to the management of rice yellow mottle virus (*rymv*) in Sierra Leone.

Duration: 8 years (2000 to 2007) established in 3 phases (2000-2001, 2002-2003, 2004-2007)

Purpose of the project: To identify feasible components (resistant varieties, cropping patterns and vector control systems that could be integrated into a *rice yellow mottle virus* (*rymv*) management strategy.

Background/description: Various rice based cropping systems occur in the inland valley swamps in Sierra Leone where the incidence of rice yellow mottle virus can be high. These systems include rice in the main season followed by cereals, vegetables, root crops, legumes or fallow during the dries. The various cropping systems are likely to have an effect on the insect pests, weeds and disease situation and consequently on *rymv* as weeds serve as alternate hosts and insects as vectors of the virus. Several insect types with *rymv* vectoral capacity have been found occurring in rice fields. The identification of crop sequences and vector control strategies that will reduce overall population pressure in addition to utilizing disease resistant rice varieties should provide a practical integrated approach for the management of the virus. The was established in 3 phases: 1) The effect of cropping systems on weed abundance, vector dynamics and incidence of *rymv*. (2000–2001), 2) The effect of vector control in the management of *rymv* (2002 –2003), 3) Evaluation of lowland rice for resistance to *rymv* (2004 – 2007)

Agro-ecological zone(s) and location(s): Inland Valley Swamps in Northwestern Sierra Leone

Expected outputs: 1) The effect of cropping systems on *rymv* determined, 2) Correlation effect of vector number and *rymv* infection established in addition to suitable vector control strategies, 3) Lowland rice cultivars resistant to *rymv* identified

Potential impact and beneficiaries: Farmers will be the primary beneficiaries as integrated package developed will not only boost rice yields but could also lead to more efficient utilization of inland valley swamps. The overall effect could be an improvement in rural economy, food diversity and an enhancement of the food security situation nationally.

Partners: (a) West Africa Rice Development Association (WARDA)/Africa Rice Centre, (b) The University of Sierra Leone

Project contact person(s)/principal investigator(s): Dr. D.R. Taylor rokupr@sierratel.sl denrtay@hotmail.com Rice Research Station, Rokupr (RRS,R)

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Chapter 25. Technology Transfer from the Adaptive Crop Research and Extension Project in Sierra Leone

Peter M. Kaindaneh

Introduction

Much of the world's intensive food production is on small land holdings. Farmers with limited resources are the mainstay of the food supply for billions of people, and this situation is likely to continue for decades, perhaps centuries. The potential for increased food production, therefore, would be tremendous if yield were increased on each hectare. But millions of farmers cultivating these small farms are uneducated or illiterate. This is by no means an indication of low levels of intelligence; on the contrary, these are very intelligent people. They farm to maximize the utility of what they produce or to maximize profit, depending on the social system and infrastructure where they live.

How does a program intended to increase production through adoption of new technologies reach a half billion farmers like these? Or, coming closer to home, what did the Adaptive Crop Research and Extension (ACRE) project do about improving the food-crop production in Sierra Leone?

It has long been recognized by experts in this field that the only way to significantly increase the productivity of the small-scale farmers in developing countries is to improve the farmers' technological capabilities. In the present state of the world, there can be few developing countries where any increase in domestic food production is not socially beneficial, through its effects on supplies available for domestic consumption, real food prices, and the balance of overseas payments. Because of the favourable effect of technology on crop yield, even subsistence farmers stand to gain from adopting high-yielding crop varieties.

In Sierra Leone, the agricultural sector is largely underdeveloped and is dominated by small-scale farmers. Though this sector employs approximately 75% of the population, it contributes 33% to the gross domestic product and 24% to export earnings. This clearly points to the inefficiency of the sector. The government's awareness of this problem has led to a significant increase in public investment in the agricultural sector over the last two decades. The main thrust of this increased commitment has been the introduction and support of integrated agricultural-development projects (IADPs). These projects have had increased agricultural productivity as their main objective, as well as improved standards of living for rural small-scale farmers, through the use of improved technologies. The new technologies normally include high-yielding crop varieties, improved agricultural practices, and labour-saving devices. One such IADP, which was operated between 1981 and 1987, was ACRE.

This study was designed to provide data on transfer of technology to the small-scale farmers in Sierra Leone and to determine the technological capability acquired by the farmers, as a result. ACRE was selected because of its emphasis on locally conducted, adaptive (on-farm) research, combined with an effective extension delivery system.

The ACRE project

The ACRE project was coordinated by the Ministry of Agriculture, National Resources and Forestry (MANRF), Njala University College (NUC), and the United States Agency for International Development (USAID). The primary donor was USAID; the recipient of the grant was the government of Sierra Leone (GOSL); and the technical assistance contractor was Southern University – Louisiana State University. The project was built on the following premises:

- that the problems of small-scale farmers in Sierra Leone are low farm productivity and low standards of living;
- that increased crop productivity will help to raise the standard of living of the farmers and their families and, hence, enhance national development;
- that adaptive crop research will yield improved technology, appropriate to the local conditions, situations, and needs of the farmers;

- that the improved technology developed by the project can be effectively delivered to the farmers by an extension system;
- that the farmers will accept and adopt the improved technology after the utility and profitability of the technology has been effectively demonstrated; and
- that the project can be maintained and institutionalized by GOSL as a component of agricultural extension services, to help promote national development.

The ACRE project was, therefore, charged with responsibility for developing and on-farm testing of appropriate agronomic practices for use by the small-scale farmers in Sierra Leone. In essence, the project was expected to transfer technology and ensure the acquisition of technological capability.

Contact farmers were used to promote the transfer of the improved technology. (Contact farmers were those who agreed to try out the new technology as demonstration projects on their farms.) These farmers became the first to adopt the technology after it was successfully demonstrated, and then they influenced other interested farmers to adopt the technology.

Theoretical considerations

Technology diffusion

Technology diffusion (i.e., the transfer of technology) is the responsibility of extension services. The full benefits of agricultural research are not likely to be realized until the research results are appropriately communicated, especially to farmers with limited holdings. Some research results have been so successful that their widespread adoption occurred without concerted extension efforts. More frequently, however, there is a large gap between the productivity that modern research makes possible and the actual productivity realized by the vast majority of small farmers. The integration and widespread adoption of research results can be supported by extension services, by researchers (with farm-level experiments), by communications people (with mass media), by private suppliers, or, ideally, some combination of these.

Technical progress on subsistence farms changes the short-run production equilibrium because one or several production functions are affected, depending on the type of innovation. Possible innovations for subsistence farmers are the following:

- changes in production technique;
- changes in the range of crops produced (e.g., the introduction of a previously unknown cash or subsistence crop); and
- changes in the yield capacity of previously cultivated crops.

These innovations tend to benefit aggregate production, labour, and land capacity. The production function shifts and allows a higher output, with unchanged labour, and the family attains a higher level of utility.

In the main, a farmer decides on an innovation in subsistence or market production or both, according to the same principle by which the incremental utility resulting from an innovation must pay for the marginal disutility accompanying the change.

When a new technology is introduced to the farmer, he or she does not immediately adopt it; there is a time lag while diffusion of the technology occurs over time and space.

The diffusion of a technology is really the accumulated outcome of many separate decisions of individual farmers; hence, to understand the diffusion process, it is necessary to study these factors (e.g., social and economic) that influence farmers' decisions.

Technology adoption

Technology may be defined as the specialized knowledge, skills, methods, and techniques required for the production and distribution of goods and services. Technology can also be hardware. Agricultural technology can be embodied in people, tools, crop varieties, agricultural practices, and processing equipment.

A farmer is considered as having adopted a technology if he or she uses it to any extent. In this study, *adoption level* is defined as the number of technologies used. Several stages of the adoption process have been identified:

1. *The awareness stage* — The farmer learns about the technology and seeks more information.
2. *The interest stage* — The farmer becomes interested in the technology.

3. *The evaluation stage* — The farmer assesses the technology and decides to try it.
4. *The trial stage* — The farmer tries the technology on a small scale to determine its utility.
5. *The adoption stage* — The farmer uses the technology (either sequentially or in full).

In the early stages of the adoption process, the influence of external agents, such as the extension worker, is very great. The extension workers initially concentrate on the contact farmers, who will later influence the early adopters. This process may then enter a stage when the farmers tend to follow their neighbours' lead, and then there may be a bandwagon effect. The whole process, therefore, critically depends on the extension workers and the extension strategies.

Technological capability

Transfer of technology is essential for the development of technological capability. *Technological capability* may be defined as the ability to harness reason and scientific knowledge to solve particular problems. This usually involves the ability to

- identify the problem;
- identify the most relevant technology;
- acquire that technology on the best possible terms;
- assimilate that technology; and
- modify and adapt that technology to suit the local situation (i.e., develop an indigenous technology).

Those who have acquired technological capability can engage in technical change or innovation. In the case of small-scale farmers, this would include minor and major modifications of the technology to suit their environment.

Technical change

In the latter stages of the adoption process, as the farmers become more familiar with the new technology, they will alter inputs and other components of their farming system to exploit the advantages of the technology. The farmers learn the various outcomes associated with various decisions linked to the technology, and such knowledge helps them adopt the technology more fully. Such changes, referred to as multiple simultaneous innovations, can be complex and variable over time and space, so researchers have little prospect of predicting them on the basis of their own trials. After the farmers have internalized the technology, they can modify it for their own special needs; that is, they can effect technical change. This shows that the farmer has acquired technological capability.

The ACRE project

Aims

Improved agricultural practices and crop varieties: One component of the ACRE project was to introduce "software" technology: improved agricultural practices and improved varieties of upland rice, inland valley swamp rice, mangrove rice, biland rice, maize upland, sweet potato, cassava, groundnut, and cowpea.

Nutrition programs: The aim of the nutrition component was to improve the nutritional status of the small children, pregnant women, and lactating mothers on the farms in the target areas. Food-preservation and -processing techniques would be improved to complement the increased food production expected as a result of the other component of the project. Recipes would be developed and disseminated. Demonstrations would be used to teach appropriate technologies for food presentation and storage. Labour-saving devices for rural women would be found, and the women would be taught how to use them. There would be two nutrition instructors per zone; each instructor would visit four villages to give lessons in child care, sanitation, and gardening and demonstrate ACRE recipes.

Human resources

Most of the Sierra Leonean technologists employed by ACRE had a first degree or a masters degree. The director and the deputy director (who was also the research coordinator) were professors from the Agronomy Department, Njala University College, and the extension coordinator was from MANRF.

In addition to the Sierra Leonean staff, there were several experts from universities in the United States, who came at different times. These included a soil chemist, extension agronomists, agricultural economists, and plant breeders. Each US expert provided scientific and technical guidance and trained a local counterpart. Many of the senior Sierra Leonean staff benefited from this training and were able to complete a masters degree in extension-related fields in the United States.

Some NUC staff did the same; these people were expected to return and be part-time ACRE staff (full-time NUC staff). After their return, the part-time staff carried out the research and extension activities for the project, including field trials and training of extension field workers, who in turn trained farmers and assisted them with their everyday technical problems.

Most of the extension and nutrition instructors had either a teacher's certificate from teacher's college or a two-year certificate in agriculture from NUC. Some worked as teachers or extension workers for MANRF. The extension and nutrition instructors received further training at ACRE seminars or in-service courses, and some took short-term courses at the International Institute of Tropical Agriculture (IITA) in Nigeria. The training of the extension and nutrition instructors was not as extensive as that of the senior personnel.

Technology

The technology embodied in improved agronomic practices came mostly from NUC, the Rokupr Rice Research Station (in Sierra Leone), IITA, and the International Rice Research Institute of the Maize Research Institute in Mexico. ACRE conducted crop-variety trials, comparing improved crop varieties with local ones under various management practices, and selected the most suitable combinations of practices for the small-scale farmers in Sierra Leone.

Extension practices

The ACRE project used a whole range of extension techniques to transfer the new improved technologies to the small-scale farmers. The extension staff offered

- field days and agricultural shows, where kits were distributed;
- on-farm results and methods demonstrations, with full farmer participation;
- farmer training during regular group meetings;
- regular farm visits;
- publicity brochures and pamphlets;
- farmer-certification ceremonies; and
- farmer compensation.

In ACRE's extension strategy, farmer involvement was paramount. The ACRE staff believed that combining research and extension in the same program and giving the farmer a central role to play would quickly lead to the desired technology transfer.

Staff survey

The data in this section were derived from a survey of ACRE technical staff, including researchers, senior extension officers, extension instructors, and nutrition instructors.

According to the ACRE staff, the on-farm results and methods demonstrations were the most effective extension practices. Next were the field days and agricultural shows and distribution of kits. When asked to indicate the least effective extension technique, 55% cited farmer training during group meetings. Farmer's group meetings were usually poorly attended, and the extension and nutrition staff did not always have new ideas to share. The staff were asked to state whether they were given what they needed to perform their duties effectively, and 89% stated that their needs were always provided for. The items that were usually not available were fuel, transportation, farm supplies and inputs, and finance, in that order.

Summary

The ACRE project had some highly trained personnel, but the research and extension staff indicated that they usually were without what they needed to effectively perform their duties. In later years, the emphasis switched from equal support for research and extension to more attention and support being given to research.

Farmer survey

In this section, the results of the contact-farmer survey will be discussed. The cluster-sampling approach resulted in a total sample of 330 farmers, from among various zones, as shown in Table 1. The table shows that in all the zones, rather small proportions of the contact farmers were female. Most male contact farmers were heads of households, so land was not a crucial factor for these farmers. Most of the female farmers were first wives, so they, too, had no problem obtaining land for farming.

Table 1. Contact-farmer survey results.

Zone	Female	Male	Total
Kanema	7	64	71
Kabala	6	53	59
Rokupr	2	72	74
Makeni	9	52	61
Njala	10	55	65

Source: The survey of the contact farmers.

According to the farmer's survey, the on-farm results and methods demonstrations were the most effective extension technique. The reason was that in these demonstrations, the farmer was involved at all stages. Improved and local varieties were cultivated side by side and improved and local management practices were carried out side by side, so the farmer was able to compare and contrast the varieties and methods.

Improved crop varieties

An important objective of the ACRE program was to introduce improved crop varieties to the small-scale farmers. In Table 2 shows the number of contact farmers given various varieties in each zone. In the Kenema and Kabala zones, the emphasis seems to have been on sweet potato varieties (especially Ropot 11), whereas in the Rokupr, Makeni, and Njala zones, the emphasis was on rice varieties. Cowpea and groundnut do not seem to have been emphasized in any zone except in Njala.

The survey of the farmers showed that there were good adoption rates for sweet potato and maize across the country and a fairly significant rate for cassava and rice, but groundnuts and cowpeas did not do as well.

Table 2. Number of times improved varieties were given to farmers by zone.

Zone	Rice	Cassava	Sweet potato	Maize	Cowpea/groundnut
Kenema	30	28	42	15	1
Kabala	31	12	32	22	1
Rokupr	60	25	30	23	2
Makeni	45	19	16	29	6
Njala	47	19	16	29	17

Source: The survey of the contact farmers.

Sweet potato did well because the improved varieties had the characteristics that Sierra Leonean farmers were looking for. For instance, the varieties adopted were all early maturing and high yielding, with good cooking qualities. This cannot be said for the improved cassava varieties, which, though they far out-yielded the local varieties, lacked the desired cooking quality. Maize adoption was low because the farmers had problems acquiring fertilizer, which is required for maize to do well.

Farmers who did adopt a crop variety were saving seeds and propagating it from year to year. Seed retention and propagation are indicative of adoption of the technology embodied in the improved variety. However, farmers have been cultivating the improved variety side by side with the local variety. Under such conditions, some cross-fertilization was bound to occur. Thus, the farmer, in most cases, was no longer using the improved varieties but hybrids of the local and improved varieties.

Improved management practices

The improved management practices transferred by ACRE to the small-scale farmer included timely planting, proper spacing, proper plant densities, timely weeding, the use of fertilizers and other chemicals (such as herbicides and insecticides), good crop husbandry (such as ridging and row planting), and timely harvesting. However, it was clear that most of these farmers were using a modified form of the practices originally promoted by ACRE.

The farmers were using a reduced rate of fertilizer application because of the unavailability of this input when it was needed. The senior extension officer and the extension instructors indicated that the ACRE extension program did not make any

arrangements to ensure that when the project ended, the farmer could continue to obtain such inputs. Also, the farmers did not really have a clear understanding of the various types of fertilizers, their uses, or how to blend them for a particular crop. Most farmers who go to buy fertilizer just asked for "crop medicine." Here, the main problem was the high rate of illiteracy among the farmers, coupled with the rather short time the extension agents could spend with each farmer (because there are two seasons per crop). The farmer did not have time to really learn the fertilizer and chemical technology.

In the case of sweet potato and cassava, most farmers had reverted to making large mounds (heaps) — the recommended ridges apparently require a lot more labour. For maize, though, some farmers still practice row planting, but they do not maintain the recommended spacing within and between rows. This may have been due to the fact that precise measurements are not part of the small-scale farmer's culture. To a small-scale farmer, 50 cm and 40 cm may not seem any different.

The farmers were asked to state the advantages and disadvantages of the ACRE practices. The most frequently mentioned advantage was that the practices led to high yields; ease of management came second. The most frequently mentioned disadvantage was that the techniques were labour intensive.

Improved hardware technology

When the farmers were asked whether they had acquired any new type of tool (different from their hoe, machetes, and axes), they indicated that they had not. A few farmers cultivating rice were introduced to the use of shovels at some point, but this cannot be regarded as an innovation.

Farmer innovations

Most farmers said they had not made any improvements to the ACRE techniques. Some very progressive farmers, however, did make clever modifications to farming techniques. A farmer in the Kabala zone harvests his sweet-potato crop twice. Instead of cutting off the vines and turning over the mounds, he carefully digs up each potato, cuts it off the vine, replaces the soil, and leaves the vine and the very small tubers undisturbed. This farmer is able to save the cost of labour required for seed-bed preparation and planting new vines, and he enjoys the benefits of two crops. But it is hard to relate this experience to the acquisition of technology.

Discussion

The ACRE project concerned itself mainly with transferring improved crop varieties and agricultural practices to small-scale farmers in five operational zones, but ACRE also developed and disseminated various recipes for pregnant women, children, and nursing mothers.

In actual implementation, it seems that the concern of the nutrition component was centred on baking and the development of exotic recipes. Women were taught to make cassava bread, potato pie, and maize pap, etc. Cakes and breads were not in the local diets, and maize paps were time consuming, with only manual processing available.

In the farmers efforts to achieve food self-sufficiency, there is evidence of their ability to harness knowledge, which implies some acquisition of technological capability, but the improved practices promoted by ACRE were not fully appreciated. The average farmer did not have enough time with a project instructor to fully grasp the reasons why ACRE recommended these techniques, so the farmer changed them in ways that made them less labour and input intensive.

There was a conspicuous lack of new tools and labour-saving devices on the farms and households of the ACRE farmers when the project folded up. From the start, it seemed that ACRE made little effort to promote "hardware" technology (i.e., technology embodied in tools, appropriate labour-saving devices, and machines). Initially, the project investigated such devices as a jab planter, a rotary planter, and a dibbler. In 1982, hand cultivation, work-oxen ploughing, planting, and weeding were compared with tractor ploughing and spacing. Cost data were collected, but the analysis was incomplete. The following recommendations were made:

Different planting methods for upland rice should be [tested]. Dibbling was effective in increasing yields but was dropped because of its tediousness and because alternative uses of farmer labour had higher return. But jab and rotary planters and other planting equipment which may be developed should be tested and may prove most effective and adaptable on farms. These recommendations, made by the project's consulting agricultural economist, seem to have been ignored. It seems that the development of farm tools, processing machines, and labour-saving devices was quickly abandoned. In fact, one senior extension officer, who had an honours degree in mechanical engineering and an MSc in agricultural engineering, was essentially doing extension work and zonal administration, instead of developing hardware technologies. He informed the

researchers that he and other staff members carried out several studies on labour-saving devices (including a rotary-disc planter for grains), but their recommendations were always ignored by management.

Conclusion

A successful transfer should lead to a new and more productive small-scale farmer, with improved crop varieties, grown under improved agricultural practices. The result should be considerably higher yields.

The ACRE project actually did make an impact on the farmers who adopted the improved varieties of sweet potato. But a lot more could have been accomplished had the project staff spent more time with the farmers and made arrangements to follow up. Because of the number of crops ACRE had to promote, one could hardly count the success rate of sweet potato, though remarkable, as a major accomplishment in technology transfer.

Policy recommendations

The government of Sierra Leone should ensure that IADPs, as well as the agricultural research institutes, are given all the assistance they need for effective operations. More than ever, the government needs these institutions to help achieve the ultimate goal of national food self-sufficiency. The IADPs, in collaboration with the government, should create farmers' cooperatives to ensure that farmers continue to get the relevant inputs, such as fertilizers, planting materials, and information, after the projects have ended. The government should ensure proper monitoring of the IADP so that it adheres to its the objectives.

Appendix 2

Pests, diseases and weeds reported from Sierra Leone (source: CABI Crop Protection Compendium, 2002)

**Acanthospermum hispidum* (goat's head)
**Acidovorax avenae* subsp. *avenae* (bacterial leaf blight)
**Agrius convolvuli* (sweet potato moth)
**Albugo candida* (white rust of crucifers)
**Alcidodes dentipes* (striped sweet potato weevil)
**Alternaria brassicicola* (*Alternaria* blight)
**Amaranthus viridis* (african spinach)
**Anomis sabulifera* (green molukhiaworm (Sudan))
**Antigastra catalaunalis* (sesame podborer)
**Aphelenchoides besseyi* (rice leaf nematode)
**Aphis craccivora* (African bean aphid)
**Aphis gossypii* (betelvine aphid)
**Araecerus fasciculatus* (areca nut weevil)
**Aspidiotus destructor* (coconut scale)
**Atherigona orientalis* (pepper fruit fly)
**Aulacaspis tubercularis* (mango scale)
**Aulacophora foveicollis* (hamra beetle)
**Balansia oryzae-sativae* (black choke)
**Bathycoelia thalassina* (cocoa pod pentatomid)
*Bean common mosaic necrosis virus
*Bean common mosaic virus (black root of beans)
**Bemisia tabaci* (tobacco whitefly)
**Bipolaris sacchari* (eye spot)
Bixadus sierricola (coffee stem borer)
**Boerhavia diffusa* (hogweed)
**Borreria latifolia* (broadleaf buttonweed)
**Busseola fusca* (African maize stalk borer)
*Cacao swollen shoot virus
*Cacao yellow mosaic virus
**Callosobruchus chinensis* (Chinese bruchid)
**Callosobruchus maculatus* (cowpea seed beetle)
**Carpophilus*
*Cassava mosaic disease (African cassava mosaic)
**Cassia obtusifolia* (sicklepod)
*Cauliflower mosaic virus
**Celosia argentea* (quailgrass)
Cephonodes hylas (coffee hawk moth)
**Ceratitis capitata* (fruit fly, mediterranean)
**Ceratitis cosyra* (mango fruit fly)
**Ceratitis punctata* (cacao fruit fly)
**Ceratocystis paradoxa* (black rot of pineapple)
**Ceratophyllum demersum* (coontail)
**Cercospora beticola* (*Cercospora* leaf spot)
Cercospora caribaea (white leaf spot of cassava)
**Cercospora elaeidis* (*Cercospora* leaf spot)
**Cercospora nicotianae* (frog-eye leaf spot of tobacco)
**Cercospora sorghi* (*Cercosporiosis*)
**Ceroplastes floridensis* (soft scale)
Characoma stictigrapta (pod husk borer)
Chrysodeixis acuta (tomato semi-looper)
Chrysomphalus dictyospermi (Spanish red scale)

*Cladosporium musae (banana leaf speckle)
 *Cleome ruidosperma (consumption weed)
 *Coccus hesperidum (brown soft scale)
 Coccus viridis (soft green scale)
 *Cochliobolus heterostrophus (maydis leaf blight)
 *Cochliobolus miyabeanus (brown leaf spot of rice)
 *Coelaenomenodera elaeidis (hispid leafminer)
 *Cofana spectra (white leafhopper)
 *Colletotrichum sublineolum (head blight of sorghum)
 *Commelina benghalensis (benghal dayflower)
 *Commelina diffusa (water grass)
 *Conyza sumatrensis (broad-leaved fleabane)
 *Corchorus aestuans
 *Corcyra cephalonica (rice meal moth)
 *Corticium rolfsii (collar rot)
 *Corticium salmonicolor (damping off)
 *Cosmopolites sordidus (banana weevil)
 *Cowpea Moroccan aphid-borne mosaic virus (cowpea aphid-borne mosaic virus)
 *Crassocephalum crepidioides
 *Crociodolomia pavonana (cabbage caterpillar)
 *Cryptoblabes gnidiella (christmasberry webworm)
 *Cryptophlebia leucotreta (false codling moth)
 *Cucumber mosaic virus (cucumber mosaic)
 *Curvularia (black grain)
 *Cylas brunneus
 *Cylas puncticollis (sweet potato weevil)
 *Cyperus compressus (annual sedge)
 *Cyperus difformis (small-flowered nutsedge)
 *Cyperus rotundus (coco grass)
 *Dacus ciliatus (lesser pumpkin fly)
 *Diaphania indica (cotton caterpillar (Japan))
 Diaporthe phaseolorum var. sojae (pod and stem blight of soybean)
 *Digitaria ciliaris (bamboo grass)
 Diopsis longicornis (stalk-eyed fly)
 Diparopsis watersii (bollworm, sudan)
 *Diplocarpon rosae (black spot of roses)
 *Distantiella theobroma (cocoa capsid)
 *Drymaria cordata (heartleaf drymary (USA))
 Dysdercus fasciatus (cotton stainer)
 *Dysmicoccus brevipes (pineapple mealybug)
 *Earias biplaga (spiny bollworm)
 *Earias insulana (Egyptian stem borer)
 *Echinochloa colona (barnyardgrass)
 *Elaeidobius kamerunicus (African oil palm weevil)
 *Eldana saccharina (African sugarcane borer)
 *Eleusine indica (goose grass)
 *Elsinoë fawcettii (citrus scab)
 *Emilia sonchifolia (consumption weed)
 Entyloma oryzae (leaf smut of rice)
 *Etiella zinckenella (lima bean pod borer)
 *Eudocima fullonia (fruit-piercing moth)
 Eulophonotus myrmeleon (cocoa, stem borer)
 Eumeta crameri (faggot worm)
 *Euphorbia hirta (asthmaweed)
 *Euwallacea fornicatus (shot-hole borer of tea)

**Ferrisia virgata* (guava mealybug)
 **Fusarium oxysporum* f.sp. *cubense* (banana wilt)
 **Fusarium sporotrichioides*
 **Gibberella fujikuroi* (bakanae disease of rice)
 **Globodera rostochiensis* (yellow potato cyst nematode)
 **Glomerella graminicola* (anthracnose of cereals)
 *Groundnut rosette virus (groundnut chlorotic rosette)
 **Haritalodes derogata* (cotton leaf roller)
 **Helicoverpa armigera* (cotton bollworm)
 **Helicoverpa assulta* (cape gooseberry budworm)
 **Heliethrips haemorrhoidalis* (black glasshouse thrips)
 **Heliotropium indicum* (devil weed (Pakistan))
 **Helopeltis schoutedeni* (cacao-mosquito)
 **Hemiberlesia lataniae* (latania scale)
 **Hemileia vastatrix* (coffee leaf rust)
 **Henosepilachna elaterii* (melon (ladybird) beetle)
Hercinothrips femoralis (banded greenhouse thrips)
 **Hippotion celerio* (grapevine hawk moth)
 **Hirschmanniella oryzae* (rice root nematode)
 **Hypothenemus hampei* (coffee berry borer)
 **Ischaemum rugosum* (wrinkled duck-beak)
 **Lasioderma serricorne* (cigarette beetle)
 **Lemna perpusilla* (duckweed)
 **Lepidosaphes beckii* (purple scale)
 **Lepidosaphes gloverii* (glover scale)
Leptoglossus gonagra (coreid bug)
 *Lettuce mosaic virus (lettuce mosaic)
 **Leucinodes orbonalis* (brinjal fruit borer)
 **Leveillula taurica*
 **Lindernia crustacea*

**Lipaphis erysimi* (mustard aphid)
 **Locusta migratoria* (migratory locust)
Longitarsus suturellus
 **Ludwigia adscendens* (water primrose)
 **Ludwigia hyssopifolia* (water primrose)
 **Ludwigia octovalvis* (primrose willow)
 **Macrophomina phaseolina* (ashy stem blight)
 **Magnaporthe grisea* (blast of rice)
 *Maize streak virus (streak disease of maize)
 **Marasmius crinis-equi* (horse hair blight)
 **Maruca vitrata* (lima bean pod borer)
 **Melanaphis sacchari* (yellow sugarcane aphid)
 **Melochia corchorifolia* (crab's eggs)
 **Merremia umbellata* (hogvine)
 **Mesoplatys cincta*
 **Mimosa pigra* (giant sensitive plant)
 **Mimosa pudica* (action plant)
 **Monilochaetes infuscans* (scurf of sweet potato)
 **Monographella albescens* (brown leaf blight)
 **Mononychellus tanajoa* (cassava mite)
 **Mussidia nigrivenella* (cob borer)
 **Mycosphaerella arachidis* (early leaf spot of groundnut)
 **Mycosphaerella berkeleyi* (late leaf spot of groundnut)
 **Mycosphaerella cruenta* (leaf spot of cowpea)

*Mycosphaerella henningsii (brown leaf spot of cassava)
 Mycosphaerella holci (glume blight)
 *Mycosphaerella musicola (leaf spot of banana)
 *Mycovellosiella fulva (tomato leaf mould)
 Mycovellosiella koepkei (yellow spot of sugarcane)
 Mycovellosiella oryzae (white leaf streak)
 Myrothecium roridum (blight: eggplant)
 *Myzus persicae (cabbage aphid)
 Natrassia mangiferae (apple branch wilt)
 *Nectria rigidiuscula (cushion gall disease)
 Negeta chlorocrota
 *Nesidiocoris tenuis (tomato bug)
 *Nezara viridula (green shield bug)
 Ootheca mutabilis (leaf, beetle, brown)
 *Orseolia oryzivora (African rice gall midge)
 *Orthezia insignis (greenhouse orthezia)
 *Oryctes boas (rhinoceros beetle)
 *Oryctes monoceros (coconut beetle)
 *Oryza longistaminata (perennial wild rice)
 *Pachymerus cardo (palm fruit borer)
 *Panicum repens (creeping panic)
 *Parapoinx stagnalis (rice case bearer)
 Parasa vivida (stinging caterpillar)
 *Parasaissetia nigra (black coffee scale)
 *Parlatoria pergandii (chaff scale)
 *Parlatoria ziziphi (black parlatoria scale)
 *Paspalum conjugatum (buffalo grass)
 *Passiflora foetida (love-in-a-mist)
 *Pectinophora gossypiella (pink bollworm)
 *Pelopidas mathias (rice skipper)
 *Pennisetum polystachion (feather pennisetum)
 *Pentalonia nigronervosa (banana aphid)
 *Peregrinus maidis (corn delphacid)
 *Phaeoisariopsis griseola (angular bean leaf spot)
 *Phakopsora pachyrhizi (soyabean rust)
 *Phellinus noxius (brown cocoa root rot)
 *Phenacoccus madeirensis (cassava mealybug)
 *Phenacoccus manihoti (cassava mealybug)
 *Phoma foveata (potato gangrene)
 Phoma leveillei (sheath blotch)
 *Physoderma maydis (brown spot of corn)
 *Phytophthora nicotianae (black shank)
 *Phytophthora palmivora (black pod rot of cocoa)
 *Pimelephila ghesquierei (African spear borer)
 *Pinnaspis strachani (lesser snow scale)
 *Pistia stratiotes (Nile cabbage)
 *Planococcoides njalensis (west African cocoa mealybug)
 *Planococcus citri (citrus mealybug)
 *Planococcus kenyae (coffee mealybug)
 *Plasmopara viticola (grapevine downy mildew)
 *Portulaca oleracea (purslane)
 Pseudoperonospora cubensis (false mildew)
 Pteroma plagiophleps
 *Puccinia polysora (American corn rust)
 *Puccinia purpurea (rust (of grasses, sorghum))

*Puccinia sorghi (common corn rust)
 *Pueraria phaseoloides (tropical kudzu)
 *Pythium aphanidermatum (damping-off)
 *Pythium myriotylum (brown rot of groundnut)
 Ralstonia solanacearum race 1
 *Rastrococcus invadens (mango mealybug)
 *Rhopalosiphum maidis (green corn aphid)
 *Rhynchophorus phoenicis (African palm weevil)
 *Rice yellow mottle virus
 *Rigidoporus microporus (root rot disease)
 *Rottboellia cochinchinensis (corn grass)
 *Sahlbergella singularis (mirids)
 *Saissetia coffeae (brown coffee scale (Sri Lanka))
 *Sclerospora graminicola (downy mildew of pearl millet)
 *Scutellonema clathricaudatum
 *Selenaspis articulatus (West Indian red scale)
 *Selenothrips rubrocinctus (cacao thrips)
 *Sesamia calamistis (African pink stem borer)
 *Setaria pumila (cat's tail grass (Fiji))
 *Setosphaeria turcica (maize leaf blight)
 *Solanum torvum (devil's-fig)
 *Sphenoclea zeylanica (gooseweed)
 *Spodoptera exempta (african armyworm)
 *Spodoptera littoralis (cotton leafworm)
 *Spoladea recurvalis (beet webworm)
 *Sporisorium sorghi (broom-corn smut)
 *Stenocarpella macrospora (dry rot of maize)
 *Stenodiplosis sorghicola (sorghum midge)
 *Striga asiatica (cane-killing weed)
 *Striga gesnerioides (cowpea witchweed)
 *Sugarcane mosaic virus (mosaic of abaca)
 *Synedrella nodiflora (Cinderella weed (Australia))
 Tabidia aculealis
 *Tenebroides mauritanicus (cadelle)
 *Tetraneura nigriabdominalis (rice root aphid)
 *Tetranychus urticae (two-spotted spider mite)
 *Thanatephorus cucumeris (many names, depending on host)
 *Thrips hawaiiensis (flower thrips)
 *Tilletia barclayana (black smut of rice)
 *Tobacco leaf curl virus
 *Toxoptera aurantii (camellia aphid)
 *Toxoptera citricida (black citrus aphid)
 *Trachysphaera fructigena (cigar end rot of banana)
 *Tribolium castaneum (red flour beetle)
 *Tridax procumbens (p.w.d.weed (Kenya))
 *Tylenchorhynchus annulatus (stunt nematode)
 *Ulocladium atrum (almond mould complex)
 *Unaspis citri (citrus snow scale)
 Uredo cajani (rust of pigeon pea)
 *Uromyces appendiculatus (bean rust)
 *Uromyces gladioli (gladiolus rust)
 *Ustilaginoidea virens (false smut)
 *Xanthomonas axonopodis pv. malvacearum (angular leaf spot of cotton)
 *Xiphinema ifacolum (dagger nematode)
 Xyleborus ferrugineus

- **Xyleborus perforans* (island pinhole borer)
- **Xylosandrus compactus* (shot-hole borer)
- **Xylosandrus crassiusculus*
- **Zonocerus variegatus* (variegated grasshopper)

SECTION 9: INFORMATION MARKET FIELD REPORT

Steen Joffe and Freida MacCormack

A variety of communications tools and approaches were presented at the recent 13-15 November 2007 stakeholder workshop in Freetown³⁰, which included presentations from a number of international communications experts offering different institutional perspectives on the subject (attendance and sessions as reported elsewhere). There was also some opportunity to consult with information market stakeholders including the National Telecommunications Commission, and local NGOs; additional meetings were held as possible, including with the local mobile phone operator Tigo (see below).

Some key communications actors and activities (and their potential constraints) include:

- **The regulator:** The National Telecommunications Commission (new in its mandate and operations: finding its feet, limited scope to lead innovation)
- **NGOs:** e.g. 'Search for Common Ground' (use 'traditional' communication methods, i.e. radio and drama)
- **Telecommunications providers:** mobile phone operators (TIGO, Celtel, Comium, Africell, Datatel); internet service providers (IPTEL, Afcorn, Multinet, Afrinet, Access Point, Fidelity, Limeline Sierra Leone, Thompsonian – not much known about them)
- **Government:** Sierra Leone Information System (SLIS) in the Development Assistance Coordination Office, which is currently under the Office of the Vice President (SLIS has good experience with collating data/information about Sierra Leone [development] from a wide variety of sources annually - www.daco-sl.org/encyclopedia - but continued funding unsure; UND-funded initiative; new government may change things.
- **Selected private sector media initiatives :**

Name	url	Notes
Awareness Times	www.awarenesstimes.com	Popular daily newspaper now also migrated to web. Run by Sylvia Blyden.
Lumley Beach Dot Com	www.lumleybeach.com	Internet services, including web design and 24-hour internet café. Also run by Sylvia Blyden.
Sierra Leone Travel and Tourism	www.visitsierraleone.org	Run by Bimbola Carroll. Based in the UK, but very dynamic site and individual, with lots of connections at least to the Diaspora.

This list is admittedly limited, both in terms of potential collaborators and knowledge about what they can actually provide. Further, there is no real agricultural (and limited development) focus in the mandates of most of the above. It does, however, provide some guidance as to the types of local actors in the Sierra Leone communications market.

'Last mile' extension efforts in Sierra Leone rely on traditional face to face approaches, supplemented by initiatives using e.g. drama and broadcast media in particular the radio. Use of mobiles is increasing but from a low base of only c. 10%

³⁰ These included distance learning modules, expert systems, internet helpdesk services, and a web-based marketplace for agricultural information and services.

penetration. GPRS internet via the mobile phone will shortly be available offering limited bandwidth but spreading coverage to 70% or more of the country. There are also options based on very high frequency radio transmission and VSAT, although the capital and recurrent costs of these are currently prohibitive for individuals or for SMEs without subsidy. Initial analysis suggests that the SL telecoms and ICT services sector is reasonably free and dynamic, with evidence of innovative business practices. Some actors are beginning to build commercial information services over internet and SMS but with limited development content currently.

Within this context strategic choices for RIU SL programme are :

- Emphasis on strengthening SL information market capacity at an enabling level, through improved communications linkages, and more effective demand pull on new technical knowledge and services both national or international;
- Working at, and slightly ahead of the rural margins of the Sierra Leone telecommunications market³¹. Internet and mobile comms should be the backbone infrastructure to link supply and demand side actors; while delivery of appropriately packaged content to rural communities and services providers will also rely on traditional means, offline tools, and broadcast media, in the medium term;
- Supporting information linkage services in the private sector, the rationale being (i) there is much dynamism in the telecoms sector in particular, juxtaposed with weak (although improving) public sector capacity. (ii) private sector uptake provides for sustainability beyond the RIU programme.

The SL Workshop endorsed the proposal to establish an independent 'knowledge brokerage' function in SL that would :

- Be a widely trusted source of agricultural information and services
- Provide means for communities, researchers, extension and other stakeholders to link & communicate
- Provide access to 'external' scientific knowledge
- Stimulate demand for information products and services relevant to agricultural and NR innovation, and service this demand through linkage with potential suppliers

The workshop also discussed/endorsed that :

- The entity would be independent and most probably privately operated;
- There is likely to be a need for capacity strengthening and other resources to ensure active involvement of rural communities/actors

Further work is needed to define modalities for implementation (presumably at the next stage of SL programme development). In particular :

³¹ .Notwithstanding infrastructure constraints the demand for mobiles and internet communications are likely to be as strong in SI as elsewhere and there is no reason to suggest that the communications landscape will not be transformed within the lifetime of the RIU programme.

- More work is needed to map and consult with information market stakeholders who would be clients of the knowledge brokerage service in terms of specific requirements;
- The relationship between the national knowledge broker function and the specific communications needs of individual innovation platforms needs to be worked through;
- The best way to foster a commercial knowledge brokerage service may as a specific Innovation Platform activity with appropriate partners in Sierra Leone, the outcome of which would be a business plan for investment support via RIU 1.3 and/or local investors.

NOTES ON TIGO (MILlicom INTERNATIONAL)

Activities and coverage:

TIGO is currently operating in 12 out of 15 Districts, with nearly 70% of coverage in urban and rural areas. By 2009, plans to be in all districts. However – penetration (number of active mobile phone numbers within a specific population) in Sierra Leone is not more than 10% (vs about 30% in other African countries). They will be pushing for at least that in the next 3-4 years. Tigo currently operates mobile internet service with GPRS but recognise that this has limited bandwidth: are planning to introduce the datacard within the next month (already have the cards), which will allow users to connect to the internet on their computers using their sim card, wherever there's cellular coverage. They recognise that technology is constantly changing and plan to change to 3G in the next few years instead of GPRS. The industry is very competitive in SL so have to be aggressive about introducing new services, e.g. plan to launch cash transfers via SMS soon – the technology is available but are now applying for licenses to be able to deal with money.

Relationship with the regulator:

The new regulator, the National Telecommunications Commission (NATCOM) is relatively new (only became operational in April 2007). However, has changed the rules in the middle of the game – e.g. license fee increased by 1000% to US\$50,000/year – which discourages investment.

There is a relationship with NATCOM but as yet it doesn't have clear policies: there's much room for improvement (hopefully things will change with new government). Duty for telecommunications equipment is 30% (quite high). They have regular meetings with the GSM providers, who face the same regulatory constraints.

Social projects:

Social Responsibility is part of the corporate culture of Millicom International, TIGO's parent company. Currently they fund a social responsibility programme with Global Forum but not technology-related per se (give soccer balls, money for library); is managed by the marketing department but ends soon. Plans to launch telecentre-type programme (along the Bangladesh model – women reselling calls type of thing) by the first quarter of next year. Are quite open to being approached about projects. Have themselves approached e.g. the Red Cross to offer support in Communications (free SMS services). Have a service: TIGO SMS Plus which customers can subscribe to – gives access to news; lifestyle; TV info; flight info; shipping info; news; and the exchange rate. The content is contracted out to an international provider and it would be quite easy to add other information to this kind of service (e.g. internationally in Millicom there are services to access stocks) – can ask the same people to do this, or locally if the capacity is there. Average use costs for the internet are about US\$1 (or Le 3,000)/month; this is the cost of 1 megabyte of information download. Millicom believes in doing work transparently; and TIGO also have an active programme for supporting local capacity, through employing staff at very competitive rates.

**SECTION 10: OPPORTUNITIES AND CONSTRAINTS IN THE LIVESTOCK SECTOR: A
SCOPING BRIEF FOR SIERRA LEONE**

PROFESSOR IAN MAUDLIN AND DR CLAIRE HEFFERNAN

NOVEMBER 2007

Introduction:

The following document is the output of Professor Ian Maudlin and Dr Claire Heffernan's consultancy visit to Sierra Leone from November 9th-15th. The aim of the trip was to better understand the opportunities and constraints within the livestock sector with the aim of up-scaling the outputs of research products for DFID's Research into Use Programme (RIU). The following report utilises the Outcome Mapping framework³² and consequently terminology to assess and evaluate the outcomes of potential interventions for the livestock sector in Sierra Leone.

Outcomes are defined as 'changes in relationships, activities or activities, actions, or behaviours...that can be logically linked to a program's activities...these changes are aimed at contributing to specific aspects of human and ecological well-being by providing...new tools, techniques and resources to contribute to the development process. (Earl et al, 2001)

The document is divided into three sections. The first section presents a wider view of the issues in the global livestock sector in order to contextualise the forthcoming discussion on the specific opportunities and constraints and desired outcomes for the livestock sector in Sierra Leone.

Section I: The Wider Forces Impacting the Global Livestock Sector:

Donors are committed to halving the numbers living in poverty by the year 2015 and livestock can contribute in a variety of ways to the livelihoods of poor people:

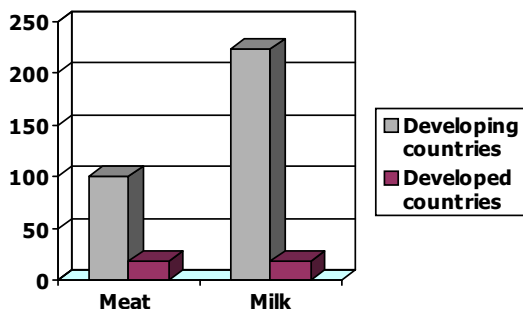
- Cash income
- Sale or hire of animals or animal products
- Asset for poor women
- Draught power and manure
- Private benefits for poor from common property resources
- Livelihood security - buffers crop yields
- Can succeed in drought prone environments
- Food, transport and fuel source

A study by IFPRI³³ has shown that livestock production may be a key means of alleviating poverty over the next 20 years. This study indicates that increased consumption of meat and milk products in developing countries will have wide-ranging, global effects. Enormous transformations are taking place in developing-country patterns of consumption of livestock products as incomes rise, populations grow, and urbanization increases. The study projects that by 2020 developing countries will consume 100 million metric tons more meat and 223 million metric tons more milk than they did in 1993, dwarfing developed-country increases of 18 million metric tons for both meat and milk (Figure 1).

³² Outcome Mapping is currently being championed by IDRC and is based upon the Outcome Engineering Framework developed by the Pacific Institute for Research and Evaluation (see Earl et al. 2001; www.idrc.ca/booktique).

³³ *Livestock to 2020: The Next Food Revolution* International Food Policy Research Institute, 1999.

Figure 1: Demand for Meat Drives a Food Revolution



Increases in consumption of meat and milk
1993 to 2020 (million metric tonnes)
(International Food Policy Research Institute 1999)

This food revolution, if handled properly, could significantly improve the well-being of many rural poor. Livestock products benefit the poor by alleviating the protein and micronutrient deficiencies prevalent in developing countries more efficiently than vegetables and cereals. At the low levels of calories consumed by the poor, lack of access to animal products, not over-consumption, should be the concern of policymakers.

Global Vision Statement: Reduce the estimated 2/3rds of the global poor who keep livestock, living on less than \$2/day.

Livestock production and animal health care in Sierra Leone:

It is clear that poor livestock keepers may benefit substantially from the projected increase in demand for milk and meat products in the developing world. However, in Sierra Leone, available statistics show that the livestock sector has been virtually wiped out by the civil unrest stretching over many years. Livestock resources are either at a very low rate of growth or are in decline.³⁴ Efforts have and continue to be made by the donor community to re-stock Sierra Leone.

Building capacity for Animal Health care in Sierra Leone:

Following the structural adjustment reforms of the 1980s and 1990s, the delivery of veterinary services across Africa was seriously impeded. While in the developed world, animal health care is almost exclusively in the hands of private, highly qualified veterinarians, in the developing world provision has taken on a highly plural nature with mixes of public and private, professional and para-professional, centralised and de-centralised systems. As in the agricultural sector, local-level participation became increasingly popular, especially among NGO's involved in livestock management and the provision of veterinary services. There was a desire to meet the needs of poor livestock keepers, especially those caught up in conflict areas, and the solution was to train para-professionals – community animal health workers (CAHWs) as an alternative to the conventional government-supported veterinarian. There have been questions about the sustainability of CAHWs in the longer term in the absence of external funding and especially if there is subsidised competition. However CAHWs are increasingly accepted as complementing rather than competing with professional veterinarians.³⁵ Nevertheless, in many

³⁴ Livestock Sector Brief, Sierra Leone, FAO 2005.

³⁵ Livestock, Disease, Trade and Markets: Policy Choices for the Livestock Sector in Africa. Ian Scoones and Willem Wolmer. IDS Working Paper 269. Institute of Development Studies in June 2006.

countries such de facto acceptance in practice creates two separate and distinct animal healthcare delivery systems which are often unlinked and inchoate.

Access, and ultimately use, of veterinary pharmaceuticals is another major problem in Sierra Leone. The importance of expert knowledge cannot be over-emphasised when dealing with veterinary drugs. Indigenous expertise is often inadequate in making use of modern drugs and vaccines and the misuse of drugs can result in resistance or serious side-effects. However, in the developing world, these complex systems of veterinary provision are a reality and something we should work with rather than pretend they can be bettered.

As will be discussed further below, it is clear that veterinary capacity is extremely limited at both the national and local levels. For example, one indicator of the state of veterinary resources is the OIE return for notifiable diseases, which shows that Sierra Leone has made no veterinary returns since 1997. In the Sierra Leone, it is clear that the livestock sector is a key entry point for RiU activities. Nevertheless, it is critical that attempts to address the wide-spread needs of the sector that a dual system of NGO vs. the Government is unintentionally supported. As such, it is vital that any in-country strategy supports linkages and convergence between actors, strategies and outcomes. However, the use of an innovation systems approach in combination with an Outcome mapping assessment protocol should lower this risk.

In-Country Vision Statement: First, to increase capacity across the livestock sector with a collaborative framework for action and second, to enhance the uptake of best practice with regard to the implementation of livestock development projects and programs.

Section II: Findings from the field

Over the course of the visit, Professor Maudlin and Dr Heffernan identified the following 'boundary partners':³⁶

1. Chief Veterinary Officer, Ministry of Livestock
2. Principle Livestock Officer, Ministry of Livestock
3. Director of Institute of Environmental Management and Quality Control, University of Njala
4. Director, School of Community Health Sciences, University of Njala
5. St. Joseph's Vocational Institute, Lunsar
6. CORAD: Joint NGO action group comprised of Africare, CRS, World Vision and Care.

From our meetings, many actors noted that during the war, the rebels concentrated on the destruction of assets, often with a specific focus on livestock. As a result, the livestock population was largely decimated. Nevertheless, as mentioned above, in the immediate reconstruction period, many organizations were involved in re-stocking. However, our assessment confirmed that no data exists on the exact level of losses or indeed, the numbers of livestock moved into the country from traders abroad. After the war, it is believed that a significant number of animals were moved into the country both privately and under the aegis of government and NGO restocking projects. However, as a result of the movement of livestock from surrounding countries, new diseases such as PPR and CCPP have been introduced. Anecdotally, livestock losses for some projects were estimated to be 95%.

Clearly such disease incursions present an immediate and on-going threat to the livelihoods of poor livestock keepers. It is clear from our preliminary survey that there is little or no capacity in the animal health sector to deal with these diseases or other animal health threats at the community level or at the country level. Indeed, according to the Director of Veterinary Services, no veterinarians have been trained since the early 1980's. Further, much of the training during this time took place in the former Soviet Block countries. At present, there are two veterinarians in the field with four others working at the ministry level but these individuals have not been formally trained as veterinarians but have attended short courses abroad within the discipline. As Sierra Leone does not have a veterinary school, the department has been forced to rely on ad hoc

³⁶ Boundary partners are defined within the terminology of Outcome Mapping as 'those individuals, groups and organisations with whom the program interacts directly to effect change and with whom the program can anticipate some opportunities for influence' (see Earl et al. 2001; www.idrc.ca/booktique).

overseas training. With regard to mid- to field-level staff, there are a reported 15 animal health professionals working in managerial roles at the district level, with a further 81 trained para-professionals working in the field.

Clearly, trained manpower is a critical constraint within the livestock sector. Further the skill base is often over 20 years old and there is an acute need for the updating of skills at professional, mid-profession and field-levels. Given the urgency of the situation e-learning and other ICT-based training resources may be the best way forward to enhance and improve professional and para-professional capacity.

However, on a wider sectoral level, the consultants identified other critical issues:

First, the timely delivery of livestock drugs is a major bottleneck within the context of service delivery. At present, drug orders placed by the government often take 8-12 months to be filled. NGOs also complained of the inability to supply trained support staff in the field with livestock drugs. At present, there is a single livestock drug provider in Sierra Leone and work with this provider is required to ensure a timely release of supplies.

Second, the adoption of 'best practice' with regard to restocking is very poor. Few lessons appeared to have been learned from restocking in other post-conflict zones such as Bosnia, Rwanda and Mozambique despite best practice and decision-support tools having been published on these issues. As such, prior to further restocking it is imperative that all actors involved in the sector are aware of these issues. Two boundary partners (CORAD and the Government of SL) expressed interest in collating best practice issues within the Sierra Leonean context via workshops and the creation and dissemination of briefing documents.

Opportunity and Constraints in Animal Health Capacity Building in Sierra Leone

ICTs have been targeted by the development community as a potential way to leap frog traditional infrastructural issues with regard to training. However, if this is deemed an appropriate way forward in Sierra Leone, the following 'outcome challenges' must be accounted for:

1. Capacity

Currently there is little or no capacity within Njala University, or the wider university community, in the field of e-learning. While computer literacy is rapidly increasing, some potential students, especially the more mature, may lack essential computer-related skills and will need induction training.

At the community level, capacity is also low. While a variety of NGO actors have expressed interest in the use of ICTs in training, many training programs are based upon the use of traditional tools. Thus, while capacity building via ICTs represents one of the best opportunities for meeting the vast training needs within the animal health sector such an approach would be a new way of thinking for the actors involved. It is therefore essential that time is spent in the training of trainers if such an approach is to be embarked upon.

2. Connectivity

Access to fast reliable and affordable Internet connectivity is likely to be a constraint, particularly for students based in remote locations. Nevertheless, institutions have been identified suitable for community and field-level workers such as St. Josephs Vocational Institute, which have Internet access. At the community level, connectivity is not an issue as validated tools for knowledge transfer do not require the Internet.

3. Infrastructure

Njala University is lacking in adequate computer or communications equipment and infrastructure to support e-learning approaches. Nevertheless, the staff is keen to begin utilizing such approaches. Working with government staff members at other than the Ministry is problematic as the infrastructure for delivering ICT-based learning is also low. Nevertheless, group access points can be obtained by working with the NGO sector.

4. Costs

In addition to capital costs associated with installing computer and communication equipment, costs will be associated with maintaining and replacing such equipment, paying for connections to the Internet an e-mail, in adapting existing or developing new courses and course content and providing e-tutors and moderators for all education groups. With regard to farmer-level tools, costs are associated with creating local language software versions with appropriate visuals. Further

inputs are required to better develop access points. Nevertheless, as noted above, costs can be minimized by utilizing the existing infrastructure of boundary partners, particularly in the NGO sector. Nevertheless such investments will tend to 'future proof' the sector and would enhance sustainability.

5. Risks

Risks associated with ICT-based approaches, particularly at the University level include issues associated with Internet security including access to materials, and vulnerability to viruses, worms and hackers. Learning materials would need to be subject to quality assurance protocols, although this requirement is equally applicable to traditional courses and has been addressed by established courses in the UK system. With a focus on distance learning there is a risk that more practical hands-on skills will be neglected and there will still be a need for access to field-based examples. Such practical experience will be key to enhancing the skills of both government and NGO sector employees and they are addressed by 'summer schools' in established courses.

With regard to community-based approaches the risk is that info-mediaries control access by the poor to information points. Studies have shown that in relation to adoption of ICTs by the poor, buy-in across all stakeholder groups are required. Nevertheless, the communication sector in Sierra Leone has undergone rapid growth in the last five years. The infrastructure regarding the Internet and mobile phones has increased exponentially. As such, key actors believe the timing of an ICT-based intervention is appropriate. Therefore, the following pilot exercise is proposed.

Section III: A Pilot Exercise to Support Capacity in the Livestock Sector in Sierra Leone: The Livestock Linkages Project

The aim of the project is to utilize an innovation systems platform to support new knowledge creation and dissemination across four key actor groups in the livestock sector: professionals, para-professionals, students and farmers.

Project Vision Statement: Facilitate boundary partners in capacity building and enhance best practice across the livestock sector.

Thus, the exercise will further develop new communication channels with regarding to livestock production and animal health across the stakeholder groups. In this manner, the project will support the expected demand for livestock off-take in Sierra Leone in the coming decades. The following project will be undertaken in four phases.

Phase I: Building Networks and Capacity among Project Partners: Scope of Work

The first phase of the study will be to create viable communication networks among project partners. The architecture of the livestock knowledge platform will be developed with partners.

Phase II: Creation of Material

During Phase II, the project will develop learning material specifically for the three stakeholder groups: professionals, para-professionals and farmers. Further, the project will pilot test outputs on clients to ensure the relevance of the material for the group involved. As such, during this period, the following activities will take place:

a. Development of Training Material:

Professional level:

- Creation/adoption of learning modules appropriate for animal health professionals in Sierra Leone.

Para-professional and Farmer Level:

- Development of training curriculum for fieldworkers and learning modules for farmers.
- Digitalisation of material into ICT-ready format.
- Translation of material into local language versions.

b. Testing of visuals in both sets of materials for appropriateness and learning outcomes.

Phase III: Implementation

During this phase, the material will be disseminated to client groups. As such, this phase will concentrate on infrastructural development and the scaling up of the tools across the identified groups.

However, further RiU dissemination activities will be developed for the wider livestock sector.

1. Restocking workshops/networking briefs
2. Livestock Service Delivery workshops/networking briefs

Phase IV: Monitoring and Evaluation

This phase will take place in conjunction with the monitoring and evaluation component of RiU activities in Sierra Leone. An outcome mapping approach will be utilized with a focus on the behavioural change of boundary partners, end-users and providers.

Conclusions:

The livestock sector in Sierra Leone offers a good opportunity for RiU to upscale the findings of previously-funded research. The critical needs of the sector fit well with both the findings and thinking derived from the RNNRS programme. Lessons learned with regard to the delivery of livestock services, restocking and training and capacity building appear particularly relevant. Nevertheless, any such attempts to build capacity must be based upon a strong partnership platform.

While Sierra Leone offers many opportunities, the risks of attempting to build capacity and disseminate lessons learned within a post-conflict environment are also readily apparent. Livestock development projects have well-known criteria for success, and the ability of partners to meet these criteria must be carefully considered prior to project start-up.

Finally, the use of an outcome mapping approach supports an overall understanding of the attitudes and values underpinning actor behaviour. However, within the sector, while there is an overall movement from rehabilitation to development activities, many actors have not yet made a shift in relation to their thinking. Thus, any attempt to initiate a development-orientated capacity building program must accommodate the often conservative and post-conflict mentality of the actors involved.

Appendix I: Meetings Held/Field Visits Undertaken

November 10th: Meetings with Professor Norman Clark, Head of Country Assessment Team, Sierra Leone.

November 11th: Visit to the Field:

1. Njala University, Njala
2. Makeni: Livestock Research Station (former); St. Josephs Technical Training Institute.
3. Restocked households in Makeni environs (2)
4. Semi-commercial pig production units (2)

November 12th: Meeting at the Ministry of Agriculture

1. Chief Veterinary Officer
2. Livestock Development Planning Officer
3. Field Veterinarians (4)

Issues and constraints in the livestock sector in Sierra Leone were discussed and potential ways forward with regard to capacity building.

November 13-15th: Workshop on Information Marketing in Sierra Leone. Informal meetings held with a wide variety of actors involved in the reconstruction of Sierra Leone.

November 15th: Meeting with CORAD partners to discuss restocking and livestock sector inputs in Sierra Leone. Discussed the role of NGOs in restocking and critical actors and needs within the livestock sector. Further areas of discussion included the need for the dissemination of best practice with regard to restocking and equally the urgent need for a co-operative and collaborative animal healthcare delivery system between the government and NGOs.

SECTION 11: DRAFT COUNTRY STRATEGY DOCUMENT FOR SIERRA LEONE

DECEMBER 2007

1 Introduction

1.1 This draft paper outlines a strategy for potential RIUP interventions in Sierra Leone over the period 2008 – 2011. It summarises the overall purpose of the programme and component 1.2 in particular, states the overarching goals of the RIUP, outlines the key components that the strategy document will cover along side associated processes and timetables.

1.2 The CSPD Team (CSPST) has been chosen as a balance between necessary skills and effective team size. It has consisted of 7 people with expertise in programme management, innovation systems, information markets, relevant NR capabilities, monitoring, impact and learning (MIL) and an understanding of the national context. It has also been assisted at various points by Dr Claire Heffernan (livestock and communications) and Mr Hugh Goyder (MIL). Its composition is outlined in the Annex below.

2 Background and Principles

2.1 The RIUP was commissioned in 2006 to capitalise upon the achievements of DFID's past and current research in renewable natural resources. Its purpose is:

- (i) To maximise the poverty-reducing impact of the Renewable Natural Resources Research Strategy (RNRRS) and other research
- (ii) To increase understanding of how the promotion and widespread use of research can contribute to poverty reduction and economic growth as summarised by the United Nations (UN) Millennium Development Goals (MDG) project

2.2 The RNRRS ran between 1995 and 2006 with the objective of generating "new knowledge and promoting its uptake and application such that the livelihoods of poor people are improved through better management of renewable natural resources". The bilateral component was organised as ten research programmes covering the needs of people dependent on agriculture, forestry, livestock and fisheries for their livelihood. The breadth of the strategy reflected the wide variety of environments in which poor people live in poorer countries and the multiple routes by which research can reduce poverty. Whilst the RNRRS provides a rich dataset from which to draw, it is also acknowledged that natural resources research from other sources is also likely to add value to the work of the RIU.

2.3 Its main organising principle is that of an *innovation system* combined with the hypothesis that an innovation systems approach will prove more effective than linear approaches at getting research outputs into use for the benefit of the poor. The key elements of this principle and approach are outlined in Box 1 below.

2.3 Following its inception phase (April 2006–July 2007) the RIUP has developed a programme of action that comprises the following expected outputs:

- **Output 1:** Significant use of Renewable Natural Resource Research and other natural resources research outputs for the benefit (direct/indirect) of poor men and women in diverse contexts;
- **Output 2:** Research-into-use evidence generated with evaluation partners; and,
- **Output 3:** Policy processes enabled by research-into-use principles, lessons and discourse.

Box 1. Elements of an Innovation System

- It involves the suppliers and users of knowledge in some form of partnership on a common platform
- There is genuine and continuous involvement of suppliers of knowledge, intermediaries, policy makers, “enablers”, all “end-users” (producer, consumer or processor) to assist in the determination of the innovation bottlenecks. Putting as much emphasis on promoting technologies as promoting approaches and processes that have been proven to be effective in getting research into use
- Investments in strengthening capacities takes place where they are needed in the “innovation system” (not just R&D organizations but also in intermediary functions that enable communications between knowledge suppliers and users)
- It serves to financially develop sustainable delivery systems/viable business models (this often involves manufacturers, service providers, credit suppliers, and providers of technical assistance to users)
- Such investment is an iterative process that enables the organisations within the system to learn from experience and improve their performance
- It introduces new technologies and/or new ways of doing things in a financially, socially and environmentally sustained basis
- It normally evolves new institutional arrangements by which the various organisations in the system operate

3. RIUP Objectives

3.1 The RIU has identified eight values that will underpin its work and these are: strategic focus; openness; transparency; fairness; innovation; accessibility; inclusiveness; and empowerment. As part of its focus on ‘fairness’, it will aim to promote access to knowledge, participation, equal opportunities, and inclusive partnerships for all social groups with a particular focus on the disadvantaged. It will also work to value cultural diversity and to reduce exclusion and the disadvantages that stakeholders face. The RIU will adopt a positive and pragmatic approach to the ‘environment’. It will promote environmentally sound management practices and the production of improved, stable livelihoods for a range of stakeholders including those of the vulnerable poor. This approach recognizes that environmentally sound management and sustainable livelihoods have a close relationship, in that one strengthens and reinforces the other

3.2 With regard to Output 1 the RIUP will apply the innovation systems approach and its values to attain significant use of RNRRS and other natural resources research outputs for the benefit (direct/ indirect) of poor people in diverse contexts through mechanisms that:

- Improve access to RNRRS and other research outputs (Component 1.1)
- Enhance demand for RNRRS and other research outputs (Component 1.2)
- Lead to development of enterprises using RNRRS and other research outputs (Component 1.3)

3.3 The overall implications of the above are that the strategies and programmes for all the components for Output 1 must not only show how they are contributing to the output indicators but they must also be explicit on how they are applying the innovation systems approach to whatever interventions are being undertaken. To assist this aspect the MIL team will work closely with the Sierra Leone Research into Use Programme (SLRIUP) at all stages (see various sections below).

4. The Sierra Leone Context

4.1 The Sierra Leone country assessment report outlined what this has meant in innovation system terms and implications for the search for suitable innovation platforms. Of great importance are the peculiar contextual circumstances in Sierra Leone caused by a civil war that virtually destroyed the country's social, economic and institutional fabric (including its research sector). Major areas of rural society ceased to function economically, people migrated to the towns in large numbers (especially Freetown the capital) virtually halting agricultural production. Infrastructure like roads and energy supply were also destroyed. Corruption has become endemic and the private sector and investment climate are both very weak. The capacity of government to help resolve these issues is also limited.

4.2 Conversely the factors likely to affect the choice and growth of economic activity are:

- Public sector reform for effective policy making and implementation – bringing all parties; political, private sector, NGOs, trade unions, etc onboard
- Human capital development
 - Improved performance management – currently conformity reigns over performance
- Creation of an enabling environment for private sector activity
 - Macroeconomic stability
- Promotion of popular participation and decentralisation

4.3 In summary the kinds of horizontal connectivity that normally characterise a viable national innovation system are relatively weak and will need to be supported. The Sierra Leone strategy will ensure that its

interventions are designed to build on whatever systems activities exist and to foster these as much as possible over the life of the programme.

5. Creation of a National Coalition for Sierra Leone

5.1 In general Component 1.2 of the RIUP is to enhance demand for RNRRS and other research outputs. For the programme as a whole this will be pursued through two possible processes:

a) National coalitions for innovation and that bring together national actors that are already implementing RIU-like activities. The RIU will, where necessary facilitate the consolidation of these actors so as to develop a common research into use agenda to which it would contribute. In essence the RIU Programme will belong to the coalitions.

b) Partners organizations (such as an international NGO, a public institution, a donor-funded programme etc) that are already implementing innovation programmes to which the RIU can add value by introducing RNRRS or other research outputs. Such a partner organization would have been assessed as having the vision and mission that embrace the principles and objectives of the RIU and as possessing strong links with local level innovation platforms capable of demanding and using research outputs.

5.3 In the case of Sierra Leone it is suggested that the RIUP should be a step-wise process using the second of the above two categories to begin with and supplemented by measures to strengthen information and knowledge linkages between innovation system actors (existing/potential) as a means to foster new partnerships and platforms. Progress towards a national coalition will thus be realised through a “bottom-up” process of coalition building (see below). The rationale for this procedure is that:

- It should produce tangible results quickly on the ground
- It should act as a learning tool for the RIUP both in Sierra Leone and as a whole
- It will act as a focus for the evolution of an effective national coalition (see below)

6. Proposed Interventions

6.1 The original country assessment noted that there are already significant interlinked activities being undertaken in Sierra Leone especially by international and national NGOs. It identified four areas where interventions look particularly promising. The CPSDT suggest that these form the basis of project interventions over the first year of the programme. It also recommends that these be staged beginning with Intervention 1 and moving quickly on to the others. In each case the programme will select a key partner who is already involved in successful economic activities and who has indicated a wish to collaborate with the RIUP. The partner will have

already built up the beginnings of an innovation platform and would benefit from a technological input from aspects of the RNRRS and other relevant knowledge.

6.2 Choice of partner will initially be decided by the country task team (CTT) outlined below (although see 8.3 on the proposed evolution of the national coalition). The partner (assisted by the CTT) will prepare a concept note outlining the proposed intervention and following approval by CTT will prepare a detailed project proposal with specified outputs and a budget. This may then be modified but will form the basis of an agreement between the RIUP and the partner which in turn will be funded through an appropriate mechanism.

6.3 In each case the CTT will also identify a partner or partner from the original RNRRS programme whose knowledge will add technological value to the project. This partner or partner will assist the local partner in the preparation of both the concept note and the final project proposal

6.4 In each project proposal emphasis should be placed on the following components

- The added value expected throughout the value chain related to the intervention
- The impact on empowerment of disadvantaged groups such as women and youth
- The impact on employment and capacity building
- Possibilities for complementary fund-raising and co-operation with other donors
- Possibilities for complementary entrepreneurial activity (e.g. chicken hatcheries)

6.5 Following the recommendations of the CA report the CPSDT recommend the first intervention be on livestock enhancement. In all regions visited during the country assessment there were expressed wishes for help in re-establishing livestock as essential and integral components of viable farming systems. This was simply wiped out during the war. It is now well understood that livestock contribute in a variety of ways to the livelihoods of poor people:

- Cash income
- Sale or hire of animal or animal products
- As an asset for poor women
- Draught power and manure
- Private benefits for poor from common property resources
- Livelihood security - buffers crop yields
- Can succeed in drought prone environments
- Food, transport and fuel source

6.5.1 we can assume that efforts will and are being made by the donor community to re-stock Sierra Leone, certainly with the larger species. However re-stocking, in the absence of animal health care provision, can be a risky and even dangerous (in the context of zoonoses) business. Following the structural adjustment reforms of the 1980s and 1990s, delivery of veterinary services across Africa became very difficult. While in the developed world, animal health care is almost exclusively in the hands of private, highly qualified veterinarians; in the developing world provision has taken on a highly plural nature with mixes of public and private, professional and para-professional, centralised and de-centralised systems.

6.5.2 as in the crop sector, local-level participation became increasingly popular, especially among NGOs involved in livestock management and the provision of veterinary services. There was a desire to meet the needs of poor livestock keepers, especially those caught up in conflict areas, and the solution was to train para-professionals – community animal health workers (CAHWs) as an alternative to the conventional government-supported veterinarian. There have been questions about the sustainability of CAHWs in the longer term in the absence of external funding and especially if there is subsidised competition. However CAHWs are increasingly accepted as complementing rather than competing with professional veterinarians³⁷.

6.5.3 the importance of expert knowledge cannot be overemphasised when dealing with veterinary drugs. Indigenous expertise is often inadequate in making use of modern drugs and vaccines and the misuse of drugs can result in resistance or serious side-effects. However, in the developing world, these complex systems of veterinary provision are a reality and something we should work with rather than pretend they can be bettered. It is apparent that veterinary capacity is extremely limited in Sierra Leone. For example, one indicator of the state of veterinary resources is the OIE return for notifiable diseases, which shows that Sierra Leone has made no veterinary returns since 1997. In the Sierra Leone setting, RIU will therefore seek to address both professional and para-professional capacity building. How this can be best achieved will emerge following discussions in country with NGOs, Animal Health Institutes, Universities and other interested stakeholders.

6.6 Once intervention 1 is underway it is recommended that the Country Task Team moves on to the other priority areas outlined in the CA report; viz.

- Assistance in post-harvest arrangements
- Establishment of micro credit and related facilities in rural areas

³⁷ Livestock, Disease, Trade and Markets: Policy Choices for the Livestock Sector in Africa. Ian Scoones and William Wolmer. IDS Working Paper 269. Institute of Development Studies in June 2006.

- Assistance in developing the operations of farmer field schools

However, there should also be space to include other areas as events unfold. For example, a strong case was made at the recent Freetown workshop (11th – 15th November) to include artisanal fisheries as a candidate platform. It will be the responsibility of the CTT (assisted by the NSC) to identify and support further potential innovation platforms. In each case the CTT will identify a suitable partner and proceed along the lines outlined above. Further details on these will be provided in the final programme document.

7. A National Information Market

7.1 Sierra Leone is subject to acute information market failures. The rural communications infrastructure is fragmented and the transaction costs for information exchange correspondingly high. Profitable opportunities to take up and create value from new technical knowledge are limited; demand in rural areas is also suppressed by limited access and capacity to engage with 'formal' sources of new technical knowledge.

7.2 A variety of communications tools and approaches were presented at the recent stakeholder workshop in Freetown³⁸. There was also some opportunity to consult with information market stakeholders including the National Telecommunications Commission, and local NGOs; additional meetings were held as possible, including with the local mobile phone operator Tigo.

7.3 'Last mile' extension efforts in Sierra Leone rely on traditional face to face approaches, supplemented by initiatives using e.g. drama and broadcast media, in particular the radio. Use of mobiles is increasing but from a low base of only c. 10% penetration. GPRS internet via the mobile phone will shortly be available offering limited bandwidth but spreading coverage to 70% or more of the country. There are also options based on very high frequency radio transmission and VSAT, although the capital and recurrent costs of these are currently prohibitive for individuals or for SMEs without subsidy. Preliminary analysis suggests that the SL telecoms and ICT services sector is reasonably free and dynamic, with evidence of innovative business practices. Some actors are beginning to build commercial information services over internet and SMS but with limited development content currently.

7.4 Within this context strategic choices for the RIU SL programme are :

- Emphasis on strengthening SL information market capacity at an **enabling** level, through improved communications linkages, supporting the emergent innovation platforms, and more broadly by strengthening effective demand pull on new technical knowledge and related national and international services;

³⁸ These included distance learning modules, expert systems, internet helpdesk services, and a web-based marketplace for agricultural information and services.

- Working at, and slightly ahead of the rural margins of the Sierra Leone telecommunications market³⁹ Internet and mobile communications should be the backbone infrastructure to link supply and demand side actors; while, delivery of appropriately packaged content to rural communities and services providers will also rely on traditional means, offline tools, and broadcast media, in the medium term;
- Facilitating emergence of private sector information linkage services, the rationale being (i) there is much dynamism in the telecoms sector in particular, juxtaposed with weak (although improving) public sector capacity. (ii) private sector uptake provides for sustainability beyond the RIU programme.

7.5 The SL Workshop endorsed the proposal to establish an independent 'knowledge brokerage' function in SL that would :

- Be a widely trusted source of agricultural information and services
- Provide means for communities, researchers, extension and other innovation platform stakeholders to link & communicate
- Provide a point of access to 'external' scientific knowledge
- Stimulate demand for information products and services relevant to agricultural and NR innovation and service this demand through linkage with potential suppliers

7.6 The SL Workshop also discussed/endorsed that :

- The entity would be independent and most probably privately operated;
- There is likely to be a need for capacity strengthening and other resources to ensure active involvement of rural communities/actors

7.7 Further work is needed to define modalities for implementation (presumably at the next stage of SL programme development). In particular :

- More work is needed to map and consult with information market stakeholders who would be contributors to, and clients of the knowledge brokerage service in terms of specific requirements;
- The relationship between the national knowledge broker function and the specific communications needs of individual innovation platforms needs to be worked through;
- The best way to foster a commercial knowledge brokerage service may be as a specific innovation platform activity with appropriate partners in Sierra Leone, the outcome of which would be a business plan for investment support via RIU 1.3 and/or local investors.

³⁹ Notwithstanding infrastructure constraints the demand for mobiles and internet communications are likely to be as strong in SL as elsewhere and there is no reason to suggest that the communications landscape will not be transformed within the lifetime of the programme.

8. Programme Management

8.1 It is recommended that the SLRIUP be managed by a secretariat with office facilities in a suitable Freetown venue. The country task manager will act as the chief executive of the Country Task Team (CTT) and report to the SMT. He/she will be assisted by a country co-ordinator suitably assisted by secretarial and office support. There will also be MIL support in the form of a national MIL manager assisted by the international MIL Country Link Manager. The office will act as a fulcrum for the creation of the national innovation coalition, starting with the first intervention and as experience is gained, gradually broadening out to include stakeholders more generally within the country as a whole.

8.2 The SLRIUP national coalition (NC) will initially take the form of a national steering committee (NSC) that will be consulted regularly during the initial stages of the programme. As outlined above the CTT will prepare possible project interventions that will be submitted to the RIUP Strategic Management Team (SMT) for approval. These will be solicited from national groupings including via the information market mechanism and will take the initial form of concept notes followed up by more detailed proposals.

8.3 The actual process of building the coalition should be done in close consultation with government (probably the Ministry of Agriculture). It should be managed by the CTT according to a timetable such that the NC is up and running by March 31st 2009. One possible approach is to build the NSC sequentially for each intervention project such that by the time the fourth or fifth project is in preparation the NC will effectively be in place. At this stage the CTT will act in effect as the executive committee of the NC. However, how coalition building should take place in detail is essentially a matter for the Sierra Leone Government and the CTT on the ground.

8.4 Financial management of projects should be carried out by bodies with a good track record of probity and accountability. Decisions on this aspect will be made by the SMT with advice from the CTT.

8.5 The RIUP will provide sufficient resources to start the Sierra Leone programme off but supplementary fund raising will be required as the programme matures. This will be the responsibility of the country task manager assisted by the country co-ordinator.

9. Monitoring, Impact and Learning (MIL).

9.1 The RIUP as a whole has a major emphasis on monitoring, impact and learning (MIL). The RIU's MIL objectives and processes will (1) support and synthesise the learning within the programme, and (2) provide evidence of how to get research into use and of the resultant impacts on poverty. MIL processes will take place within all the initiatives that form the RIUP.

9.2 In Sierra Leone, MIL processes will be integrated into the country strategy and implementation plan. They will be consistent with the programme-wide approach, have a primary focus on the performance and learning frameworks at process, output and outcome level, and contribute to the diverse and dispersed RIU programme as a whole. In line with the overall RIUP, the SLRIUP will target poor farmers, particularly women. The programme will therefore need to collate and disaggregate data in relation to gender and social group. Specific activities will be defined in the implementation plan but should include:

- establishing **baselines** for all interventions
- Participatory **monitoring** systems, utilising the performance and learning frameworks, to track inputs, activities and outputs and the effectiveness of partnerships.
- Periodic **evaluation** of progress towards objectives and validity of approaches; changes within and added value of partnerships/coalitions; changes in the external environment relevant to project aims; any impacts on the disadvantaged.
- Processes and events to collate, reflect on, and share **learning** arising from the projects and to feed it into decision making or advocacy processes.

9.3 As an integral part of the Sierra Leone RIU programme, these activities will be managed by the CTT including the National MIL Manager, with support from the international MIL Country Link Manager. The SLRIUP will involve in-country evaluators and researchers where possible. However, limited existing independent research/evaluation capability in country suggests that the programme will need to take a capacity-building approach in this area.

10. Capacity Building

10.1 The RIUP has placed significant emphasis on the need for capacity building as a necessary aspect that is integral to all interventions. The CPSDT suggest that capacity building initiatives take different forms but chief among these is the capacity among stakeholder groups to interact and link productively. Mechanisms to achieve this will include regular workshops dealing with all funded projects. Capacity building will also include bringing the university and research sector up to international best practice standard. As noted above MIL work will place particular attention on these aspects. The SLRIUP will be responsible for ensuring that regular capacity building events take place

11. Projected Budgetary Requirements

11.1 Each project intervention will estimate its own budgetary requirements and this will clearly vary according to relative resource needs. However, if the CTT can use the estimated £1.2 million that is available to leverage an

equivalent sum from national and other international sources then it should be possible to mount (say) 10 projects over the period up to April 2011 at an average cost of c. £240,000 per project. This sum would be a full cost estimate and would include a share in the amortised costs of national office and other administrative costs within Sierra Leone.

12. Time Line

12.1 The suggested time line for the SLRIUP is as follows:

December 31 st 2007	Country strategy agreed by the SMT
January 31 st 2008	Country programme agreed by the SMT
	March 1 st 2008 Appointment of Country Task Manager and Co-ordinator confirmed.
March 31 st 2008	Agreed MOUs reached with first partner organisation
	March 31 st 2008 Agreement reached on the likely structure of the Sierra Leone Information Market
	September 1 st 2008 Decisions reached on funding further RIUP projects
	October 1 st 2008 Committal of resources to further RIUP projects
	March 31 st 2009 Transformation of the NSC into the NCC completed.
	July 31 st 2010 Report back on all interventions
	March 31 st 2011 Final report to RIU SMT

Annex CSPD Team

1. Team Leader and Innovation Systems specialist (Norman Clark)
2. Natural Resources Specialist (Ian Maudlin)
3. Dissemination/Information Access Specialist (Freida McCormack)
4. Information Markets Specialist (Steen Joffe).
5. Gender/Poverty/MIL Specialist (Simon Starling)
6. Development Economist (Emmanuel Cleeve)
7. National Co-ordinator (David Suale)