# SUB-SAHARAN AFRICA CHALLENGE PROGRAMME

Programme Proposal

Volume 1, June 2004


Building Sustainable Livelihoods

through

Integrated Agricultural Research for Development

## "SECURING THE FUTURE FOR AFRICA'S CHILDREN"

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## PUBLICATIONS

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Volume 1: Funding proposal

Volume 2: Reference materials from the consultative programme development process

Volume 3: Report of the Programme Formulation Workshop, 10-14 March 2003



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# SUB-SAHARAN AFRICA CHALLENGE PROGRAMME PROPOSAL

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# PROGRAMME PROPOSAL

## EXECUTIVE SUMMARY

Sub-Saharan Africa has the tragic distinction of being the only region in the world where overall food security and livelihoods are deteriorating, rather than improving. Over the last 14 years, the number of Africans living below the poverty line has increased by 50%. In a region where 70% of the population lives in rural areas, a structural food deficit has persisted for more than 30 years, leading to the highest levels of per capita food aid in the world. Some 400 million Africans are dependent on smallholder farming or pastoralism, under conditions of natural resource degradation that threatens the medium- and long-term sustainability of agriculture. Looking into the future, a number of factors – *inter alia*, climate change, population growth, poverty, declining soil fertility and availability of water, rural-urban migration, HIV/AIDS, gender biases against women farmers, weak infrastructure and markets, and counterproductive policies – will worsen the situation of Africa's rural poor unless major new efforts are made to arrest these trends.

Recognizing the gravity of this problem, the New Partnership for Africa's Development (NEPAD, established by Africa's leaders in 2001) has set itself the goal of increasing agricultural output by 6% per year for the next 20 years. This poses a tremendous challenge for agricultural research and development institutions, policy makers, and Africa's farmers. The extensive consultation process that culminated in this proposal identified the following three issues as the most significant constraints to reviving agriculture in the region:

- failures of agricultural markets
- inappropriate policies; and
- natural resource degradation.

Addressing these constraints in isolation will not solve the problem, however. Although the traditional approach to agricultural research and development has brought about significant advances in the countryside, its fragmented and reductionist nature makes it ineffective in dealing with increasingly complex challenges. A new paradigm is called for that can foster synergies among disciplines and institutions, along with a renewed commitment to change at all levels from farmers to national and international policy makers. The proposed Sub-Saharan Africa Challenge Programme (SSA CP) is based on such a paradigm, entitled "Integrated Agricultural Research for Development" (IAR4D).

### The IAR4D Approach

The IAR4D paradigm draws on successful experiences in Africa with Integrated Natural Resource Management (INRM), which takes a systems approach to managing the interactions between soils, water, pests, and human interventions in agriculture. IAR4D goes beyond INRM, however, to encompass as well the domains of policies and markets, and the effects that these have on the productivity, profitability, and sustainability of agriculture. Taking all these factors into account, the research and development agenda of IAR4D will focus on four overall objectives:

- To develop technologies for sustainably intensifying subsistence oriented farming systems;
- To develop smallholder production systems that are compatible with sound natural resource management;

- To improve the accessibility and efficiency of markets for smallholder and pastoral products; and
- To catalyze the formulation and adoption of policies that will encourage innovation to improve the livelihoods of smallholders and pastoralists.

Integrating research and action on these four dimensions already represents an improvement on current practice, but the IAR4D approach calls for an even broader scope of work. Four additional mechanisms or "support pillars" are required to foster internalisation of a new way of doing business, and the "out-scaling" and "up-scaling" of programme outcomes – out-scaling to neighbouring villages or similar agro-ecosystems elsewhere on the continent, and up-scaling to connect with local, national and international governments and institutions and the private sector. (Figure 1.4 on page 13 of the proposal presents graphically the concepts of out- and up-scaling.) The four support pillars of IAR4D are:

- Promotion of organizational and institutional change to enable cross-disciplinary research and development and multi-institutional collaboration;
- Capacity building for project teams, farmers, and scientists in African institutions;
- Information and knowledge management (including documentation of new methodologies developed) to disseminate widely the findings of IAR4D work; and
- Ongoing monitoring and evaluation, and a systemic approach to impact assessment, to track Programme progress towards overall goals, signal the need for mid-course adjustments, and document the returns on investment in IAR4D.

## Implementation of the Sub-Saharan Africa Challenge Programme

Because IAR4D represents a significant change from past approaches to agricultural research and development, it will be implemented in the SSA CP through a two-step process congruent with the principle of "learning from doing." For the first phase of the Programme, Pilot Learning Sites (PLSs) have been selected by the African subregional organizations (SROs) for agricultural research (CORAF/ WECARD, ASARECA, and SADC/FANR) – one site per subregion, each characterised by a different but complementary set of constraints to sustainable development. A stepwise screening process using spatial and non-spatial data led to the identification of a range of candidate sites. SRO Task Forces then chose three Pilot Learning Sites, the most serious constraints faced by the communities at these sites, and formulated hypotheses to address the problems. The three sites are Kano-Katsina-Maradi (Niger and Nigeria), "Lake Kivu" (Democratic Republic of the Congo, Rwanda and Uganda), and a transect that runs from northeast Zimbabwe through central Mozambique into southern Malawi.

For each site, Pilot Learning Team (PLTs) will be formed to address the hypotheses. These will be comprised of members from a variety of scientific disciplines (biophysical and social) and from diverse institutions (e.g., national agricultural research institutes, universities, CGIAR Centres and advanced research institutes; extension agencies; nongovernmental, community-based, and farmers' organizations; and the private sector).

Once funding is available, the three initial PLTs will begin their work by continuing the participatory problem identification with farmers to further refine the problems and develop concept notes. The teams will pay particular attention to involving women agriculturalists who have frequently been marginalised in past development efforts. The diagnostic stage will lead to the identification of relevant "entry points" for research which will set the agenda for the work of the PLTs. Regardless of the primary focus of PLT activities, all projects will include measures to address the four overall interacting SSA CP objectives, i.e., intensification, NRM, policies and markets. Facilitation and mentoring services will be provided to the teams from the outset to ensure that they work effectively across disciplinary and institutional boundaries and with their multiple constituents, and to foster broader changes in the institutional context. PLT interventions will be driven by local needs, but they will draw on a significant amount of available knowledge and best-bet technologies, even while generating new methodologies and practices that will have relevance for subsequent efforts.

Given the magnitude of the constraints to agricultural development, the innovative nature of IAR4D, and the complexity of change dynamics, it will take at least 5-10 years to demonstrate the full impact of this new approach. However, past experience (for example, that of the African Highlands Initiative) suggests that within one to two years, there will already be signs of tangible benefits flowing

from the work of the Pilot Learning Teams. An early evaluation of the Phase I work will be therefore be undertaken to document the validity and challenges to implementing IAR4D in the initial three sites. Documentation of methodological innovations will also be included as part of this evaluation. Based on evaluation findings, the CGIAR Executive Committee will determine if the evidence warrants expanding IAR4D to a larger number of sites.

It is proposed that in Phase Two of the SSA CP, an additional six sites will be added, making a total of nine sites across sub-Saharan Africa (three sites per subregion). This is considered the minimum number of sites necessary to demonstrate the effectiveness of the approach under diverse local conditions and problem complexes, and to enable policy makers and members of research and development institutions to see IAR4D in practice at close hand. Selection of Phase 2 Pilot Learning Sites and Teams will be done through an open competitive process overseen by the subregional organisations and the SSA CP Programme Coordination Unit, which will ensure broad participation of relevant institutions and groups involved in agricultural research and development. Phase 2 Pilot Learning Teams will follow the same approach to identifying entry points and conducting activities as in Phase 1, building on lessons learned in the first round of IAR4D activities. Once fully implemented, the SSA CP will give strong emphasis to ensuring that the results of Programme activities are communicated to research and development institutions throughout sub-Saharan Africa, so that findings can be taken up well beyond the immediate local areas where projects are carried out. Impact assessment and continued documentation and synthesis of methodological developments will be important features of the Programme as it matures.

## Expected impact of the Challenge Programme

Through this approach, the Sub-Saharan Africa Challenge Programme will strive to meet its overall goal, which is to bring about improved rural livelihoods, increased food security and sustainable natural resource management throughout sub-Saharan Africa as a result of greater impact from agricultural research for development. The Programme aims to transform the way that sectors and institutions at all levels approach research for development in the region. This will entail a shift from narrowly focused sectoral concerns to a co-operative, gender-sensitive, integrated approach that includes public-private sector linkages and improved markets and policies. The design of the SSA CP is based on a two-year consultative process with more than 100 representatives of African institutions and international experts, drawing on lessons learned from past shortcomings as well as successes with approaches such as Integrated Natural Resource Management. The Programme is fully aligned with the NEPAD goal of sustainably improving livelihoods and natural resource management in sub-Saharan Africa. Management of the SSA CP is designed to ensure high quality research by the best qualified partners, transparency and accountability in the use of funds, and African ownership of the Programme and congruence with national and regional priorities.

The total five-year investment required to implement the Sub-Saharan Africa Challenge Programme (Phases 1 and 2, with a total of nine Pilot Learning Sites) is US$70 million. Using modest standards of achievement, the Programme will yield an internal rate of return of 34% and, at a 10% discount rate, a net present value of US$185 million. This estimated calculation of the Programme's return on investment does not include benefits to agents other than the communities in the Pilot Learning Sites that will stem from improved market efficiencies, better natural resource management and biodiversity conservation, and more effective African and international research and development institutions. The latter areas are arguably where the greatest impact of IAR4D will be realised, but it is difficult to calculate *ex ante* the economic value of transformation in these domains.

The Sub-Saharan Africa Challenge Programme and the IAR4D model represent an innovative framework to significantly improve the well-being of Africa's smallholder farmers and pastoralists (especially women and children), reverse the decline of the natural resource base, improve agricultural policies and market, and enhance the quality and efficiency of research for development. It is an ambitious agenda, but without such a broad and integrated approach, the cycle of poverty and resource degradation that grips Africa's farmers will remain unbroken.

# CHAPTER 1. RATIONALE FOR A CHALLENGE PROGRAMME FOR SUB-SAHARAN AFRICA

*This chapter reviews the overall picture of socio-economic development in sub-Saharan Africa, discusses the interrelated factors that constrain African agricultural development, and describes the core principals of the proposed Challenge Program for the region.*

## 1.1. An Africa-wide mandate for change

In Africa and amongst Africa's partners around the world, forces are converging to press for a new approach to development in sub-Saharan Africa. One example of this is the New Partnership for Africa's Development (NEPAD), which articulates the determination of Africans to extricate the continent from the consequences of underdevelopment. National and pan-African bodies such as NEPAD, as well as the international development community (Pinstrup-Andersen & Cohen 2003), recognise the need in sub-Saharan Africa to simultaneously increase food production and the incomes of small-scale farmers and pastoralists, whilst maintaining the natural resource base. In May 2001, the Forum for Agricultural Research in Africa (FARA), along with its three founding subregional organizations (SROs) and the CGIAR centres, issued *The Durban Statement*, calling "on the international research system, including the CGIAR centres and advanced research institutions, to forge more effective and efficient partnerships with African NARSs and achieve greater programmatic integration." The Programme Formulation Workshop convened by FARA in March 2003[1] to craft the elements of the Sub-Saharan Africa Challenge Program likewise identified the need for a new way of doing business in agricultural research for development in Africa.

In support of NEPAD's goals, FARA and the SROs endorsed the target of 6% annual growth in agricultural productivity to stem and reverse the decline in food production and incomes of the rural poor in sub-Saharan Africa (NEPAD 2003). To attain this by 2020, the region should:

- have dynamic agricultural markets among nations and between regions;
- be a net exporter of agricultural products;
- have food available and affordable, with equitable distribution of wealth;
- be a strategic player in agricultural science and technology development; and
- have a culture of sustainable use of natural resources (FARA 2002b).

To flesh out a strategy for achieving these goals, an extensive consultation process has been conducted by FARA since its inauguration in 2002, with input from more than 100 scientists from research institutions in Africa and elsewhere in the world.[2] During the consultation process, numerous issues were identified as potential constraints,[3] three of which were most frequently given highest priority: failures of agricultural markets, inappropriate policies, and natural resource degradation.[4] There was also overwhelming consensus that addressing these issues in isolation has failed to raise the productivity and profitability of African agriculture sufficiently or sustainably. A new paradigm was called for that would approach these in a holistic and integrated manner.

The conclusion of the consultation process was that there is an urgent need for a major research effort, on the scale of a Sub-Saharan Africa Challenge Programme (SSA CP) composed of interlinked

[1] Volume 3.

[2] Much of the input consisted of a diversity of proposed research hypotheses that would contribute to the goals of the Programme; see Volume 2 for examples of these inputs and hypotheses. These were very influential in stimulating the discussions at the Programme Formulation Workshop in Accra and in providing material for the Proposal. A questionnaire was distributed at the March 2003 FARA meeting to assess areas of agreement and priorities among the diversity of possible research actions. The outcomes of the survey are summarised in Volume 2.

[3] See Annex A-1 for a discussion of the priority issues identified by the three African subregional agricultural research organization (CORAF/WECARD, ASARECA, and SADC/FANR).

[4] Report of the Programme Formulation Workshop, Volume 3.

**Box 1.1. High level endorsement for a new paradigm**

In making agriculture one of the central pillars of the New Partnership for Africa's Development (NEPAD), Africa's leaders have recognised the urgency of improving the livelihoods of farm and pastoral families on the basis of sustainable use of natural resources. To break the vicious cycle and improve livelihoods as required to meet the Millennium Development Goals, the challenge set in the NEPAD's *Comprehensive Africa Agriculture Development Programme* (CAADP) is to increase agricultural output by 6% a year for the next 20 years. This requires a 3% growth in total factor productivity, which is a major challenge.

CAADP's Agricultural Research, Technology Dissemination and Adoption pillar will be comprised of four sub-themes that collectively contribute to testing the central hypothesis: "that conservation and efficiency of use of soil and other natural resources will be optimised under conditions of market and/or policy and institution-driven productivity." The four research themes are:

1. Integrated natural resource management
2. Adaptive management of appropriate germplasm
3. Development of sustainable market chains
4. Policies for sustainable agriculture.

These will be reinforced by cross-cutting initiatives in scientific capacity building. Together, they constitute the integrated research agenda of this Challenge Programme.

In June 2004, the World Bank hosted a framing workshop for the proposed TerrAfrica Regional Sustainable Land Management Programme. TerrAfrica responds to a growing awareness that there has been underinvestment in sustainable land management in sub-Saharan Africa in relation to the severity and magnitude of the problems, and that if this situation is not corrected, land degradation and desertification in the region will continue, placing in jeopardy global efforts to boost growth and reduce poverty. TerrAfrica aims to set priorities, generate new partnerships and research and strategic policy frameworks, create knowledge and share tools, as a basis for catalysing additional resources and more innovative, programmatic investments in support of sustainable land management. The Sub Saharan Africa Challenge Programme has the potential to make a major contribution to TerrAfrica and related programmes.

Dr K.Y. Amoako, Executive Secretary of the United Nations Economic Commission for Africa has stated: "*If we're going to truly mobilise science and technology for sustainable development, all key stakeholders must be involved in both policy formulation and implementation. That's the way we avoid academic and elitist policies; that's the way we define and strengthen the role of public institutions, international partners, universities, NGOs, women's organisations, civil society and the private sector; and that's the way we ensure that policies are tailored primarily with a view to meeting the specific needs of end users and clients*."

The institutions called to action by Dr. Amoako are the stakeholders of the Forum for Agricultural Research in Africa, i.e. public institutions, universities, international partners, NGOs, women's organisations, civil society and the private sector. The SSA CP is their collective response to the challenges set out above.

projects embracing ecological, social and political variability. The consultative process resulted in the following mission, goals and objectives for the SSA CP.

The SSA CP's ***mission*** is to add value to and enhance the impact of ongoing agricultural research for development in sub-Saharan Africa. The Programme aims to transform the way that sectors and institutions at all levels approach agricultural research.

The ***goal*** of the SSA CP is to bring about improved rural livelihoods, increased food security and sustainable natural resource management throughout sub-Saharan Africa as a result of greater impact from agricultural research for development. It will thereby contribute to meeting the poverty and hunger targets of the Millennium Development Goals, and NEPAD goals as set out in the Comprehensive Africa Agriculture Development Programme (CAADP).

The Challenge Programme will be characterised by a collaborative effort among researchers (national, regional and international), extension agencies, the private sector and civil society. Following the example of the African Highlands Initiative and INRM, the approach will embrace an institutional innovation process in which participatory, action-oriented methods drive research for development to solve critical problems. Among other things, this will entail a shift from narrowly focused sectoral concerns to co-operative, gender-sensitive, integrated approaches that include public-private sector linkages. This new paradigm is presented here as **Integrated Agricultural Research for Development** (**IAR4D**).

The remainder of this chapter lays out the overall rationale for a continent-wide challenge programme, given the intractable problems in African agriculture and the shortcomings of the conventional approach to agricultural research and development. The core principles for the IAR4D approach are described, using integrated natural resource management (INRM) and the African Highlands Initiative (AHI) as models. [5]

## 1.2. Economic and agricultural development challenges in Africa

### 1.2.1. Africa's development challenge

Sub-Saharan Africa is the only region in the world where, overall, livelihoods and food security continue to deteriorate. Over the last 14 years, the number of Africans living below the poverty line has increased by 50% (Amoako 2003). The majority of Africans still face widespread rural poverty, worsening food insecurity, and degradation of the resources on which their farming systems depend. Today, half the population of Africa – 340 million people – lives on less than a dollar per day. Sixty percent of people over the age of 15 are illiterate, and 42% of the population lack access to safe water. Thirty-one percent of the population (194 million people), most of them women and children, are undernourished (Conway & Toenniessen 2003). These conditions are linked to a mortality rate in children under 5 years of age of 140 per 1000, and life expectancy at birth of only 54 years.

Seventy percent of the population (430 million people) live in rural areas, and more than 90% of these rural dwellers live on small-scale farms. Although the economies of sub-Saharan Africa are essentially based on agriculture, for over three decades the region has faced a structural food deficit whereby food production has failed to keep pace with population growth. To compensate for the shortfall in food supply, Africa receives the highest per capita quantity of food aid in the world, amounting to over three million tons of food per year (Conway & Toenniessen 2003). Such a level of dependence on food aid is untenable over the long run. Taken as a whole, the problems faced in Africa represent a humanitarian tragedy, as well as threatening peace in the region, the conservation of unique environments and biodiversity, and the continent's ability to take up its proper role in expanding world trade.

For farmers, one's geographic and socio-economic location determines the particular configuration of hardships to be faced. In the semi-arid regions of sub-Saharan Africa, farmers and pastoralists have to contend with extreme natural resource challenges (limited water, poor soil fertility, and availability of organic amendments). They also have few technology options, and are constrained by limited infra-structure and links to markets. In the densely populated highlands, available land is scarce, water and other resources are becoming more limited, and off-farm income sources are not readily available. Declining soil fertility and erosion are major concerns, as are increased pests and diseases. In all cases, input supplies and credit are limited.

Traditional production systems of rural households were geared for subsistence, and were generally sustainable under conditions of low population pressure and isolated markets. However, this equili-brium is increasingly stressed by population growth, which in turn triggers either intensification of agriculture or expansion into marginal lands. Inappropriate crop and land management practices under either of these scenarios strip the soils of nutrients and organic matter and leave them vulnerable to degradation, reducing both the productivity and sustainability of agricultural systems over time. In addition, expansion into marginal areas brings increased risk of crop failure, environmental degradation and loss of biodiversity.

Farm and pastoral families also have to contend with the devastating social and demographic conse-quences of HIV/AIDS, which is increasing the proportion of dependants in households that are already struggling. HIV/AIDS affects nearly 13 million resource-poor African women, who constitute a disproportionate 53% of the 24.5 million Africans living with the virus. Since women are the major food producers in Africa, the impact of the virus is compounded because it jeopardises food security by debilitating the agricultural labour force. For example, in southern Africa, drought and the HIV/

[5] In addition to its roots in INRM, IAR4D also draws concepts and methods from sources including Farming Systems Research, Ecosystem Science, Sustainable Development, Participatory Research, Livelihood Analysis, and Knowledge Management.

AIDS pandemic have diminished physical, economic and social capital to such an extent that many households can no longer even try to improve their natural capital. Measures are urgently required that will enable affected households to feed and support themselves financially, even as the work force is being weakened and depleted. Families need income to purchase medicine, as well as to raise healthy children who will be able to lead their communities out of poverty.

Further aggravating these problems are emerging forces such as the uncertain consequences of climate change, and the growing strength of urban markets which in turn affects labour and cash movements between rural and urban areas. Community expectations for services are also increasing in response to the integration of urban and rural livelihoods, physical (roads) and social (schools) infrastructure development, and general economic growth. These higher expectation levels drive competition for available resources and investment capital, often at the expense of investment in natural resource management.

In these circumstances, rising rural poverty leads to lack of investment in the natural resource base and overexploitation of ecosystem services (Cadisch et al. 2002). The pressures outlined above lead to an erosion of the natural resource base because incentives to conserve natural resources are weaker than the immediate rewards of simply extracting them. A vicious circle arises, characterized by: (a) agricultural practices that are detrimental to important ecosystem services, such as water conservation, biodiversity management, carbon sequestration; (b) a level of resource degradation that threatens the medium- to long-term ecological sustainability of agriculture in the region; and (c) the failure to generate sufficient financial and social capital for rural communities to secure the health and education of their members, and to catalyse economic development at local levels and beyond.

The ubiquitous land degradation in Africa, whether manifested in terms of soil erosion, nutrient depletion, desertification, deforestation or overgrazing, is both a cause of poverty and low productivity in rural areas and a symptom of the multiplicity of factors that drive both poverty and food insufficiency. The state of land degradation reflects both a dramatic draw down of natural capital and a simultaneous lack of investment in replenishing it. Success in motivating investment in natural resources requires incentives, inputs, information, and institutions more or less concurrently.

One of the principle drivers behind this vicious circle is low agricultural profitability. Smallholder agricultural production is characterised by very low profit margins. Low farmer purchasing power limits access to inputs that could substitute for natural capital. The problems are even worse for the increasing numbers of female-headed households, given endless demands on women's time and money. The low purchasing power of farmers and the high costs of distribution within the smallholder economy also constrain investment in input markets, particularly seed and fertiliser markets. Agricultural markets tend to be fragmented, thin, and inefficient. Assembly, bulking and storage of small quantities of smallholder produce is expensive, and private sector investment in better transport and storage facilities is limited. Market inefficiencies also result from ineffective contract enforcement, and the high costs of connecting dispersed smallholder production to distant (in infrastructural terms) urban or international markets.

### 1.2.2. Changes in the institutional and global economic context

Unless the vicious circle described above – of unsustainable agricultural practices and unfavourable economic returns to agricultural production – is broken, Africa will be unable to guarantee viable livelihoods for its rural populations, nor ensure broader economic development for its citizens. However, not only are the problems at the farm level becoming more complex, but the global economic context and the institutional environment in African nations are also in flux.

With regard to global economic conditions, Africa is faced with the need to raise smallholder productivity at a time of historically low world commodity prices. Support policies, technical change, and market efficiencies in more advanced countries have combined to increase the competition in world markets and lower prices for agricultural products. Structural adjustment and market liberalisation should theoretically enable African agriculture to compete with world producers. However, except for coastal West Africa, African farmers and markets are constrained by high transport and transaction

costs that limit participation in world bulk commodity markets. Increasing the profitability of African agriculture will therefore depend in large part on improving the efficiency of domestic markets serving growing urban populations.

In terms of the African policy and institutional setting, improving private sector participation and the efficiency and reach of agricultural markets remain key objectives within a policy environment generally committed to minimal government intervention. Incentives to conserve natural resources were strengthened during the 1980s and early 1990s by institutional changes designed to facilitate market liberalisation, democratisation and decentralisation of public sector services. However, while necessary, market liberalisation policies and structural adjustments were not sufficient to foster the development of efficient agricultural markets. In fact, as governments withdrew from the markets, consumption of purchased inputs such as fertiliser fell markedly, and in most cases has not recovered.

Limited government budgets will not support a return to the types of subsidies and market interventions that characterised the early part of the post-colonial period. Policies must therefore move away from price and market interventions into strengthening institutions, infrastructure, and technical change processes to foster profitable production and links to growing urban and subregional markets. This is consistent with the success of African agriculture in peri-urban areas, in commodities such as smallholder dairy produce for which there is growing urban demand, and in countries such as Nigeria where there has been marked investment in road and transport infrastructure. The task is to find ways to extend such market and infrastructural development to enable improved access to urban markets by larger agricultural areas and rural populations.

Democratisation, which followed in the wake of the market liberalisation process, increased participation in policy processes such as the development of Poverty Reduction Strategy Papers, and enhanced accountability of public institutions (including agricultural research institutes). Democratisation has also become associated with decentralisation of government functions. This allows more institutional adaptation to local conditions, decision-making at more appropriate local levels, more potential for farmer participation, and enhanced accountability. In some cases, democratisation has led to civil society organisations a assuming role where the private sector failed to take over from the restructuring public sector.

These changes have established an environment for the creation of more dynamic institutional partnerships, as can be seen in the case of several national agricultural extension and advisory services in sub-Saharan Africa. To foster collaboration, national agricultural research systems have formed subregional organisations (ASARECA, CORAF/WECARD and SADC/FANR) to help coordinate their programmes and build critical mass for addressing common problems. This was followed by the creation of the Forum for Agricultural Research in Africa to provide a continental perspective for agricultural research. Such institutional innovations provide a new context within which to think about agricultural research and development.

There have also been changes in the CGIAR, which is a major contributor to agricultural research in sub-Saharan Africa, where it spends 42% of its budget. Over time, CGIAR centres have moved away from their original distinct mandates and geographical areas of influence to a culture that mixes inter-centre collaboration and competition. Recognition of overlapping functions among IARCs has led to intense scrutiny of CGIAR programmes in recent years, and the Africa-based CGIAR centres have begun to revise their regional research strategies (e.g. Alumira & Heinrich 2003) to achieve greater impact on human and environmental well being by following the priorities that have been identified by the subregional research organisations (SROs).

## 1.3. An alternative research paradigm for African agricultural development

### 1.3.1. Critiques of the conventional approach to agricultural research and technology development

One might surmise from the discussion in Section 1.2.1 that no headway has been made in addressing the problems of agricultural and economic development in Africa. This would be a false conclusion.

Hazell and Johnson,[6] for example, note that while investment in agricultural research in Africa is low on a global scale, the return on this investment has been relatively high. Indeed, there is an impressive range of success stories, embracing the full range of agricultural research disciplines – genetic improvement, pest management, soil and water management, small enterprise development, etc.[7] Anderson (2003) documents a number of emerging successes in natural resource management in sub-Saharan Africa from Botswana, Madagascar, Mali and Namibia, which indicate that significant progress is possible with participatory approaches to natural resource management. But these local successes have not had sufficient impact on food security and poverty alleviation at national and continental scales.[8] The principle constraint to greater impact is not so much a lack of scientific excellence or expertise, but rather the failure to integrate research across disciplines and sectoral boundaries in order to respond to systemic problems in a systemic way.

## The limitations of the reductionist approach to scientific research

In the past, the complex and heterogeneous farming systems in Africa have been addressed through a relatively linear and fragmented research approach, where complexity was simplified into one or two key elements for which scientists sought solutions through the classic reductionist scientific process. This research has often had significant success at the field or herd level, but has failed to achieve impact on a broader scale. Inadequate technology dissemination and adoption have multiple causes, including poor understanding of the needs and circumstances of farmers, and the inability of unidisciplinary research to address interactions at the system level. For instance, research on soil fertility depletion has often been restricted to simple nutrient replenishment technologies, without consideration of the interactions between soil management and crop and pest management practices, the availability of implements and farm power (human, animal and motorised), and without recognising the importance of access to markets for inputs and outputs, or policy constraints to adoption.

While the reductionist approach was very successful in parts of Asia where the Green Revolution took place, it has not had and could never have the same success in Africa. The reasons for this have been much better understood in recent years.[9] It is now widely agreed that science for the benefit of African smallholder farmers needs to be contextualised in the complex social and technical circumstances in which they operate. This must include a balance of biophysical and social science research, analysis and intervention across multiple scales of agriculture, promotion of the adaptive capacity of farmers, and measures to overcome gender biases. It has to have focused systems thinking, an emphasis on methodologies for scaling up and out, and significant attention to organisational development (NRC 1999).

During the last decade, natural resource management has moved away from compartmentalised disciplinary methods to more integrated approaches, as exemplified by Integrated Pest Management and Integrated Soil Fertility Management. However, these practices in isolation are increasingly recognised as being disjoined from their essential context. The concept of Integrated Natural Resource Management (INRM) arose in recognition of the importance of addressing the interactions ***between*** components (e.g., water, pests and soils) as much as the components themselves.[10] But successful resource management and sufficient and sustainable agricultural productivity needs to go still further,

[6] Keynote Paper 6, Volume 2.

[7] Many of these are referred to in the keynote papers in Volume 2.

[8] Over the past decade, there has been an extensive consultation process to critically review the role that agricultural research, including science-technology-policy links, has and can play in strengthening agriculture in the region. This consultation has involved national and international institutions, non-governmental and farmer organisations, and other civil society groups engaged in agricultural research for development in the region (see Volumes 2 and 3 of this proposal for examples of contributions to this process). The review of past experience addressed the question of why, with a range of scientific success that includes peer recognition at the highest level, the African agricultural research system has under-achieved in terms of social and economic change. Two documents that summarize views on this subject are Röling & de Jong (1998), who critique the overall (global) performance of these systems, and Evenson & Collin (2001), who record the failure of agricultural research and extension in sub-Saharan Africa to induce sufficient positive technological change by small-scale farmers.

[9] Keynote Paper 2 presented by N. Sanginga, Volume 2.

[10] Keynote paper 2, presented by N. Sanginga, Volume 2.

into the realms of markets and policies.[11] The integrated research agenda proposed in Chapter 2 and beyond therefore addresses the full chain of interactions, from resources to production systems to markets and policies.

## The importance of participatory approaches

The pioneering work of Chambers and others has led to a focus on participatory approaches that redefine the role of scientists and farmers. This approach is summarised in the WARDA position paper as "participation of potential users [that] increases the efficiency and effectiveness of the processes of technological change."[12] Making progress in alleviating poverty is dependent on enabling poor families (especially those headed by women, who increasingly have to raise families by themselves) to express their needs and be fully involved in the innovation process. The needs of women in particular have not been well addressed in past research because of limited capacity to apply gender-sensitive participatory approaches. Women and other disadvantaged end users have typically been brought into the research process too late to contribute effectively to the evaluation of technologies that have already been developed and are ready for dissemination. Consequently, the technologies resulting from research are often inappropriate for the needs of the poor and women.

Chambers & Jiggens (1986) also point to flaws in the technology transfer model of adoption, which assumed that extension agents, supposedly responsible for disseminating technologies to farmers, would take up the technologies developed by researchers. An alternative hypothesis is that new institutional arrangements and extension approaches that enable farmers to participate fully in developing, demanding and accessing information will improve farmers' capacity to select and adopt appropriate technologies, and the capacity of scientists and partners to respond to the farmers' needs (Chambers & Jiggins 1986).[13]

## The way forward

Sayer & Campbell (2001), summarising the work of the CGIAR Task Force on Integrated Natural Resource Management, concluded that "sustained improvements to the livelihoods of poor tropical farmers require a different type of research, aimed at enhancing the capacity of the rural people to adapt to changing conditions, rather than at delivering 'finished' technologies." It is necessary to break away from unidisciplinary and reductive research, and instead focus more holistically on the complex context – social, ecological, economic and institutional – which determines success or failure in achieving impact. Building on this point, a range of complementary actions is required for innovative research and improved technologies to achieve greater impact on agricultural development in sub-Saharan Africa. The most important of these actions include:

- facilitating more effective engagement of farmers and other participants in the production-to-consumption chain in the agricultural research and development process at different levels;
- enabling farmers to access efficiently functioning agricultural input and output markets; and
- providing support for smallholders and pastoralists to engage in knowledge-intensive integrated management of their natural resources, and achieve sustained improvements in their livelihoods.

To be effective, these services must themselves be provided in an integrated manner, with closer interaction and more wide-ranging partnerships between and within the agricultural research institutions, and involving an interacting mix of public sector, private sector, and civil society organisations.[14]

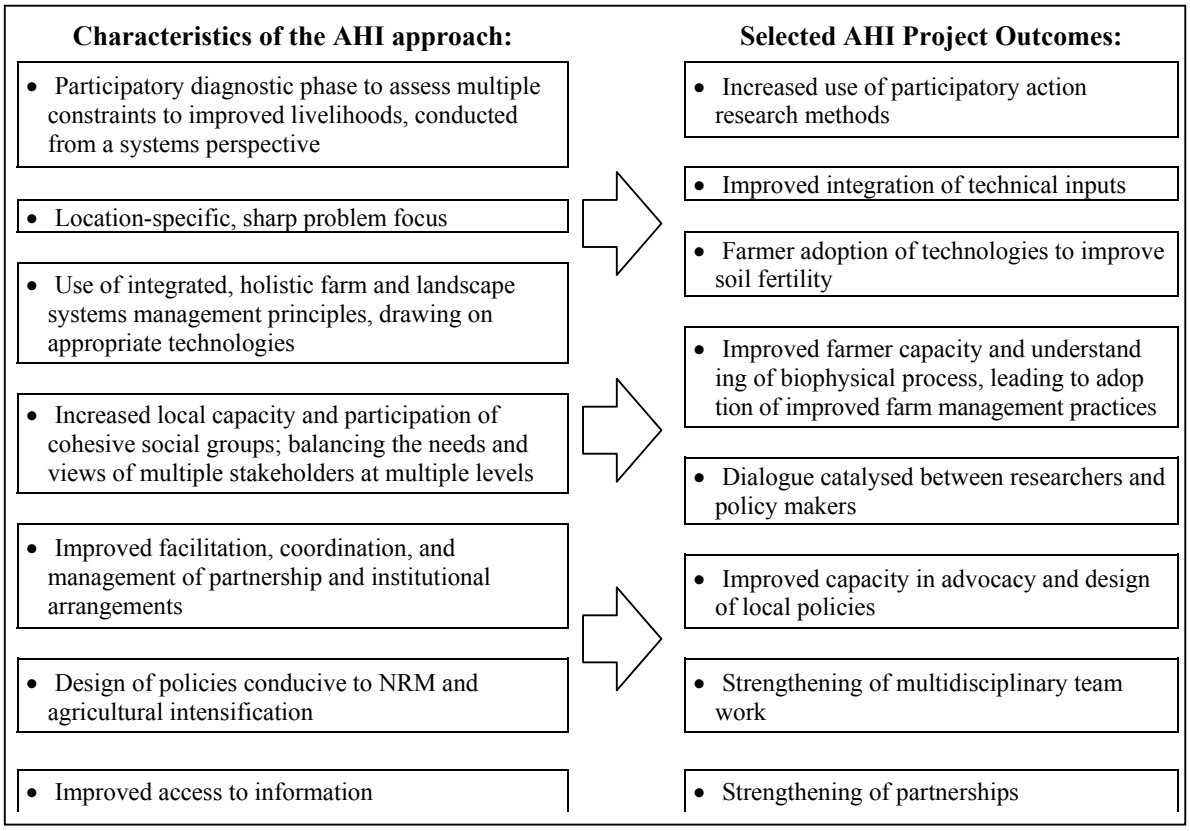
[11] Keynote papers 5 and 6, presented by Debrah and Hazell, Volume 2.

[12] WARDA position paper, Volume 2.

[13] ILRI position paper, Volume 2.

[14] More detailed analyses of the issues raised above are given in the problem statements related to the agenda for IAR4D presented in Chapters 2 and 3, in the keynote and position papers in Volume 2 of this proposal, and in their accompanying references.

**Table 1.1. The African Highlands Initiative (AHI) – A prototype model for the Sub-Saharan Africa Challenge Program/IAR4D**




### 1.3.2. Foundations of an alternative approach

Fortunately, an approach already exists that contains the above elements and can serve as a model for the Sub-Saharan Africa Challenge Program, namely the African Highlands Initiative ("AHI," which is hosted by ICRAF on behalf of ASARECA). [15] AHI has successfully put into practice an expanded approach to Integrated Natural Resource Management, the relevant features of which are summarized in Table 1 and Figures 1 and 2. Figure 1 highlights the explicit way that INRM links problems in natural resource management, system intensification, market access and policies, and asks fundamental questions with regard to both the sort of research that is needed and the social organisation and behavioural approaches required of the participants in the process. As shown in Figure 2, organisational change, capacity building and knowledge management are all given an explicit priority (the first five steps of the operational process are devoted to aspects of team building), in view of the fact that solutions to problems in these three areas are of critical importance to African agricultural development.

The CGIAR's review of multiple case studies of INRM (CGIAR 2003) points to a number of additional foundational principles that will underpin the Sub-Saharan Africa Challenge Program, including:

- dealing with complexity by focusing on key causal elements and their interactions;
- merging the perspectives of multiple disciplines and actors required to craft innovative solutions;
- overcoming systematic gender biases;
- conducting research on component technologies and the interactions between them at the systems level, e.g. water x soil x pests x genetic resources;
- integrating and generating policy, technological and institutional alternatives for various levels;

[15] For more background on the AHI, see Stroud 2003.

**Figure 1.1. The cornerstones of the INRM conceptual framework**[16]

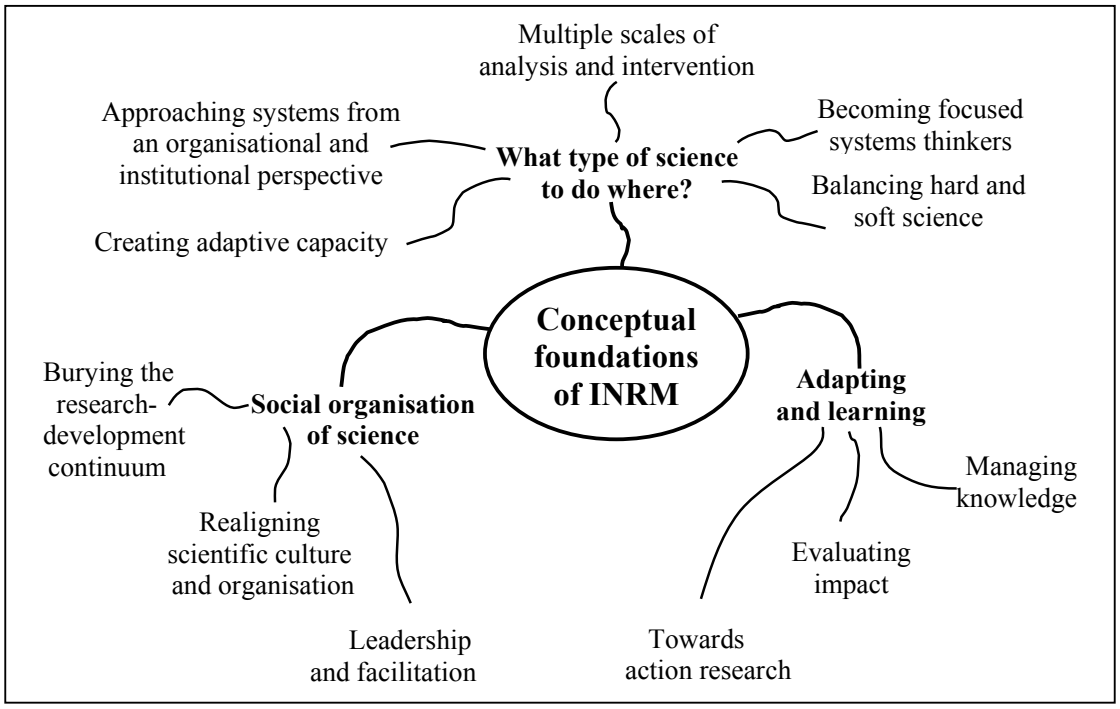
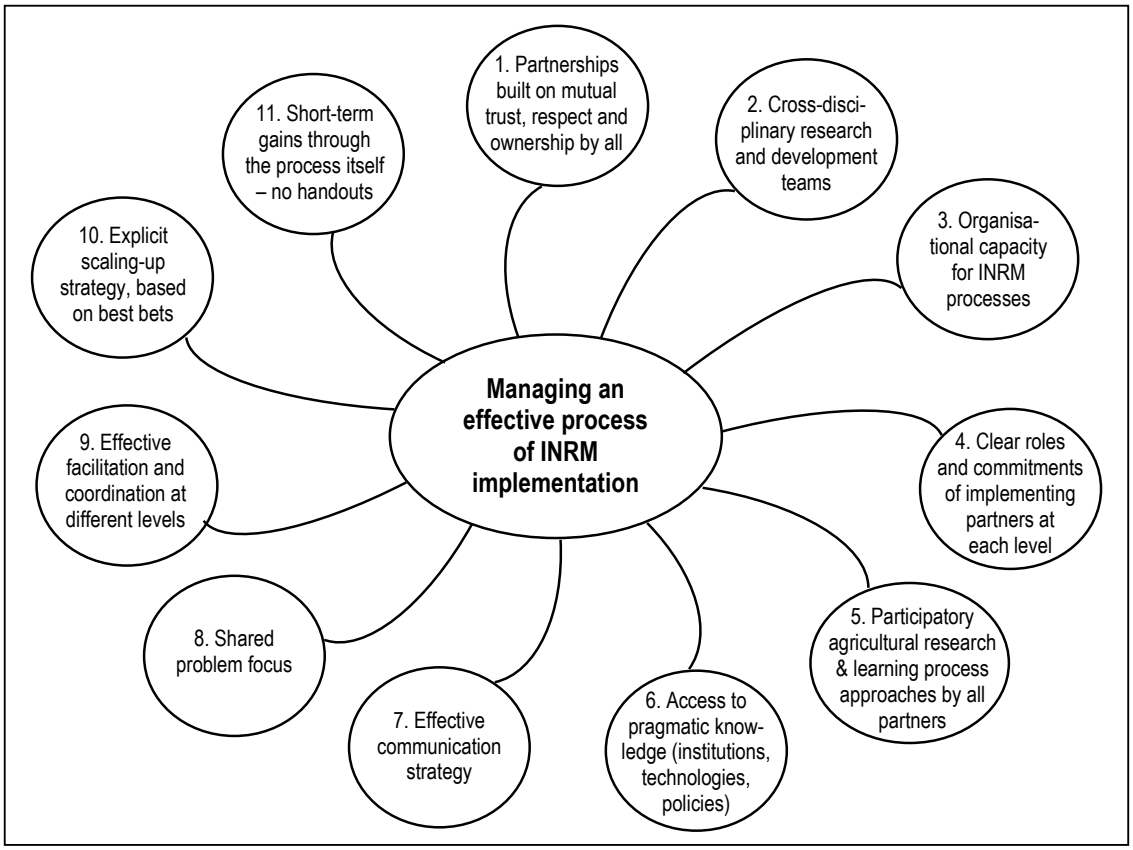



**Figure 1.2. AHI's eleven steps to implementing INRM**




[16] Campbell et al., Keynote paper 1, Volume 2.

- providing advice on trade-offs between the goals of productivity, sustainability, resilience and profitability, and increasing awareness of the environmental cost of poor NRM ;
- integrating across scales of analysis and looking for ways to scale results up and out;
- improving the adaptive capacity of stakeholders to manage the resilience of the agro-ecosystem;
- moving from training to social learning; and
- advancing knowledge management.

## 1.4. Integrated Agricultural Research for Development (IAR4D)

In response to the problem diagnosis of Section 1.2 and building on the models of INRM and the AHI, the SSA CP approach of Integrated Agricultural Research for Development proposes an innovation process with three major thrusts:

1. **A set of principles** for conducting research for development that squarely addresses the complexity and heterogeneity of farming systems in sub-Saharan Africa.
2. **A new research agenda** that recognises the necessity for an integrated approach to research and addresses the interactions between natural resource management, production systems, and agricultural markets and policies.
3. **Institutional change** to forge new partnerships that will involve all stakeholders, especially smallholders and pastoralists, women as well as men, in addressing the problems of food production and maintaining the resource base of agriculture for future generations.

In terms of its overall structure, the SSA CP/IAR4D approach will consist of two broad components: its ***research and development focus,*** and ***underpinning support mechanisms*** (see Figure 1.3). With regard to the R&D focus, the proposed agenda will strive to achieve ***four interrelated objectives***, namely:

- To develop technologies for sustainably intensifying subsistence oriented farming systems;
- To develop smallholder production systems that are compatible with sound natural resource management;
- To improve the accessibility and efficiency of markets for smallholder and pastoral products; and
- To catalyze the formulation of and promote enabling policies that will encourage innovation that improves the livelihoods of smallholders and pastoralists.

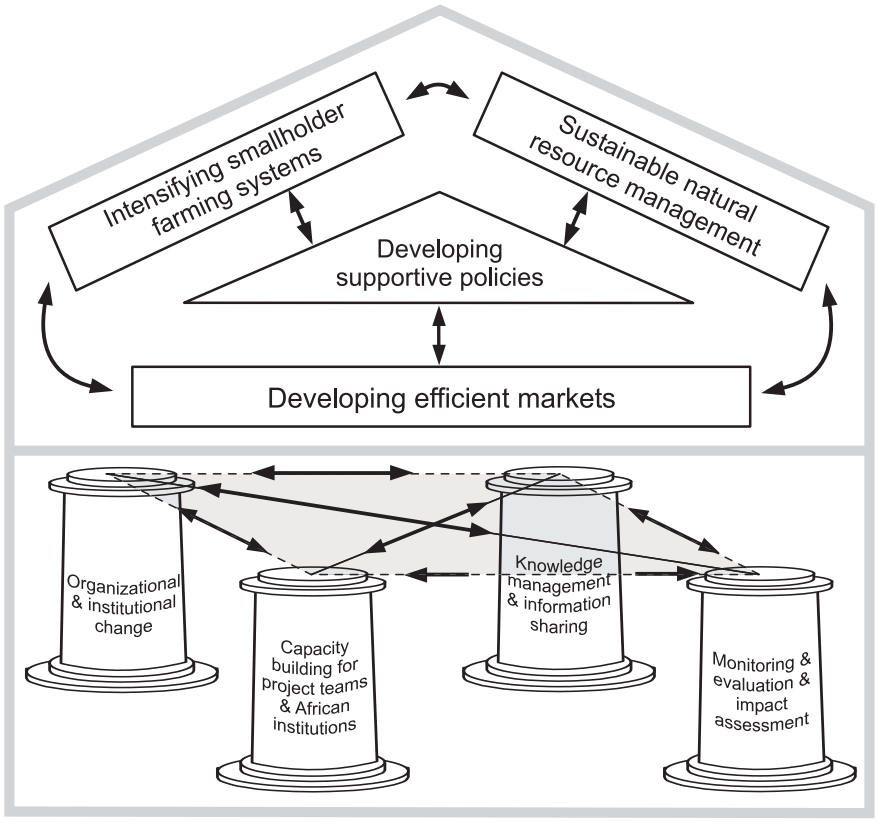
These four themes should not be seen as separate areas of intervention because the interactions between them are as, if not more, important than the themes themselves. In particular, it is clear that markets determine the viability of proposed intensification and NRM interventions and the policy sphere affects the other three challenges in very influential ways. There are, therefore, quite deliberate overlaps in the actions proposed in different parts of the agenda.

However even integrating these four R&D domains in the conduct of research will not be sufficient to bring about the required transformation in the institutional approach to agricultural development in sub-Saharan Africa. Therefore, the SSA CP will put equal emphasis on four intertwined support functions or "pillars," which are essential to up- and out-scaling of research outputs and approaches: fostering organizational and institutional change; capacity building for project teams and African research institutions; knowledge management; and monitoring and evaluation and impact assessment.

The different research projects in the SSA CP will have a number of common characteristics:

- The scientific programme of the projects will be targeted at removing significant constraints to sustainable improvement of livelihoods, as diagnosed at specific locations.
- While local problems will drive the research agenda, wider dimensions of the focal problem(s) will also be explored to generate insights of more systemic and broader geographical significance.
- Projects will be demand-driven and executed by multidisciplinary and multi-institutional teams, which will need to be prepared to build capacity and to adapt as the dimensions of the problem are defined and confronted.
- Information and knowledge of IAR4D processes and outcomes will be shared between projects to

**Figure 1.3. Activity domains of the Sub-Saharan Africa Challenge Program (IAR4D)**




accelerate progress at the Programme's "Pilot Learning Sites," and to facilitate more effective out-scaling and up-scaling.

- The collective goals of the projects will be to develop innovative solutions to problems affecting local stakeholders, as well as to improve the processes, methodology and capacity for integrated agricultural research for development in the region.

While the reductionist approach to agricultural research and development has failed to fully meet Africa's needs, an integrated or holistic agenda risks the other extreme – of addressing too much and doing nothing thoroughly. However, drawing on the lessons of systems ecology, it is known that: (1) some components of every system are more important than others; and (2) the interactions *between* things are often more important than the things themselves. Research under the SSA CP will therefore be based first on careful prioritisation of "entry points," and second, on exploring beyond those entry points to other components with strong interactions that influence the chosen point of investigation.

Entry points[17] must be found that enable research to address specific priority problems, based on participatory diagnostic processes led by multidisciplinary teams comprising both biophysical and social scientists. Entry points will be the starting points for exploring the full dimensions of focal problems across the entire agricultural system and resources-to-policy chain. Poverty mapping and spatial analysis tools will enable IAR4D collaborators to present information that will allow all parties, including smallholders and pastoralists, to jointly select entry points that address the communities' most pressing constraints, and whose removal will lead to the greatest impact on sustainably improving livelihoods.

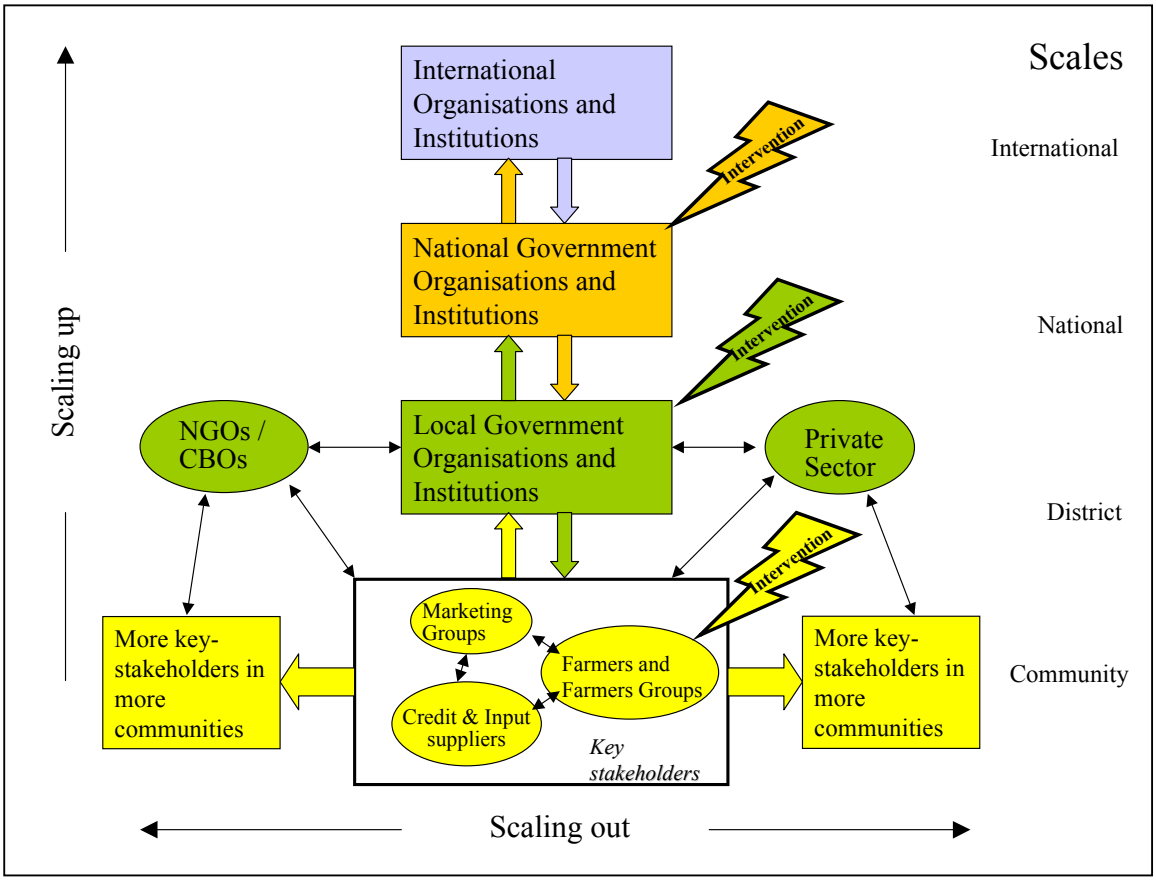
[17] Many years of interaction between scientists from NARS, IARCs and ARIs, and African smallholders and pastoralists have provided much information and knowledge that will facilitate identification of possible entry points under different circumstances. Potential entry points identified for the first Pilot Learning Sites, and the science for addressing them, are presented for each of the Programme's component activities in Sections 3.2 and 3.3 below. Volume 2 of this proposal contains in-depth discussions of the science that will be applied to address the entry points.

Synergies will be sought in the generation and adoption of improved technologies, through institutional innovation in agricultural markets, land and resource tenure arrangements, information flows, agricultural extension and advisory services, and the methods and content of agricultural research. The overall goal is to accelerate the shift from a subsistence orientation to a market or commercial orientation on the part of smallholder agriculture. Research must be positioned at the centre of the interacting processes, to facilitate and improve understanding of the relationships between institutional innovation and technological innovation, and to enhance the connectivity and partnerships between different institutions.

The Programme will be executed by multidisciplinary, multi-organisation teams working at "Pilot Learning Sites" (PLSs). Pilot Leaning Sites will be carefully chosen by Africa's subregional research organisations (CORAF/WECARD, ASARECA and SADC/FANR), based on two main criteria: (1) the potential benefits to local, national and regional development that flow from addressing site-level obstacles to sustainable smallholder agricultural development, and (2) the representative nature of sites, whereby similarity between site-level problems and challenges faced elsewhere in the subcontinent is such that lessons learned at the project level can be extrapolated to other locations.

The research conducted at Pilot Learning Sites will have to be organised to ensure that results will be out-scaled into neighbouring communities and up-scaled through local and national to international scales, including efforts to reach decision makers at all levels from the community to the globe. The range of organisations and the roles they will play in implementing, out-scaling and up-scaling IAR4D are illustrated in Figure 1.4. The SSA CP will need to balance the local tailoring of solutions with extrapolation of insights to other settings. This will require dissemination of information and capacity

**Figure 1.4. Major components of scaling IAR4D up and out**[18]




[18] From Ortiz, Figure 4 in Keynote paper 3, Volume 2, which is after Douthwaite et al. (in press).

extrapolation of insights to other settings. This will require dissemination of information and capacity building to bring all players up to speed. Implementing and internalising these thrusts will draw on the principles of self-learning, institutional innovation and value addition that are intrinsic to the INRM framework.[19] As the African agricultural research community engages in mutual learning and better dissemination of results, it should become a more interactive, interdependent and vibrant body of professionals with continental impact and recognition.

These aims will be achieved by interweaving a combination of research along with institutional change, capacity building, knowledge sharing, and impact assessment. Interventions will be developed based on site-specific participatory problem diagnosis involving multiple stakeholders: farmers, members of national, regional and international research organizations, extension agencies, NGOs and CBOs, the private sector, and policy-makers. Chapters 2 and 3 outline the objectives, sample entry points, and expected outputs of activities by type of intervention. Once again it must be stressed, however, that while these are presented as discrete lines of work, the innovative nature of the SSA CP derives from the way activities are fully integrated to generate synergistic impact on complex, interrelated challenges.

[19] Keynote paper 1 presented by B. Campbell, Volume 2.

# CHAPTER 2. FOSTERING SUSTAINABLE LIVELIHOODS THROUGH THE FOUR RESEARCH THREADS OF IAR4D

*This chapter presents the four research domains of IAR4D: intensifying smallholder farming systems, and strengthening natural resource management, markets, and policy*

As noted in Chapter 1, the extensive consultation process that led to the formulation of the SSA CP concluded that, to achieve the substantial advances required to strengthen Africa's agricultural sector, an approach is called for that fully integrates technology interventions with improvements in markets and policies. This chapter describes the four research domains of IAR4D that respond to this need.

## 2.1. Intensifying subsistence-oriented smallholder farming systems

Technical, policy and marketing innovations are required that will enable smallholders to continue to meet subsistence needs as well as generate a marketable surplus. This implies intensification of cultivation, including shifting to higher-value niche crops with sufficient density of production to assemble products efficiently for cost-effective marketing (as is the case in irrigated Asian rice systems, especially in large delta areas). In other words, increasing spatial density of production is a prerequisite to meeting the demands of commodity oriented market development. This in turn requires varietal specialisation in line with market preferences, and improved scheduling of farm operations to target seasonal price advantages.

However, there are significant trade-offs between meeting the needs for efficient marketing and developing systems that enhance sustainable resource use. The process of intensification tends to lead to greater specialisation, greater dependence on purchased inputs, and attrition of the diversified structure of farming systems with further erosion of biodiversity and other natural resources. Particularly where women do not exercise some control over money, the nutritional status of households may suffer if food expenditures are reduced to pay for production inputs.

Improved germplasm is an important option for sustainable intensification of farming systems. For example, new maize cultivars offer 25% yield gains relative to traditional varieties, and research is well on track to developing and disseminating varieties that perform significantly better under conditions of drought and low soil fertility. Improved cassava cultivars have 40% better yields and have raised per capita output by 10% continent-wide, benefiting 14 million farmers. Livestock research has produced innovations in husbandry and disease control, such as vaccines for the control of devastating rinderpest epidemics. However, to be fully effective, these innovations need to be integrated with improved markets and policies, so that increased production does not lead to falling prices or misuse of natural resources (for example, due to over stocking of livestock).

Alternatively, integrated systems approaches to soil, pest, crop and livestock management can help make efficient use of farmer-available resources, particularly labour, organic and other natural capital resources. Such approaches provide complementary responses to limited available inputs, compensating for the high cost of inputs by improving the efficiency of their use, and providing better and more sustainable opportunities for increasing profitability. Integrated approaches also foster greater resilience to climatic, economic or biological shocks.

The implications of these contrasting models of intensification can only be understood when market changes are connected with farming system responses. This therefore forms another level of action research inherent in this Challenge Programme. Because of the hierarchical interactions between scales, an important guiding principle of such research is that, to effectively address a constraint or bottleneck at a given spatial and temporal scale, it is imperative to also address relevant issues (or entry points) at other levels, both higher and lower.

In summary, agricultural intensification to date has not been compatible with stewardship of natural resources in subsistence-oriented production systems, and there is an imbalance between specialisation and integration that impairs market development for African farm products. Table 2.1 outlines sample

hypotheses that could serve as entry points for addressing these issues, as well as indications of project outputs that will result from IAR4D work in the domain of sustainable intensification. More detailed discussion based on questionnaire response of researchable hypotheses and the Programme's potential contributions to achieving the Millennium Development Goals is provided in Volume 2 (pp 385-437) of this proposal.

**Table 2.1. Hypotheses (entry points) and outputs for work on sustainable intensification**

| Hypotheses (entry points) | Outputs |
|---|---|
| • That opportunities exist for improving smallholder livelihoods by developing sustainable systems for integrated production and marketing of higher value niche commodities | • Organised and secure adoption of higher value adapted niche commodities by smallholders such as vanilla in wetter areas and gum Arabic in dry areas |
| • That intensification can be achieved while maintaining the biological functions and ecological integrity of agro-ecosystems | • Adoption of balanced approaches to eco-tourism and co-use of buffer zones that will reward small-holders and pastoralists for conservation practices |
| • That research in germplasm improvement and natural resource management can be integrated to achieve greater economic and ecological efficiencies in agricultural production | • More judicious use of improved germplasm such as stress tolerant maize synergistically combined, for example, with agroforestry and/or green manure producing higher and more sustainable smallholder incomes |
| • That technologies and market arrange-ments can be devised to compensate for labour shortages due, for example, to migration to urban areas and HIV/AIDS | • Technologies such as goat milk production and apiculture adopted by HIV/AIDS affected families |
| • That better support can be provided that will meet the needs of women smallholders | • Women with better access to support systems are less disadvantaged, more productive and having a greater role in decision making in the disposition of family incomes |
| • That modern spatial and risk analysis tools and communication systems can be applied to raise the sustainable human support capacity of semi-arid areas | • The cycle of build up and collapse, which tends overtime to build dependency on relief aid, is ameliorated by implementing continuous flexible communal management systems that empower ethnic knowledge |
| • That there is unexploited potential for profitable smallholder irrigation | • Communal arrangements made for equitable sharing and judicious use of water resources, for example for balancing the needs of cultivators and livestock owners in inland valleys ("fadamas") of West Africa |
| • That with appropriate technologies, enabling policies and access to markets the risks to smallholder capital investment can be effectively managed | • Smallholder innovation for improved livelihoods catalysed and sustained by enabling policies and assured markets |

Overall, this research will produce options for smallholders to intensify the use of their limited resources while maintaining food security and without jeopardising the resources on which the future of agriculture depends. It will allow resource-poor households, especially those headed by women, to intensify their production systems and move into the market economy, and it will provide options for situations where labour is scarce. The outputs will lead to a mix of short- medium- and long-term impacts. Within the five years in which Challenge Programmes are required to demonstrate impact, changes in intensification will be measurable in terms of farm and ancillary businesses' productivity and profitability indices and better labour use efficiency.

## 2.2. Sustainably managing natural resources while intensifying their use

A recent publication, ***Nature, Wealth and Power in Africa*** (Anderson 2003), opens with the statement that "natural resources are a major source of wealth and power in Africa; they are also a key to rural development and good governance. Natural resources, land, minerals, forests, wildlife and water are central to the livelihoods of 70% of the population, and dominate some African economies." To achieve sustainable livelihoods, natural resources must be managed by focusing on the needs of agricultural households within community frameworks. This applies equally to farming communities and to areas of natural savannah and forest, including wildlife conservation areas.

Soil fertility decline is Africa's most prevalent constraint to agricultural productivity, and is driven by a multiplicity of causes.[20] Regeneration of severely degraded soils must address a complex set of issues including land tenure and use rights, improved soil and water management, grazing regulation, managing animal numbers, and techniques for large-scale reseeding. Soil deficiencies are compounded in many areas by moisture deficits. Average rainfall is low in many parts of sub-Saharan Africa, but the high intensity, temporal variability, and unpredictability of rainfall are more serious problems.

The loss of genetic diversity increases smallholder risk by reducing the range of options for addressing pest, disease and climatic stresses, and also removes options for exploiting emerging market opportunities. These problems affect farmers continent-wide, but especially in densely populated countries such as Ethiopia, Ghana, Kenya, Malawi, Nigeria, Rwanda, Zimbabwe and Limpopo Province in South Africa.

In the guidelines for the Millennium Ecosystem Assessment,[21] the resources of biodiversity and soils comprise a category of essential "support services" for sustainable ecosystem functioning, because of their influence on a wide range of other factors such as water availability and quality, nutrient supply, pest and disease control, and carbon sequestration. Diminished genetic diversity and soil resources adversely affect livelihoods, far beyond their local and specific impact on agricultural productivity (Swift et al. 2003). Management of soil and agrobiodiversity therefore become key entry points for addressing constraints on sustainable agro-ecosystem management, requiring a long-term perspective and a systems approach across multiple scales.[22]

Recent advances in communication systems and in early warning technologies provide important opportunities to link natural resource management with marketing and thereby overcome the perennial problems of adverse terms of trade (low prices of stock at sale and high prices at restocking) for remote area residents and their consequent delayed sales and apparent neglect of resources. Policy changes are another important component of improved natural resource management. For example, changes in water laws, such as the new legal framework in South Africa, have the potential to cover the difference between farmers' private costs and the potential social benefits in managing the natural resource base. However, before such examples can be taken up more widely, there are numerous implementation questions that have to be addressed.

In summary, inadequate investment in the management of soil, water, and agrobiodiversity by smallholder farmers and pastoralists is due to the difficulty of:

- adapting natural resource management practices to the fluctuating market demands;
- managing natural resources across scales for the multiple benefits from ecosystem services, and determining the private and social trade-offs from such holistic approaches;
- adopting an integrated approach to reducing land degradation.

Table 2.2 outlines sample hypotheses that could serve as entry points for addressing these issues, as well as indications of project outputs that will result from IAR4D work in the domain of sustainable natural resource management. (See Volume 2, pp 385-437, for discussion of additional potential hypotheses and interventions related to this Programme objective.)

[20] Sanginga, Keynote paper 2, Volume 2.
[21] www.millenniumassessment.org.
[22] Debrah, Keynote paper 5, Volume 2; Sanginga, Keynote paper 2, Volume 2.

**Table 2.2. Hypotheses (entry points) and outputs for work on sustainable NRM**

| Hypotheses (entry points) | Outputs |
|---|---|
| • That adaptive responses to farmer needs and market opportunities are the best means of finding ways of improving natural resource management and achieving higher sustainable efficiency and profitability | • Farmers receiving higher incomes due to improved marketing opportunities are practising improved natural resource management and enjoying improved livelihoods |
| • That acceptable trade-offs can be found between agricultural productivity and ecosystem services for small-scale farmers through integrating research on soil and biodiversity management | • Smallholders with improved soil and biodiversity management achieve increased agricultural productivity while sustaining ecosystem services |
| • That spatial and temporal decision support tools can be developed that facilitate adaptive management at the ecosystem level in response to market opportunities | • Policy makers and resources owners (smallholders and pastoralists) benefiting from application of modern decision support tools to help determine environmentally appropriate responses to market opportunities |
| • That integrated soil fertility management will produce viable options for lower value staple crops such as cereals and that this will generate multiplier effects in agricultural systems | • Smallholders practising integrated soil fertility management in the production of lower value crops and thereby reducing their dependence on unreliable and expensive external inputs |
| • That improved marketing arrangements for livestock in sparsely settled areas will improve the terms of trade for livestock owners and help balances stocking rates with range carrying capacities | • With assurance of recovery after drought without retaining animals to the last moment pastoralists will be more commercially oriented and will have less dependence on emergency relief due |
| • That the trade offs between sequestered carbon and water shed protection and agricultural productivity and food security can be validated, valued and harnessed for pragmatic use to reward African smallholders for their stewardship of natural resources | • Practical systems of transfer payments established to provide incentives for African smallholders to protect natural resources |
| • That ecotourism can be advanced by providing options for reconciling the competition between agriculture and wildlife, including managing pasture and disease interactions | • Pastoral communities on whose land ecotourism depends reap fair returns to wildlife and other natural assets and compensation for genuine losses due to diseases transmitted from wildlife to domestic animals |

Overall, this research will promote sustainable use of natural resources by enabling smallholders and pastoralists to adapt appropriately to market changes, and by optimising ecosystem services and reducing land degradation. The outputs will lead to a mix of short- medium- and long-term impacts. Within the five years in which Challenge Programmes are required to demonstrate impact, changes in sustainable natural resource management will be assessed by amongst others the following measurable impacts:

- optimal efficiency of use of inorganic and organic inputs;
- improved soil, water and biodiversity management and conservation;
- adopted sustainable pest management options;
- improved soil quality and health;
- higher agricultural production at the regional and national levels;
- decreased/reversed trends in deforestation, nutrient depletion, soil erosion, genetic diversity erosion, and water pollution;
- better system resilience to severe shocks such as drought, floods, etc;

- improved human health through improved nutrition, enhanced water quality and biological pest control
- enhanced capacity of farmers of both genders to manage their systems in a sustainable manner.

## 2.3. Developing more efficient markets

Among the principal causes of persistent poverty in the African agricultural sector is the lack of good market opportunities. Opportunities in regional and global markets would be much enhanced by the removal of the current host of inequitable subsidies, tariffs and regulatory barriers that create disadvantageous conditions for Africa's farmers.[23] However, there are probably more opportunities for improving domestic markets and regional trade in Africa than there are for promoting global export of crops and livestock.

Most agricultural markets in Africa conform to what Fafchamps and Minten (1999) term a "flea market economy," i.e., markets are characterised by a large number of actors, transactions of low volume and on a cash basis, no grades and standards, no forward contracting, high costs of market information, and virtually no scale economies in either assembly or distribution. Such inefficiencies in output markets have corollaries in inefficiencies in input markets, resulting in a lack of access by farmers to improved technologies.[24] Addressing these challenges constitutes a large and complex research agenda in itself, which can only be developed by implementing and evaluating institutional innovations through action research. However, the development of markets for processed cassava in Nigeria[25] demonstrates the potential for creating conducive conditions for farmer investment. The Nigerian case is an example of interlinked markets for inputs, outputs and rural credit, with output markets providing the cash flow that enables and encourages purchases of inputs, supporting further development of all three markets. In many cases, labour markets will also be linked positively.

For many of the poorest households, which currently face food production deficits virtually every year, the highest priority may be for technologies that specifically contribute to food security and provide diversified options for generating income. But technology delivery must be linked with the development of inter-rural markets to move food from surplus to deficit areas and, where appropriate, with the commercialisation of production for sale to urban or export markets. In areas with better farming conditions and markets, research programmes should focus on market-oriented production and value addition, with technologies that offer competitive returns to labour and capital.

Policies are needed that encourage the formation of producer organisations so that smallholders can standardise and bulk up their commodities to reduce the cost of sales. Improvements are also required that reduce high transport and marketing costs resulting from poor infrastructure and weak marketing institutions, which are major constraints to smallholder prosperity. Attention should be given as well to improving the incentives and capacity of smallholders to save and invest. This will require an entirely new approach to rural finance that will enable smallholders to access credit and deposit facilities. (Microfinance institutions, for example, are not serving agricultural producers well, even though they are otherwise effective in serving the poor.) There has been an assumption that without subsidies, market interest rates are too high for small producers, but this is not borne out in practice (Moll, 2002). More pertinently, policies are required that reduce the transaction costs of obtaining small amounts of credit and ensuring that the desired inputs are available locally and in suitable packages. This may include provision of inventory financing for rural suppliers to make inputs available on credit, a system with low transaction costs widely preferred by farmers.

Although the private commercial sector serves large-scale farmers, it is less interested in smallholder producers. Thus for the foreseeable future, smallholders will need the services of voluntary producer organisations with support from civil society and NGOs.[26] Policies should favour collective institutions such as community-based organisations and cooperatives, that can link smallholders to more favour-

[23] Hazell & Johnson, Keynote paper 6, Volume 2.
[24] Debrah, Keynote paper 5, Volume 2.
[25] Ortiz, Keynote paper 3, Volume 2.
[26] See position papers by Debrah and Hazell & Johnson, Volume 2.

able input and output markets and help them diversify into enterprises that offer better returns for their labour. These policies must ensure that small-scale farmers, and women farmers in particular, receive greater priority access to supporting services. They must help protect the terms of trade for pastoralists and other inhabitants of remote areas, especially during and after adversities such as drought.

In summary, smallholder farmers and pastoralists have to contend with poor market access and high transaction costs due to:

- limited opportunities for increasing product value-added, because of a lack of processing technology and no organised markets for processed products;
- few arrangements for critical market functions such as assembly, grading and standardisation, storage, processing, transport, contracting, market information, arbitrage, wholesaling, and distribution;
- high market margins and transaction costs, inability to apply scale economies, and high costs of price or information transmission; and
- markets for staple foods that are poorly interlinked with input and output components.

Table 2.3 outlines sample hypotheses that could serve as entry points for addressing these issues, as well as indications of project outputs that will result from IAR4D work in the domain of developing more efficient markets. (See Volume 2, pp 385-437, for discussion of additional potential hypotheses and interventions related to this Programme objective.)

**Table 2.3. Hypotheses (entry points) and outputs for work on more efficient markets**

| Hypotheses (entry points) | Outputs |
|---|---|
| • That improvements in market information, access and opportunities for women and men smallholders can be made at local, national and regional scales which will catalyse and facilitate the adoption of income enhancing innovations | • Increased net incomes for smallholder farmers attributable to increased and more reliable market information and improved market access |
| • That government support systems for agriculture can be improved to create opportunities for smallholders to profitably engage with input and output markets at local and regional scales | • Increased and sustainable returns to government support for agriculture in terms of both improved farm profitability and enhanced local trade and economic resilience |
| • That more efficient financing mechanisms for smallholder production and marketing can be devised that will encourage them to save and invest productively | • Greater participation by micro credit and other financing agencies in rural development |
| • That the beneficial competition evident at the retail level can be reproduced further upstream, where recent studies indicate there is less competition but where a significant share of the final price is taken up | • Improved farm gate prices due to better competition along the whole production to consumption chain |
| • That judicious public-private partnerships can be formed that will cater for the needs of smallholders, even in remote or sparsely populated areas | • Private enterprise fulfilling a greater role in the livelihoods of smallholders and pastoralists |
| • That more effective credit mechanisms can be developed that will encourage smallholder innovation | • Credit systems with reduced transaction costs that make borrowing of small amounts a viable proposition |
| • That incentives can be found that will encourage smallholders to invest in sustainable natural resource management, even in production systems of lower-value staple food crops | • Smallholder adoption of sustainable NRM practices even for staple food crops, because they are more profitable even over short time horizons |
| • That the strengthening of the negotiating capacity of African countries in regional, inter-regional and global trade issues will lead to improvements in the livelihoods of smallholders and pastoralists | • Rural incomes raised through improved local, inter-regional and global trade |

Overall, this research will provide options for improving input and output markets for smallholder and pastoral produce that will help raise farmgate prices and thereby provide incentives for investment in improved natural resource management practices. Such markets will also improve the chances of subsistence farmers adopting high-value crops and thereby entering the market economy.

The outputs will lead to a mix of short- medium- and long-term impacts. Within the 5 years in which Challenge Programmes are required to demonstrate impact changes in smallholder and pastoral marketing will be assessed by amongst others the following measurable impacts:

- improved farm gate prices
- improved instruments for smallholder credit;
- more market opportunities for smallholders;
- better incentives for farmers to invest in improved natural resource management practices, particularly soil management practices;
- greater volumes of farm produce marketed by smallholders.

## 2.4. Developing enabling policies

As noted by Hazell and Johnson, "A smallholder-led transformation of Africa is both technically and economically feasible,"[27] but this will not happen where there are constraining policies. The impact of policies differs between nations and regions given different histories and circumstances, but there are also many common concerns across the continent.

Hazell and Johnson note that the development of appropriate policies requires processes based on rigorous data collection and analysis, dynamic planning, effective monitoring and evaluation systems, and learning that supports adaptation and revision of plans to fit changing circumstances. Modern information technology facilitates such processes by simplifying the collection and analysis of data, as well as the dissemination of policy concepts. However, institutional changes are also required to enable the necessary flow of information within and between governments and aid agencies.

The policy agenda of the SSA CP must aim to create conditions for farmers to adopt existing and emerging productivity-enhancing technologies. To promote technology adoption, policies are needed that build on domestic market reforms, and govern marketing and trade for export crops and livestock as well as intraregional trade in agricultural products. There are also many tariff, quota, and regulatory policies that need to be addressed in WTO negotiations, for example. In addition, in the process of implementing structural adjustment programmes, African governments have begun to pay more attention to institutional innovations built around private-public partnerships. Governments have also started decentralising authority to local levels so that rural communities can influence decisions that affect them. These moves are creating more favorable conditions for entrepreneurs, including small-scale farmers.

To take advantage of globalisation and its comparative advantage in producing export crops, Africa needs an approach that combines the right mix of domestic market reforms with institutional and infrastructure investments, with the added complexity that such reforms must also address serious gender biases. In the context of decentralisation throughout Africa, effective capacity building is needed at the local level, notably in terms of natural resource management, as are feasible policy processes in the context of minimal funds.

New policies are also needed to overcome the constraints imposed by limited access to land, skills and capital, and to improve rural infrastructure, including markets and health services. Policy makers need to reform public institutions to overcome vested interests and avoid the imposition of new forms of rent seeking. These include issues such as property rights and more effective ways of managing common property. Instead of imposing environmental regulations, a more promising approach is to promote income-enhancing environmentally-friendly technologies. When they become more commonly available, markets for environmental services may also change incentives to conserve resources and

[27] Keynote paper 6, Volume 2.

benefit the poor.[28] However, for these to be effective in the African context, the costs of monitoring and enforcement will have to be reduced.

This Challenge Programme will take account of policy concerns in all IAR4D projects in order to establish enabling policy environments for the rural poor in sub-Saharan Africa. The SSA CP will ensure that policy makers are aware of IAR4D work in their countries and spheres of influence by involving them in projects, particularly in the policy research aspects. The direct involvement of community based and farmers' organisations will also create channels for influencing policy makers.

In summary, African policy makers have tended to pay more attention to urban issues and have not been well informed about the outcome of policies on the rural-poor, nor about the policy options for addressing gender and equity issues. Current policies often discourage the adoption of innovations that sustainably and equitably improve agricultural livelihoods in sub-Saharan Africa, because they fail to:

- take into account the need to ensure markets for local surpluses by enabling movement of agricultural products nationally and regionally and ensure the right mix of domestic market reforms and institutional and infrastructure investments;
- promote private/public partnerships;
- promote export crops and intraregional trade in agricultural products;
- facilitate emerging markets for environmental services;
- favour collective institutions such as community-based organisations and co-operatives;
- ensure that small-scale farmers, and women farmers in particular, have adequate and equitable access to supporting services and productive assets.

Table 2.4 outlines hypotheses that serve as entry points for addressing these issues, as well as indications of project outputs that will result from IAR4D work in the domain of developing enabling policies. (See Volume 2, pp 385-437, for discussion of additional potential hypotheses and interventions related to this Programme objective.)

Overall, this research will help governments formulate pro-poor enabling policies that will support innovation and sustainable intensification in smallholder and pastoral systems. The outputs will lead to a mix of short- medium- and long-term impacts. Within the 5 years in which Challenge Programmes are required to demonstrate impact of enabling policies will be assessed by amongst others the following measurable impacts:

- enhanced soil management for long-term production, particularly with respect to biodiversity, water, and soils,
- better-considered policies for enabling enhanced rural livelihoods based on sustainable practices;
- more sustainable and more profitable agricultural sectors; and
- enhanced involvement and capacity of policy-makers in natural resource management issues.

[28] An example of the potential of promoting this by transfer payments is provided by FACE, an NGO which is facilitating an arrangement between farmers in Uganda and the private sector in the Netherlands. In this transfer arrangement, the payment that is made to farmers who are rehabilitating degraded lands in the vicinity of Mt Elgon National Park, is accepted as investment in sequestering carbon in the South by the private sector in the Netherlands.

**Table 2.4. Hypotheses (entry points) and outputs for work on enabling policies**

| Hypotheses (entry points) | Outputs |
|---|---|
| • That research results used more effectively will inform policies that support sustainable and profitable land improvement, watershed protection and agricultural utilisation | • Better ways will have been found to inform policies that affect the sustainability and profitability of land improvement, protection and agricultural utilisation leading to measurably greater and more effective use of research products by government in framing related legislation and policies |
| • That new international markets can be developed involving transfer payments to land users for providing ecosystem services (biodiversity, carbon sequestration and watershed protection functions) through carbon-offset and similar mechanisms | • The international community will recognise the role of African smallholders and pastoralists in sequestering carbon, conserving biodiversity and water and will provide the incentives for them to continue doing so. |
| • That property and access rights and the management of common property can be improved to encourage intensification and sustainable use of natural resources | • Property rights and the management of common property will have been improved, resulting in intensification and sustainable use of natural resources |
| • That more appropriate policies will foster greater engagement by NGOs and CBOs in community level sustainable agriculture | • NGOs, CBOs and similar organisations will be better engaged in community issues related to enhancing sustainable agriculture |
| • That public-private partnerships can be promoted that will benefit smallholder farmers and pastoralists | • Private enterprise will be more actively engaged in providing services and markets for smallholders and pastoralists |
| • That gender biases that disadvantage women smallholders can be overcome | • The policy environment for agricultural development will have become more positive and supportive for both women and men |

# CHAPTER 3. IAR4D PROCESS SUPPORT FUNCTIONS TO ENSURE UP- AND OUT-SCALING

*This chapter presents the four "support pillars" of IAR4D: organisational and institutional change, capacity building, knowledge management and information sharing for up- and out-scaling, and monitoring and evaluation and impact assessment.*

IAR4D implies three kinds of boundary-crossing work that pose challenges for participants. First, as indicated throughout this document, IAR4D requires inter-institutional and interdisciplinary team work to effectively tackle complex problems. To enable this to succeed, the SSA CP will support ***organisational and institutional changes*** to foster strong functioning partnerships. Second, IAR4D is built on the principle of intersectoral and multi-level involvement in priority setting, engaging multiple stakeholders from policy-makers and entrepreneurs, to NGOs, CBOs, and extensionists, to farmers (and particularly women and others who have traditionally been marginalised from R&D efforts). The approach of participatory action research and learning (PARL) is essential to bring this about. PARL is the key to transforming the development paradigm from a linear "technology pipeline" approach, to an innovations systems approach where research and development (including adoption of new practices) occur hand-in-hand. ***Capacity building and mentoring*** will support both partnership building and the internalisation of PARL principles by Pilot Learning Teams. Third, IAR4D calls for cross-site learning and mechanisms to capture the lessons learned and to scale up and out the work done at individual Pilot Learning Sites. This dimension of the Programme will be addressed through the methodology analysis and dissemination and the ***knowledge management and information sharing*** component of the SSA CP, under the auspices of the Programme Coordination Unit.

These three dimensions of IAR4D represent major innovations in the way agricultural research for development is actually conducted. IAR4D and the Pilot Learning Teams are paving new ground here, suggesting the need for an "experimental" approach whereby participants continually step back to evaluate and adjust modes of working. ***Monitoring and evaluation and impact assessment*** are fundamental to good project management in general, but are especially important to the SSA CP in that they represent the application of learning principles to the overall execution of the Programme. These four support pillars, discussed in greater detail below, are thus every bit as important for IAR4D and the successful transformation of African agriculture as the more mainstream research activities described in Chapter 2.

## 3.1. Organizational and institutional change

IAR4D is fundamentally about the need to balance competing individual and societal interests in multiple uses for natural resources, including both physical and biological elements (soil, water, genetic resources, etc.). It concerns not only the way people use natural resources to support livelihoods, but also the ***organisational*** and ***ecological*** requirements for establishing the long-term sustainability of those resources.

The SSA Challenge Programme will involve a wide range of organisations operating at different but intersecting locations and scales in agriculture. These include:

- the national agricultural research and extension institutions and the ministries with which they are affiliated (Agriculture, Science and Technology, Trade and Industry etc.);
- universities and other educational institutions engaged in agricultural and environmental research and development activities;
- the subregional research organisations (ASARECA, CORAF/WECARD and SADC/FANR), which bring together the national systems;
- international agricultural research centres operating from headquarters in the subregions or teams posted there;
- research agencies and universities from outside the continent, collectively called advanced research institutes; NGOs of national, regional or international origin; and

- farmers' and women's organisations, which represent the end users of agricultural research products.

The implementation of IAR4D is therefore dependent on partnerships that bring together scientists with different types of expertise and that link organisations that play different roles in agricultural research and development. In addition, IAR4D should place strong emphasis on carrying out research in a demand-driven mode that serves end-user needs, rather than in the supply-driven mode that has characterised much agricultural research in the past. In order to succeed in these new ways of working and working together, support for two types of change process will be essential, namely, efforts to integrate multi-institutional partnerships, and a reorientation towards farmer-driven multidisciplinary, multi-institutional and multi-sectoral research for development. This section describes some of the particular challenges related to these themes, a preliminary agenda for work on institutional and organizational change, and some of the expected outputs of this work.

### 3.1.1. Problem identification

### Integrating multi-institutional partnerships

A major programme is required to accelerate a change process that has been underway for some time, i.e. the formation of integrated national agricultural research *systems* (NARSs) that include all institutions that conduct agricultural research: government, parastatal, university and private. Links with other relevant institutions and stakeholders (in- country and external, research and non-research) are often lacking. As Byerlee and Alex (1999) state:

> Emphasis on building agricultural research capacity has now shifted from exclusive attention to developing national agricultural research institutes (NARIs) to strengthening national research systems, broadly defined to include the NARIs, universities and the private sector (both for profit and non-profit). The challenge is to develop a well-articulated research system to meet national objectives for the sector by (1) developing innovative institutional models that encourage participation of alternative research funders and suppliers, (2) bringing more resources into the research system, and (3) exploiting complementarities among various participants at the national and international levels.

There is an urgent need for NARIs to integrate better, not only with each other, but also with non-research service providers and institutions involved in change and development processes, which will include farmer and trader associations, extension services, marketing, policies, tenure, rural credit, etc., components of which are found in both the public and the private sector.

The new paradigm adopted by the SSA CP, with its focus on managing complexity, suggests important roles and opportunities for African universities as members of the IAR4D teams. In September 2004, FARA is convening at the African Union a workshop on Building African Scientific and Institutional Capacity (BASIC). The BASIC workshop is expected to lead to a proposal for collaboration among African universities and between African and northern universities and the CGIAR to revitalise tertiary agricultural education, with capacity for training in IAR4D as a primary focus. This will ensure that the human capacity will be in place for up-scaling IAR4D as envisaged in the Sub Saharan Challenge Programme.

The private sector also has much to gain from getting more involved in promoting improved participatory natural resource management in smallholder systems to improve input and output marketing opportunities. However, research is required to establish effective public-private partnerships to serve low-income smallholders and pastoralists. The shifting relationship between the public and private sectors has been a matter of substantial debate, heightened by the removal of agricultural subsidies and pressure from donors to privatise agricultural support services. Whilst greater efficiencies may have come from privatisation of some services (e.g. seed and input supply, veterinary care, pest management and a wide range of advisory and analytical services), it is clear that there are many aspects of smallholder and pastoralists agriculture to which the private sector has yet to make an effective contribution. In particular, the private sector needs to be better involved in promoting improved natural resource management in smallholder systems through the provision of appropriate inputs suitably packaged and delivered to smallholders.

The subregional research organisations were created to facilitate the development of scale economies in agricultural research at subregional levels. As such, they became a natural focal point for linking the research of the CGIAR to that of the NARSs. SROs provide the organisational frame for effective division of labour in applied and strategic research at a subregional level, and more effective targeting of possible technology and process spillovers. .

CGIAR centre relationships with NARSs are frequently based on networks that they host and/or manage on behalf of the SROs. These, and the ecoregional and system-wide programmes of the CGIAR, provide models for the SSA CP to consider. Most of the networks are commodity-based, but a smaller set of natural resource management (e.g., AfNet, SoilFertNet/Soil Fertility Consortium and SWMNet) and market-orientated networks (e.g., FoodNet) are much more aligned with the spirit of the SSA CP. However, the hierarchical structure of these networks needs to be modified, and membership widened beyond NARSs and IARCs to include other stakeholders.

### Reorienting research agendas: Fostering multidisciplinary, multisectoral, demand-driven research

Although agricultural research institutions and systems, both national and international, have been under significant pressure to change over the last several decades, they still tend to be structured along disciplinary, commodity or thematic lines. This both impedes the flow of knowledge and militates against adopting integrated or holistic approaches. Since many institutions are still highly compartmentalised and conduct only limited cross-disciplinary work, mechanisms to encourage cross-disciplinary learning and action will need to be built in as essential parts of IAR4D project development and implementation.

Despite commitments to a more integrated agenda, agricultural research is still typically conducted within a highly focused and reductionist commodity improvement paradigm. NARIs and CGIAR Centres alike are often deficient in such areas as landscape and systems ecology and simulation modeling. Related areas such as forestry, watershed dynamics, livestock and livestock products, agroprocessing and quality maintenance of agricultural products, markets and agriculture-related policies and rural development are neglected. While participatory research methods have been actively promoted in many IARCs and some NARIs over the last decade, the link between participatory methods, natural resource management and market relationships is much weaker than, for example, that between crop improvement and pest management.

In an important departure from the past, the primary research for development strategy of the CGIAR centres has also shifted from a commodity- and technology-driven mode to an approach that starts with the participatory identification of opportunities for smallholder farmers. Those opportunities are then developed into interventions at the farm level through new partnerships in the pursuit of science for development, and by linking farmer-producers to the market chain. The analysis of CGIAR research activities in 2000 showed that all centres, including those with strong crop improvement mandates, now have significant soil fertility research programmes. There is thus an interesting paradox between the greater understanding of the need for integrated approaches, and the extent to which soil fertility and other NRM research is still being done for single crops rather than for the farm enterprise as a whole, let alone for systems at higher scales. Similarly, while IFPRI is wholly devoted to food policy, most other centres also have policy research programmes addressing their own mandates often independently.

## 3.1.2. Proposed support to enable organizational and institutional change

Promotion of a new paradigm that will offer a more effective approach to improving livelihoods must be accompanied by investment in exploring the opportunities and barriers to organisational change. In addition to the disruption and costs of change, other barriers include poor information on the “hows” of change or what the impact of particular change is likely to be. With information on this, research programmes would be better equipped to identify what types of actions are needed to enable change (e.g. information, capacity building, new management and performance evaluation systems, donor support and other financial incentives, etc.)

Considerable attention should therefore be devoted to institutional and organisational issues at all levels, from village level groups to international agreements. Thus the overall objective for this domain of support activity is to facilitate change in national and international agricultural institutions working in Africa, to enable them to implement the multidisciplinary and multi-institutional agenda of IAR4D.

Examples of entry points that contribute to achieving the organisational change objective include:

- Changes in policies and procedures to ensure the mainstreaming of capacities for participatory pro-poor and gender-sensitive research for development research, across all sectors of agricultural research and development;
- Actions to reorient research to end-user priorities, giving ownership of implementation of IAR4D to farmers and others with a strong investment in the outcomes of agricultural change;
- Procedural and policy changes to open institutional access and promote dialogue and involvement in negotiation to farmers and other stakeholders at all levels of the hierarchy of agricultural research for development;
- Fostering of an effective culture of self-propelling, mutually reinforcing inter-institutional partnerships among research and development institutions and organisations at national, regional and continental scales;
- Enhanced capacities of agricultural institutions to manage organisational change and partnerships;
- Institutional changes to enable information to flow within and between government and donor agencies, including development of institutional incentives for co-operation and sharing; and
- Development of appropriate practices for embedding quality control and impact evaluation as a continuous self-assessment process in all institutions and partnerships that participate in IAR4D.

### Outputs

This component of the Challenge Programme will address the critical organisational arrangements and processes for implementing IAR4D on the basis of equal participation amongst diverse and unequally endowed collaborators. It will provide knowledge of ways to minimize inter- and intra-institutional barriers, including gender biases, through learning-by-doing. Within the time frame of the first five years of the SSA CP, the extent of institutional change is expected to be limited but should include:

- effective multi-institutional teams working directly with farmers and other stakeholders and delivering integrated research results;
- mechanisms and incentives to support the above and the implementation of IAR4D in place within national and international institutions;
- work plans of the key national and international institutions that reflect the principles and components of IAR4D; and
- effective public-private partnerships for agricultural developments in place throughout the regions.

## 3.2. Capacity building

### 3.2.1. Capacity building for project teams

The development of human and institutional capacity is central to operationalising IAR4D, from the formation of teams to the assessment of impact. The required institutional changes and shifts in research orientation, as well as the actual research itself, will fall most heavily on institutions directly collaborating in the SSA CP "Pilot Learning Teams" (PLTs). Among other things, PLTs will need training in the areas of participatory research, iterative learning and change impact assessment, organisational change and mainstreaming. Partners unfamiliar with the IAR4D paradigm will need to master and internalise the IAR4D participatory diagnostic and service delivery approach, whereby disadvantaged members of the communities, such as women and children, are involved in finding solutions to the constraints that are most important to them. Unless all partners are familiar with the IAR4D principles, new entrants will face difficulties and innovative partnerships will be constricted.

The formation of effectively functioning teams that enable collaboration among the full range of

stakeholders in IAR4D, is another *sine qua non* of the Programme. Modern research teams need to be learning organisations able to apply adaptive management skills to all aspects of their agenda. This is especially important for the PLTs, which will be composed of a wide range of partners with complementary but differentially developed skills and objectives. IAR4D will not succeed if the teams fail to function as inclusive, non-hierarchical partnerships between equals with differing roles. Too often, team-building has been left to "just happen," but experience shows that it requires dedicated skill and attention. The INRM Taskforce gave particular attention to the issues of team building and learning together, as indicated in the INRM operational "wheel" (Figure 1.2).[29]

To overcome this, a new approach is proposed that includes building capacity for teamwork as a primary element of proposal development and project implementation. Facilitation and mentoring services will be provided to support and guide capacity building and institutional change from the very first steps in the formation of the IAR4D teams and, to varying extents as required, throughout the project life. The Programme Coordination Unit will, through competitive grants, engage the services of professional facilitators to work with the Pilot Learning Teams.

The facilitation and mentoring service will promote the development of and adherence to high quality proposals and work plans in which all partners can participate effectively. Another important function of facilitation and mentoring will be to develop the teams' capacities for self-monitoring and evaluation. It will use the results of the teams' action learning processes to rapidly transmit experiences about successes and failures between the Pilot Learning Teams so that they can learn from each other. Without this service, each Pilot Learning Team will have to go slowly through every iteration of IAR4D. The provision of the service will accelerate learning and internalisation of the approaches and outcomes so that IAR4D will be progressively taken up independently of the SSA CP and without the need for external expertise.

In addition to up-front training and continual coaching in conducting IAR4D, the Pilot Learning Teams may also identify additional skills or specific areas of expertise that they require but which are not readily available to them, such as gender analysis skills or how to interact effectively with policy-makers. The facilitation and mentoring service will assist the Teams to obtain such expertise through either expanded partnerships or capacity building.

### 3.2.2. Capacity building for stakeholders

To a significant extent, out-scaling will depend on whether smallholders and pastoralists in communities not directly served by the PLTs adopt IAR4D generated technologies in their farming systems. In addition to neighbours and players in the local market chains (including private enterprise) who will observe the local impact of IAR4D, the next generation of farmers, Africa's school leavers, will be expected to take up the products of IAR4D, thereby becoming both actors and beneficiaries. In contrast to past research, the SSA CP will make provision for awareness and capacity building designed to promote and enable out-scaling. The aim is that out scaling should as rapidly as possible acquire its own momentum so that the innovations will spread widely enough to have the required impact.

In addition to the capacities needed for implementing IAR4D in the funded projects, there is a dearth of capacity among the people upon whom spontaneous out-scaling will depend. Capacity building must also therefore address the needs of individuals, teams and institutions from all stakeholder groups, including those not involved in immediate implementation of IAR4D but whose contribution is essential to out-scaling. Disseminating IAR4D across the subregions will be catalysed by enabling scientists from countries without Pilot Learning Sites to join teams in other countries so that they too can gain skills and expertise in implementing the new paradigm. The Programme Coordinator will be responsible for ensuring that the merits and defects of approaches and methods developed by the different teams are captured, cross analysed and rapidly transmitted between teams so that the learning process will accelerate over time.

As noted in Section 3.1.1, the longer-term success of IAR4D will depend on mainstreaming these lessons

[29] For example, the ICRA Position Paper, Volume 2.

into the national, regional and international organisations at all levels, especially in tertiary education institutions producing scientists, agribusinessmen and policy makers. It is expected that this need will be addressed by the project on Building African Institutional and Scientific Capacity (BASIC), currently being developed by African and northern universities, the CGIAR, FARA and other stakeholders.

### 3.2.3. The approach to capacity building in IAR4D

The overall objective of capacity building in the SSA CP is to develop a mindset and a set of skills among scientists, institutions and other stakeholders in the agricultural sector in sub-Saharan Africa to enable them to apply integrated approaches to agricultural research for development. Specific objectives include:

- To facilitate the creation of multi-institutional teams to pioneer the development and successful implementation of the principles of IAR4D throughout Africa;
- To enhance the range of expertise in the disciplines needed for IAR4D in research for development institutions in sub-Saharan Africa. This entails strengthening the skills needed for successful gender-sensitive, interdisciplinary, inter-institutional and multiple-stakeholder problem solving teamwork, that addresses priority problems identified by the intended beneficiaries, and that demonstrates a clear route to impact at farm and community levels;
- To facilitate changes in the structure and management practices of the institutions of the research for development system to accommodate the needs of IAR4D;
- To provide the mechanisms and skills to enable farmers and other land managers to engage in the research for development process;
- To enable farmers in neighbouring communities and the next generation of farmers to appreciate and incorporate the principles of integrated natural resource management into their production systems and thereby become effective players in out-scaling the outcomes of IAR4D.

Examples of ***entry points*** that contribute to achieving the capacity building objective include:

- Exploration of the most effective approaches to facilitation and mentoring, to build effective IAR4D teams through the principles of self- and continuous learning;
- Exploration of means to support and strengthen farmers' management skills and ability to innovate, within the institutional context of market- and research-driven (knowledge-intensive) agriculture – giving particular attention to reinforcing women's management and innovation skills.

The Programme Coordination Unit will be responsible for ensuring that these components are successfully incorporated into the SSA CP, through collaboration with appropriate stakeholders and agencies.[30]

### Outputs

This component of the Challenge Programme will ensure that capacities exist amongst all the major stakeholders not only to implement IAR4D, but also to out-scale and upscale it and internalise it in the national agriculture systems of sub-Saharan Africa. Expected outcomes of this work include:

- relevant participatory methods mainstreamed in all organisations involved in IAR4D;
- women and men farmers and other "client" groups demonstrably influencing the research for development agenda before projects start; and
- a broader range of expertise available in both national and international institutions to fill needs of IAR4D implementation, and the embedding of these skills in the culture of the institutions.

In addition, the intensive focus on teamwork will result in:

- clearer definition and broader ownership of goals and methods of research;
- empowering stakeholders from all sectors, and particularly women farmers;
- resolving the often conflicting interests of these stakeholders;

[30] See Section 5.1.5: The Programme Coordination Unit.

- fostering the adaptive management capacity of stakeholders; and
- developing guidelines on why, how, when and what to do.

## 3.3. Knowledge management and information sharing for out- and up-scaling IAR4D

### 3.3.1. Rationale

Africa has countless examples of experimental successes and localised adoption of research outputs. However, these have not stemmed the decline in rural standards of living nor the deterioration of the natural resource base. Successful products of agricultural research in Africa have typically generated only limited impact because the requirements for out-scaling and up-scaling have not been adequately considered. Indeed, the challenge of how to effectively disseminate results across scales is among the most difficult in agricultural research.[31] Since IAR4D is an *approach to research* rather than a product per se, its impact will depend on how well the merits of the concepts are conveyed to potential practitioners and policy makers. In view of the multi-institutional nature of IAR4D, it is necessary to reach out with information and awareness building to all stakeholders, across the board from people entering farming and agribusinesses through farmers' organisations, community based organizations and NGOs, research and extension agencies, to policy makers at the highest levels, so that they fully internalise the concepts relevant to their domain of work.

The SSA CP therefore explicitly includes measures to improve the dissemination of information and knowledge emanating from research. This component of the Programme will therefore require Africa-wide research, working with all of the Pilot Learning Teams and stakeholders at all levels. This is particularly important given that IAR4D activities will only be conducted in a limited number of sites (see Chapter 4). For Programme goals to be realised, successful outcomes in Pilot Learning Sites must be rapidly assimilated and taken up the scale from where research is conducted, to policy makers and research and extension institutions at district, national and regional levels and across the continent. This in turn requires that the results from and across the sites must be synthesised in a way that permits extrapolation beyond the project sites, and lessons learned to be rapidly disseminated and taken up by others.

An IAR4D agenda poses additional challenges for knowledge management because of its innovative scientific content, and because IAR4D is multidisciplinary and multiscalar. Traditional ways of disseminating agricultural knowledge seldom link well with other knowledge systems, such as those related to land use and rural development, most notably, forestry, hydrology, and wildlife management. This creates policy conflicts among ministries and other stakeholders involved in the various sectors, and particularly in cross-sectoral themes such as rural development and poverty alleviation. There is a need for access to raw data, but an even greater need for better synthesis of results that will improve the impact of their use.

A critical element for achieving impact is having up-to-date information and knowledge of the research processes and products available in appropriate formats and media. Databases containing information from previous research and development activities will be acquired or developed and shared with all partners. Many of the sources are already documented in the supporting papers in Volume 2 of the proposal. A major feature of the planning and team-building processes will be agreeing on the responsibilities and mechanisms for the flow of information and other types of communication among the partners. Failures in this area are among the most common causes of disharmony in research teams, and of diminished impact of the project outputs. The Programme Coordination Unit will also engage expertise to capture and synthesise methodological developments, and make them rapidly available to the IAR4D teams and other stakeholders.

In view of the constraints to information exchange in Africa, the SSA CP will, through the Programme Coordination Unit, be proactive in determining and maintaining the most viable arrangements for information exchange. This function will dovetail with the work of FARA's information unit, and will be done in collaboration with the CTA's Knowledge for Development portal, FAO World Agricultural

[31] See keynote paper by Campbell et al, Volume 2.

Information Centre (WAICENT), the European Union supported INFOSYS project, the CGIAR centres, CAB International and other agricultural information and knowledge sources and systems. The Programme is committed to sharing not only internally generated knowledge, but also that of the many other programmes and projects addressing INRM, as well as to introducing the principles of IAR4D into institutions of learning from which the next generation of smallholders, pastoralists, agribusiness people, extension agents, researchers and politicians are emerging.

In response to these needs, the Programme Coordination Unit will ensure that Pilot Leaning Teams synthesise and disseminate successful approaches and outcomes to communities, civil society, national governments, regional organisations and development agencies, so that these can be readily incorporated into development programmes. This will require engagement with and understanding of the different needs of diverse stakeholders.

Exchanging information will not, however, be sufficient for achieving uptake of IAR4D. Beneficiaries must be able to convert information into applicable knowledge. While information may be relatively culturally neutral, knowledge is influenced by social and cultural assumptions. For instance, agricultural knowledge that is derived from scientists and that derived from farmers may be very differently structured, even when based on similar information. Modern science-based technologies are organised in codified forms of knowledge, such as books, scientific papers, patents, blueprints and databases, but a great deal of agricultural knowledge is embodied in individuals and communities in tacit and implicit form. Implicit knowledge can only be accessed and learnt through practical experience based on relationships and trust between learners and mentors (Nonaka 1995, Mbigi 2000).

The SSA CP, through its promotion of holistic IAR4D, presents a unique and important opportunity to develop processes that reconcile the conflicts between the reductionist methods of "modern" science and the holistic methods of "ethnic" science, so that information coming from research will make beneficiary smallholders and pastoralists more knowledgeable. The most common knowledge management models are linear or hierarchical: institutions responsible for agriculture have extension departments that are tasked to capture research findings from NARIs and IARCs and transform them into extension materials for farmers. This model suffers from a distinction between generators and recipients of information and knowledge. The assumption that farmers, and indeed many other stakeholders, are merely passive recipients of research outcomes means that their knowledge has a very limited chance of influencing research agendas. The approach to knowledge management envisioned for the innovation systems approach of IAR4D will be a significant advance on past efforts to disseminate research information, which has often merely confused the intended beneficiaries, if indeed it reached them at all.

Effective innovation requires a fusion of different knowledge systems to make them mutually reinforcing rather than antagonistic. The IAR4D approach provides a framework for effective fusion of these systems and the reinforcement of coping strategies within development contexts. Because it embraces many principles and methods drawn from ecosystem science, IAR4D overcomes the significant disjuncture between agriculture and ecology that arises because, as scientists and extension workers struggle with specific technologies, the impact on the whole ecosystem is rarely considered and rather difficult to isolate and measure.

Greater integration of the research agenda implies greater complexity in the information and knowledge that is being generated and, in particular, the necessity for a systems focus – closer to the way farmers perceive the world than the highly sectoral conventions of many scientists. A major pending task in knowledge management is to develop ways of integrating different types of knowledge, since informal knowledge is at least as important as formal knowledge in complex socio-ecological systems. New ways of managing knowledge and improved analytical capacity to cope with informal knowledge are therefore needed. In particular, ways are needed to make implicit knowledge explicit (Sinclair & Walker 1998). Process facilitation will play an important role here to promote learning and integration of knowledge among stakeholders and researchers, and to empower smallholders and pastoralists who are the true "managers" of natural resources.

The focus on system level properties and processes has generated renewed interest in modelling tools.

Combining simulation models with participatory approaches can help develop new production system configurations and evaluate their resilience and profitability under different biophysical, social and economic conditions.[32] However, nothing has provoked as much controversy in natural resource management as the use and misuse of simulation models. Advocates proclaim the awe-inspiring capacities of computer models. Detractors point to enormous investments in data gathering to feed models that they claim rarely predict outcomes any better than skilled practitioners can (Sayer & Campbell 2003). However, the problems of dealing with complex situations embracing multiple objectives and actors, non-linearity, unpredictability, and time lags in natural resource system responses necessitate the use of modelling. This must be underpinned by linking "hard" and "soft" data, and by engaging stakeholder participation to provide reality checks to the modelling process (Lynam et al. 2002). This will enable IAR4D to make optimal use of the information and thought processes that come from indigenous knowledge systems, as well as those from the formal sciences.

### 3.3.2. Knowledge management and information sharing approaches in IAR4D

Objectives for the SSA CP work on knowledge management for scaling research findings up and out include the following:

- To promote an inclusive attitude to agricultural knowledge that draws on information and knowledge from all relevant sources, both formal and informal;
- To strengthen the capacity across sub-Saharan Africa to access, manage, utilise and share agricultural information and knowledge within and among rural communities and research and development institutions; and
- To synthesise research results for increased ease of dissemination and impact.

Examples of entry points that will contribute to realising these objectives include:

- development of viable and sustainable mechanisms for data collection, analysis, and effective monitoring and evaluation;
- identification of new approaches and organisation of agricultural research that increase the utility of scientific knowledge to farmers;
- use of modern information technology to collect and analyse data and disseminate policy concepts;
- development of models and action-support tools to effect scaling out and scaling up of integrated agricultural technologies, along with strategies to mainstream these into development programmes;
- methods to combine tools such as simulation modelling with farmers' indigenous knowledge systems, in order to provide effective agro-ecosystem scale decision and negotiation support tools;
- ways to optimise the flow, use and impact of agricultural information and knowledge between all stakeholders at local, national, regional, continental and global scales;
- exploration of the conditions under which public-private knowledge and information services can optimise benefits for smallholder farmers;
- methods and approaches to integrate "hard" and "soft" scientific data and formal scientific and indigenous knowledge systems into agricultural management models; and
- identification of knowledge management techniques that facilitate adaptive management of complex agricultural systems.

### Outputs

This component of the SSA CP will reconcile the different knowledge levels and information requirements of the diverse stakeholders. It will ensure that research outputs and information on the processes of IAR4D serve to make all stakeholders more knowledgeable. As a departure from much previous research, it will ensure that beneficiaries can interact effectively with their formally trained colleagues. Assessment of change in the ways that knowledge is generated, shared and used will require studies of these processes within each project area, which will constitute a research topic in its own right.

[32] WARDA and ICRISAT position papers, Volume 2.

## 3.4. Monitoring and evaluation and impact assessment

Work stemming from numerous fields of endeavour and widely different case studies (Sayer & Campbell 2001; Hagmann et al. 2002; Douthwaite 2000; Douthwaite et al. 2003) have led to the conclusion that impact assessment should be an essential, integral and continuous component of IAR4D. It is fundamental to the work of the research teams, as well as being part of programme management and accountability. In an innovations systems approach, it is essential to have a means of quickly determining and explaining what works and what does not, not only within a team, but also between learning teams so they can avoid pitfalls and benefit from the successes of others. It is also vital to be able to assess both whether the Programme is on track towards achieving sufficient and sustainable impact, as well as the magnitude of that impact on improving livelihoods and natural resource management.

Conventional measures of *ex post* impact assessment are difficult to apply to integrated research. At the system level, where IAR4D impact should most properly be measured, it is nearly impossible to attribute impact to the interventions of specific partners or disciplines.[33] Impact assessment should, therefore, be directed at the sustainability of system performance, assessed by system level indicators over time, together with assessments of the adaptive capacities of the managers as they respond to the post-project effects of changing conditions. New approaches, such as gender-disaggregated outcome mapping and impact pathways analysis, should be applied to track the impacts of programme outputs that depend for their impact on uptake by diverse and numerous adopters (Earl, Carden & Smutylo 2001). Where key parts of a project include changes in human and institutional behaviour, as in IAR4D, the assessment of impact is yet more complex and requires social indicators to complement the biological and economic descriptors.

Rather than measuring the impact of specific technologies, impact assessment in IAR4D should seek to identify outcomes that enable resource managers (farmers, pastoralist, local, national and regional officials and politicians, international NGOs, etc.) to innovate and adapt to constantly shifting challenges, and that help resource systems to become more resilient under changing pressures. As Campbell and Hagmann (Volume 2) note, integrated research is more concerned with better decision-making, increasing options and resilience, and reconciling conflicting management objectives as a foundation for better management and technological change, than with producing specific technological packages.

The impacts of IAR4D must be assessed across the linkages that occur in natural resource management systems, with integration across spatial and temporal scales. Impact assessment must cope with geographic linkages of organisms, plots, catchments and the global environment, and human linkages of households, villages and districts and international organisations.

Impact assessment of IAR4D will recognize that different processes occur over different time frames with some variables operating slower than others. Slow variables such as gradual erosion of soil fertility, depletion of ground water, the breakdown and accretion of social capital in communities affect the dynamics of more rapidly cycling processes and may exceed thresholds or trigger breakpoints, thus causing sudden shifts in systems. The slow variables will need to be tracked, possibly through simulations, in ways that can distinguish highly fluctuating short-term variations from longer-term effects.

### Objectives

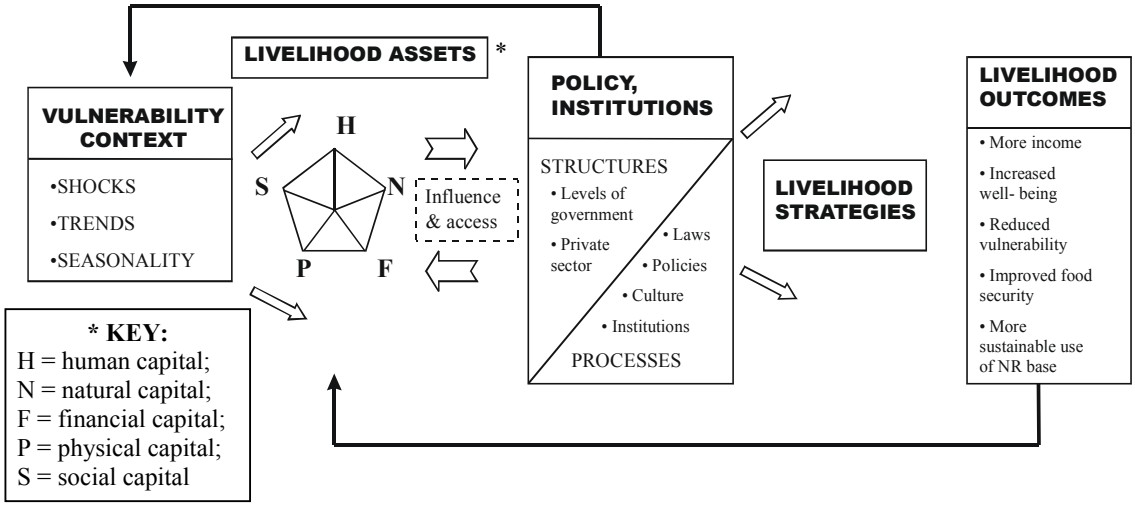
The objective of impact assessment in the SSA CP is to rigourously evaluate the progress, benefits, and obstacles encountered in the execution of IAR4D work. An independent impact assessment process will provide assurance that the goals and objectives of the Programme are being met and, where necessary, will facilitate timely corrective actions. Since this inevitably has an element of performance auditing, the function has to be kept apart from the internal process of monitoring and self-learning that is an essential component of the IAR4D approach. Thus, the service should be provided by specialists who have no stake in the conduct or outcome of the Programme and whom the investors will regard as wholly objective.

[33] See Figure 4 in Campbell et al., Keynote paper 1, Volume 2.

## Entry points

Impact assessment within the SSA CP will be based on systems theory concepts and methods, as appropriate to interventions undertaken in complex circumstances. IAR4D impact assessment must be applicable to a social process in which people overcome constraints by simultaneously modifying their production systems and their use of technology, to reach objectives that contribute to improved livelihoods and sustainability (Douthwaite et al 2003). The complexity and nonlinearity of agricultural change can be dealt with through a two-stage approach: first, by developing a model of how research will achieve impact, using impact pathway analysis to guide project management; and second, by conducting *ex post* impact assessments to determine the wider benefits of the research, including establishing linkages to poverty alleviation. To accomplish this, Programme impact assessment will draw on sustainable livelihoods concepts, simulation modelling, geographical information systems, multi-scale databases, and other decision and negotiation support tools. Examples of some of the elements of sustainable livelihoods that need to be addressed are shown in Figure 5.[34] Conceptual models such as this one are essential for maintaining a broad systems perspective on issues, this one being directed at the household level, but with many links to other levels.

**Figure 3.1. The elements of the sustainable livelihoods approach**




Long-term monitoring of communities and households, coupled with selected control groups, will be used to provide information and data that can be used to test hypotheses of the IAR4D themes adopted at the sites, e.g. on market development, managing natural resources, intensification of smallholder systems, improved policies, and scaling out and up. Impact will be measured in terms of incomes, well being, vulnerability, food security, and sustainability of use of the natural resource base. It will be essential to develop and measure indicators in the pilot sites, control sites, and most likely in sites using other intervention methods. The scales of analysis may be at community, household or plot levels.

Impact assessment specialists will be needed at the outset of each Pilot Learning Team's activities, to set up systems and establish baselines and milestones. Once data are being routinely collected and collated by PLTs and the SSA CP Programme Coordination Unit, specialists will be required only periodically to conduct data analysis and report to stakeholders, principally through the Programme Steering Committee and Subregional Organisations. While impact assessment will provide independent evaluations of progress towards the goals and objectives of the Programme, it will depend on data and information provided by the participants and beneficiaries, implying the need for a collaborative effort. Monitoring and impact assessment will therefore be an integral part of Pilot Learning Teams' research agendas, rather than add-ons.

[34] From Keynote Paper 1, "Rising to the Challenge of Poverty and Environmental Sustainability: Towards a conceptual and operational framework for INRM," compiled by B.M. Campbell and J. Hagmann from (Carney 1998).

Impact assessment specialists will also be expected to work with the Pilot Learning Teams to ascertain how effectively research outputs are being transferred. Their studies should evaluate the impact not only of tangible technologies, but also of information and the way it is delivered, in particular to community-based organisations and individual farmers. Impact assessment will also involve the NARIs in monitoring the transfer of unfamiliar technologies. The specialists' roles will include the training of extension staff; networking with transfer agencies to ensure that emerging constraints to adoption are identified and addressed in time; helping to establish stronger transfer pipelines; and monitoring the adoption and impact process through continuing research.

### Outputs

This component of the Challenge Programme will ensure that stakeholders are aware of what impacts research in a specific locality has on local livelihoods, while capturing off-site effects and external drivers of change. Evaluation studies will also address the impact of trade-offs between different interests at different scales, the potential impact of alternatives, and the consequences of tradeoffs and interventions at different scales.

Monitoring and evaluation will be built into the reporting process, which could follow a three-step review process:

- reports on project implementation and results prepared by the individual Pilot Learning Teams;
- a review workshop organised by the Programme Steering Committee; and
- an external review (based on the review report, the review workshop and field visits).

A meta-review may be undertaken of the completed external project reviews, to draw lessons from the experiences of all the Pilot Learning Site projects implemented during Phase 1 of the SSA CP. That would have three steps:

- preparation of a draft meta-review report, based on the completed external reviews;
- a workshop, involving representatives of the Pilot Learning Sites and other key stakeholder groups, to discuss draft report and identify additional lessons;
- a final meta-evaluation report based on the previous two steps.

## 3.5. From theory to practice

Chapters 2 and 3 have laid out the separate components of the IAR4D approach. The next chapter will reintegrate these components by indicating how the Pilot Learning Teams engage the specific challenges faced in the Pilot Learning Sites located across sub-Saharan Africa

# CHAPTER 4. THE SSA CP'S MODULAR APPROACH TO IMPLEMENTING IAR4D

*This chapter describes the approach to and outcomes of the selection process for first-round Pilot Learning Sites, and the two-phase process for implementing IAR4D under the SSA CP.*

Chapters 2 and 3 have described the rationale and approach that will be taken under the Challenge Program to put the IAR4D model into practice in sub-Saharan Africa. This chapter lays out the three-step process that will be followed to implement the SSA CP: a preparatory module – completed with the submission of this proposal – that involved stakeholders in the design of the Programme; Module I, which initiates IAR4D activities in three Pilot Learning Sites (PLSs); and Module II, which scales up IAR4D interventions to additional sites across sub-Saharan Africa.

**Preparatory Phase:** The SSA CP has a number of innovative features, not the least of which has been the participation of FARA and the subregional organisations (SROs) in the development of this Africa-wide programme. African stakeholders have been involved in the overall design of the SSA CP, with SROs playing the lead role in the final preparatory phase to identify candidate Pilot Learning Sites (one per subregion) and related entry points, relevant science, and likely partners (including CGIAR Centres). The outcomes of the final preparatory work are described in Section 4.1 below. SRO leadership of the site selection process has demonstrated African ownership of the Challenge Program, as well as congruence with regional priorities and criteria.[35]

**Module I:** Assuming the SSA CP approach is endorsed by the CGIAR Science Council, the Programme will be initiated with a **first module** designed to validate IAR4D at three initial Pilot Learning Sites. Further evaluation by the Science Council will be required before the Pilot Learning Teams can be funded to engage in full implementation of IAR4D and for initiation of further modules.

**Module II:** Module II provides for approximately six additional Pilot Learning Sites. This will increase exposure to IAR4D in the subregions to a level from which IAR4D can be internalised and fully integrated into subregional research programmes. This is essential to ensure that IAR4D achieves it full potential impact through out- and up-scaling (the lack of which is a common failing of agricultural research in Africa). Section 4.3 outlines how Module 2 activities will be carried out.

## 4.1. Preparatory phase: Selection of the first Pilot Learning Sites

This section begins with a discussion of the process used to select the three Module I PLSs, followed by a description of each of the sites, the respective research and development challenges that will be addressed, and some preliminary research hypotheses, pending further refinement and ratification with the PLS communities as the programme gets underway.

### 4.1.1. Module I site selection process

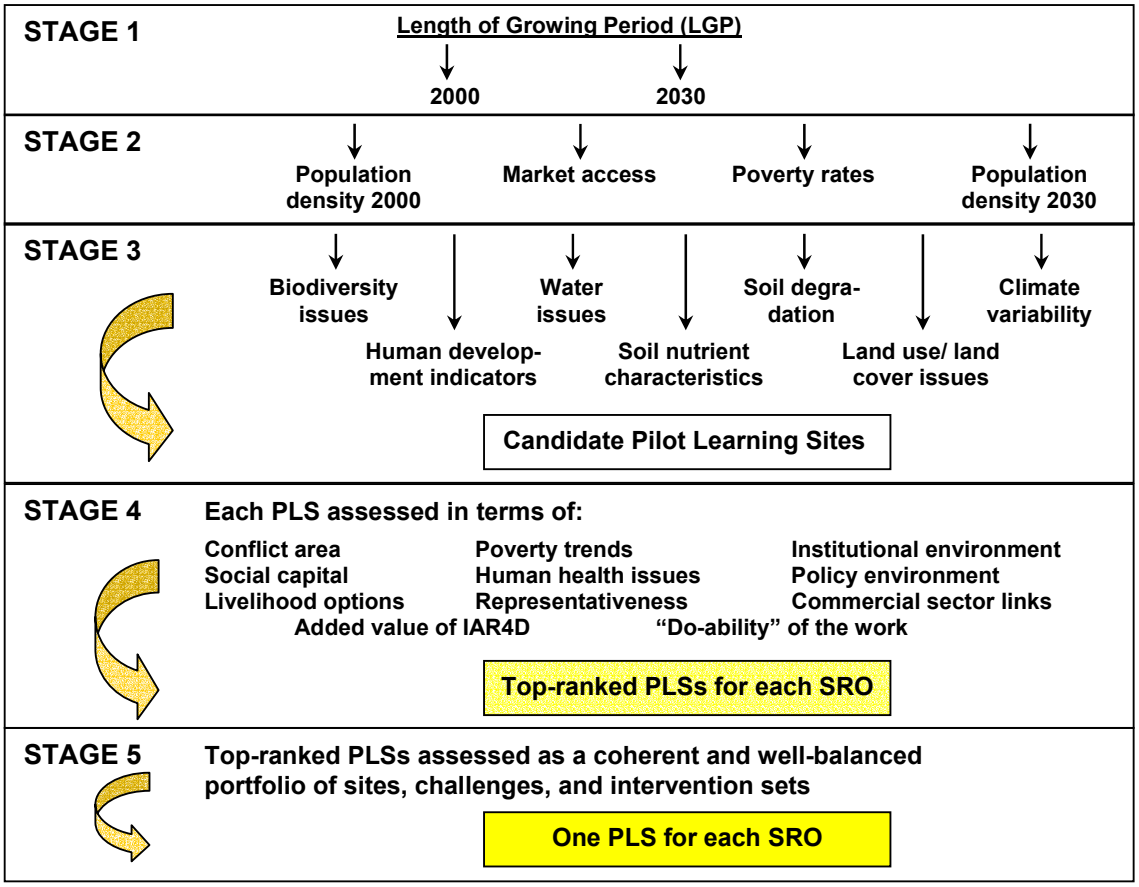
Pursuant to the request of the interim Science Council, the SROs readily undertook to identify one Pilot Learning Site each for the start up phase, guided by a common methodology agreed upon with FARA to ensure relevance and representativeness. PLS selection was informed by the broad strategic priorities of each SRO, and the set of sites selected across the sub-continent were to be complementary, with contrasting biophysical, socio-economic and policy-institutional dimensions. This was considered desirable in order to ensure that value adding "continental learning" could take place as a consequence of the experiences and results from each PLS.

The work of PLS selection was done by Task Forces set up by each SRO. These Task Forces were composed of representatives of the SRO, the NARS, the CGIAR, and other regional institutions. The Task Forces were assisted by a spatial analysis working group (SAWG), made up of representatives from each SRO and professional spatial analysis scientists from ILRI and IITA. They also had access to

[35] See Annex A-1 for background on the priorities articulated by the subregional research organizations as part of the SSA CP consultation process.

focal persons in the field working with the communities and extensive information from ongoing research. A five stage process was designed that utilized both spatial (Stages 1-3) and non-spatial data (Stage 4), culminating in a collective decision-making process to select the final three sites (see Figure 4.1).

**Figure 4.1. Stages in the process of Pilot Learning Site identification**




The **first stage** of the site selection process was based on analysis of length of growing period, as LGP synthesises and integrates a great deal of information related to climatic variables that dictate the innate potential or suitability of different areas for particular agricultural activities. A map of possible changes in LGP by 2030 was also produced, based on downscaling of outputs from the Hadley CM3 General Circulation Model. The **second stage** was to apply "gross" filters to the LGP map, together with a masking out of protected areas, deserts, lakes and urban areas. The second-stage filters were human population density, market access, and levels of poverty. The rationale for these three was the desire to identify areas where impacts of the Challenge Programme could be expected to be both large and relatively rapid; such areas would tend to have high population densities, relatively good market access, and high levels of poverty.

For the **third stage**, another set of filters were added, relating to current and (as far as possible) future stresses to the various systems. A variety of spatial data layers was available for this stage, including soil degradation, nutrient deficiencies, biodiversity, and land-use and land cover, livestock density and climate trends. Information on human development indicators was not available at a level of detail greater than the country level, unfortunately, so these could not be used. The idea of this stage was to identify areas where NR stresses have already developed (or are likely to develop in the future), given increased demands on the resource base. In addition some SROs decided that cross-boundary sites should be selected, a criteria that was later adopted by all SROs. This process led to the identification of six candidate sites in the ASARECA subregion, 13 in the CORAF/WECARD subregion, and 15 in the SADC subregion.

In the **fourth stage** of the process, a range of non-spatial criteria were used to select the three highest priority candidate sites for each subregion (these criteria are listed in Figure 4.1, Stage 4). These characteristics of the candidate PLSs were scored in terms of their influence on suitability of pilot sites for the purposes of the research as determined by the SRO Task Forces. In the **fifth and final stage**, the nine priority sites were considered together in order to pick one in each subregion. The goal was that the resulting set of three sites would contain a range of different activities, deal with different problems, and in general form a complementary portfolio of research locations.

This final decision-making process took place during a meeting of representatives of the three SROs, held at FARA headquarters June 10-11, 2004. The principle outcome of that meeting was the selection of the three Module I PLSs: Kano-Katsina-Maradi (Niger and Nigeria), "Lake Kivu" (Democratic Republic of the Congo, Rwanda and Uganda), and a transect that runs from northeast Zimbabwe through central Mozambique into southern Malawi. Taking the three sites together, they cover a range of different agroecological zones, widely disparate rainfall regimes, widely differing policy, market and institutional environments, and a range of critical NRM issues at each site. Spatial analysis indicated that each of the PLSs is representative of much larger areas of sub-Saharan Africa and millions of people, in terms of characteristics such as agroecology, human and livestock population density, and market access (maps indicating similar agro-ecologies to each of the three sites can be found in Annex A-2). Table 4.1 summarizes the characteristics of the three sites, and Sections 4.1.2 to 4.1.4 describe them in more detail.

**Table 4.1. Characteristics of the selected PLSs for Module I**

| Site characteristic | Kano, Katsina, Maradi | Lake Kivu | Zimbabwe-Mozambique- Malawi corridor |
|---|---|---|---|
| Length of growing period (months) | 2.5 - 6 | > 9 | > 5 - 10 |
| Annual rainfall (mm) | 500-1100 mm | 1,500-2,000 | 700 - 800 |
| Relief | Mostly flat, interspersed with inland valleys | Mostly mountainous, mostly 1500-1800 masl | From mountainous (1,000 to 1,500m) to flat plains (400 to 700m) towards coast. |
| Existing policy environment [a] | **2** | **1** | **1** |
| Existing market environment [a] | **2** | **1** | **2** |
| Existing institutional environment [a] | **3** | **1** | **3** |
| Principal NRM issue | Soil nutrients | Vulnerability | Soil fertility mngmt |
| Site area ($km^2$) | 83,900 | 19,500 | 274,000 |
| Site human population (2000) | | | |
| Number inhabitants (million) | 18.3 | 15.2 | 11.5 |
| Density (people per km2) | 218 | 779 | 42 |
| Annual population growth rate | 2.4% | 2.2% | 1.2% |
| Projected population, 2030 (million) | 37.3 | 29.2 | 16.4 |
| Representativeness: | | | |
| Area (km2) | 513,000 [b] | 362,000 [c] | 1,491,000 [d] |
| Human population (million, 2000) | 51 | 69 | 93 |

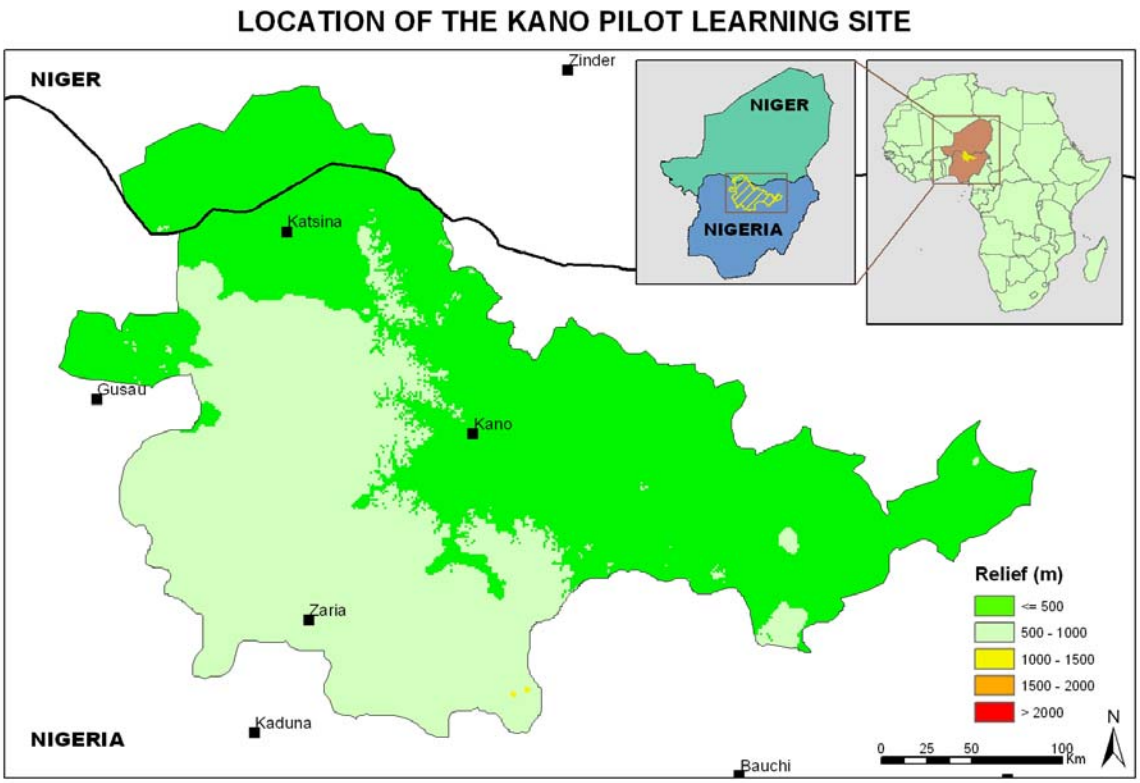
**Notes:**

[a] Stronger = 3, medium = 2, weaker = 1

[b] Kano extrapolation: derived from overlays of the semi-arid areas, accessibility index < 50, cattle density < 50 per $km^2$, human population density > 50 people per $km^2$.

[c] Kivu extrapolation: derived from overlays of elevation > 1500 m and annual rainfall > 800 mm; , human population density > 50 people per $km^2$ and accessibility index < 90.

[d] Zimbabwe-Malawi-Mozambique extrapolation: derived from overlays of the areas with a length of growing period > 5 months accessibility index < 150, human population density > 15 people per $km^2$




### 4.1.2 West-Central Africa PLS: Kano-Katsina-Maradi (Niger and Nigeria)

The West African Pilot Learning Site is located in the northern part of Nigeria and the south-central part of the Republic of Niger, encompassing the Nigerian states of Kaduna, Katsina and Kano (as well as parts of neighboring states), and Aguié and Madarounfa Departments in the Maradi region of Niger (see map). The PLS area covers approximately 85,000 km$^2$, which range from 350 to 1,200 masl. As one moves from the northern to the southern parts of this site, both average annual rainfall and the length of growing period increase – rainfall varies from 500 to1100 mm as one moves south, and the LGP ranges from 2.5 to six months. Temperatures range from a minimum around 20ºC during the cold dry season (December-February), to a maximum of 45ºC during the hot dry season (April-June). The area has a good network of paved roads (national and international roads). Nigeria's major railway line passes through this area, and there is an international airport in Kano as well as domestic airports in Sokoto and Maradi. Cross-border trade between Maradi Region and Katsina and Kano States is well developed.

The total population living in the site area is approximately 18 million, 60-80% of whom live below the poverty line (US$1 per person per day). Major sources of employment and income in the area include agriculture (animal and crop production), trading, artisan work, food processing, paid employment in textile industries and vegetable oil processing plants, and public services jobs (local, State and federal governments in Nigeria and local, regional and national levels in Niger Republic).

The area is predominantly flat grasslands, interspersed by *fadamas* (inland valleys). Smallholders rely primarily on rainfed mixed cropping systems (cereals and legumes). *Fadamas* are usually sown in rice and horticultural crops, but as the water recedes during the dry season they also provide vital dry season grazing for livestock. Major crops in the region include cereals (pearl millet, sorghum, maize, upland rice and wheat), legumes (groundnut, cowpea, soybean, Bambara groudnut, moringa), fiber (cotton), and roots and tubers (cassava, sweet potato, *Cyperus esculentus*). Livestock (cattle, sheep, goat and poultry) are found in the area, with high livestock density (> 50 units/km$^2$) found in most of the site**.** The following agricultural products are marketed: cowpea, groundnut, maize, sorghum, millet, *Cyperus esculentus* and vegetables, as well as cattle, goat, sheep and other livestock products, and many agro-industrial products. Sorghum and maize are used as adjunct by breweries in Nigeria for the manufacture of alcoholic and non-alcoholic beverages. Private seed companies (Premier and Alheri) are well established.

The target area is politically stable and represents a priority in the local, regional, national/federal development policies. Government interventions include the construction of rural infrastructure and the development of small scale irrigation in the *fadama* areas; improving marketing conditions for high value products; organizing farmers and pastoralists associations; and establishment of micro-credit systems commonly referred to as *Warrantage*. In terms of the environment for research, there are many important towns in the target area with a critical mass of basic research facilities, as well as major universities and numerous national, regional, international and NGO partners and already formed partnerships with farmers and pastoralists' associations.

**Sustainability challenges:** There is inherent low soil fertility due to low activity clay parent material and limited use of organic manure and inorganic fertilizers. The problem is worsened by shortened fallow periods and almost continuous monocropping. The major natural resource management issue in the cultivated areas is soil erosion, both water and wind. A lesser problem is flooding, which occurs along the *fadamas* when heavy rains fall within short periods. Overall, high population pressure on land with already low soil fertility and erratic rainfall, and the unrealised potential for cross-border trade for cash crops and livestock, call for and justify agricultural intensification on sandy soils and *fadamas*. Such intensification will create opportunities to improve and increase agro-industries and agribusiness in the target area.

## Problem Statement for the Kano-Katsina-Maradi PLS

The challenges for this area are to alleviate the problems of low crop and livestock productivity, degradation of natural resource base and weak market systems. Knowledge of locally successful technologies, and "bright spots" where there has been progress, will be used to catalyse and sustain the out scaling required for significant improvement in livelihoods. These challenges will be approached through intensification and diversification based on the development, promotion and adoption of productivity-enhancing crop and livestock systems as components of integrated natural resource management technologies, along with appropriate market linkages. These will need to address the tensions between cultivator and pastoral communities by making them, more synergistic in production and marketing. The interactions between these factors must be optimised to enhance food security, increase household income and conserve natural resources.

## Researchable hypotheses addressing specific problems, constraints and opportunities:

1. That integrated soil fertility and water management and the use of stress tolerant crop varieties will enable sustainable management of natural resources where land degradation, declining soil fertility, and low and erratic rainfall are the major constraints.

2. That opportunities are available to intensify subsistence oriented smallholder farming systems despite currently (i) little or no use of purchased inputs and low or non-adoption of productivity-enhancing technologies; (ii) need for better control of weeds, pests, and diseases of crops; and (iii) low livestock productivity due to low genetic potential, diseases, and lack of quality feeds.

3. That developing efficient markets where they are currently not functioning well (e.g., for inputs and outputs such as agro-industrial processing and byproducts and micro-credit), supported by improved market information systems, will provide incentives for improving quality, storage and bulking up, and will enhance opportunities for intra-regional trade in agricultural products and agro-industrial byproducts.

4. That empowering communities to be heard in policy debates and the development of enabling agricultural policies will *inter alia* promote cross border trade and public/private partnerships.

5. That strengthening institutional capacity for information management will improve market information and enable effective early warning systems.

Table 4.2 summarizes a number of additional features of how work might be carried out in this PLS, subject to further inquiry with stakeholders once Phase I activities are launched in the area.

## Table 4.2. Summary of intervention approach at Kano-Katsina-Maradi Pilot Learning Site

| Research Hypotheses | Outputs / Outcomes | Entry Points | Relevant Science & Tools | Potential Partners |
|---|---|---|---|---|
| 1. That **properly managed soils** will both require, and contribute to, improved interactions between soil, water and biodiversity. | Improved soil fertility practices that are sustainable and consistent with smallholder resources and land tenure. | • The application of IAR4D to address the causes of land degradation, declining soil fertility, and low and erratic rainfall in an approach that involves the beneficiaries in identifying the problems and contributing to the solution. | **Formal studies, surveys and models to:**<br>• Develop indices/indicators to assess extent of land degradation; test potential components of ISFWM using GIS tools and modeling;<br>• Take account of social, economic, environmental and institutional dimensions in assessing the potential for adoption of different combinations of technologies that have been developed independently in the PLS.<br>• Conduct feasibility studies, economic analyses using GIS tools; *ex ante* impact assessment to inform smallholders and pastoralists of the options.<br>• to assess trans-boundary market potential<br>• Surveys on current storage, packaging and processing technologies<br><br>**Participatory action-process research will be employed to:**<br>• to researching farmers' constraints and determine research priorities.<br>• to assess the roles of different actors on the production to consumption chain and engage them in joint learning to address the constraints. | **National Agricultural Research and Development Institutions**<br>Institute for Agricultural Research; National Animal Production Research Institute; National Agricultural Research and Extension Liaison Services; National Cereals Research Institute; Savannah Forest Research Institute; National Root Crop Research Institute; Lake Chad Research Institute; Nigerian Stored Products Research Institute; National Institute for Horticulture Research; Nigerian Institute for Fresh Water and Fisheries Institute; Institut National de la Recherche Agronomique du Niger; Faculté d'Agronomie de Niamey; Faculties of Agriculture in ABU, Zaria, Tafawa Balewa University, Bauchi, Bayero University, Kano<br><br>**Extension services**<br>Kano State Agricultural Research and Development Authority; Jigawa Agricultural Research and Authority; Bauchi State Agricultural Development Project; Katsina State Agricultural Research and Development Authority; Kaduna State Agricultural and Development Project; Agricultural and Rural Management Training Institute; Services |
| 2. That breaking farm level **constraints to use of organic and inorganic fertilizer** for maintenance of soil fertility and health will enable smallholders to invest in other high-return production strategies. | There will be optimal efficiency of use of organic and inorganic inputs, higher on-farm productivity and better labour use efficiency. | • Use of modeling tools, combined with participatory approaches, to develop new production system configurations and evaluate their resilience and profitability under different biophysical, social and economic conditions | | |
| 3. That developing and/or promoting the adoption of **productivity-enhancing and environment friendly crop and livestock technologies** are essential for sustainable increase in agricultural productivity, improved food security, and reduction in rural poverty. | Agricultural production systems that better integrate livestock owning households and house-holds with no livestock in rela-tion to the spatial distribution of nutrients across landscapes, so that nutrients are not away from households with no livestock.<br><br>Sustainably intensified mixed clop livestock systems catalyz-ing endogenously generated out scaling. | • IAR4D will ensure that the proposed innovations are appropriate to the beneficiaries circumstances but also build ownership of them to accelerate adoption.<br>• The holistic approach of IAR4D will integrated livestock requirements with cropping practices to maximize returns to farm family resources including labour, land and capital. This will involve addressing low quality feeds, diseases/ pest control, and the low genetic potential of livestock<br>• IPM approaches will be employed to address the high prevalence of weeds, pests and diseases of crops, including better systems for use of organic fertiliser | | |

| Research Hypotheses | Outputs / Outcomes | Entry Points | Relevant Science & Tools | Potential Partners |
|---|---|---|---|---|
| 4. That **improving input/output markets** and farmers' capacity to use purchased inputs will increase their ability and incentives to invest in integrated natural resource management practices and productivity-enhancing technologies. | Smallholders and pastoralists organized to take advantage of collective bargaining in obtaining inputs and collective arrangements for assembling, quality control, handling and processing of agricultural products to have better and more advantageous access to private enterprise services. | • The accessibility and affordability of purchased inputs and alternative supply arrangements will be assessed. This will include research on access to agro-industrial byproducts, micro-credit systems, labor, and market information, etc.<br>• Research will be required to improve output marketing by better matching farm production to market quality and safety requirements and improve processing and storage | • To strengthen the capacity for innovation within the prevailing economic, environmental and policy circumstances to improve livelihoods and build social capital.<br>• To empower communities to get their demands heard and influence local and national government priorities and policies.<br><br>**Modern techniques and methodologies will be employed in participatory technology development:**<br>• Identify and test existing IPM components, develop new IPM components<br>• Identify and test improved crop and livestock technologies, including (new) high-value alternatives<br><br>**Other tools include:**<br>• Policy analysis, dialogue and discussion fora<br>• Information tools: IT, cyber-informatics, GIS, spatial and temporal analysis.<br>• The products of conventional and biotechnology assisted approaches to crop improvement will be used appropriately when they are available. This is especially required in respect of tolerance for stresses such as drought and striga. | Départementaux de l'Agriculture, l'Elevage; l'Environnement et de l'Action Communautaire.<br><br>**Development Projects**<br>National Fadama Development Program; Community Base Agricultural and Rural Development Program; Bank of North; National Special Program for Food Security/South-South Cooperation; Projet de Promotion des Initiatives Paysannes phase 2; Projet de Promotion des Exportations Agro-pastorales; Agence Nigérienne pour la Promotion de l'Irrigation Privée; Projet Intrants/FAO<br><br>**CGIAR Centers and Advanced Research Institutes:**<br>AGRHYMET ICRISAT; IFDC; IITA; ILRI; WARDA<br>Actions in this PLS under the SSA CP will synchronize with and take full advantage of the products and outcomes of the GEF-funded Desert Margins Programme and the proposed Desert Margins Centre for maximum value addition and accelerated impact.<br><br>**Non Governmental Organizations:** SG2000; Karkara; Care International-Niger; World Vision-International; DAMINA |
| 5. That implementation of **enabling government agricultural policies** will encourage stakeholders (farmers, pastoralists, farmer and pastoralist organizations, and agri-business entrepreneurs) to innovate and invest in sustainable intensification. | Farmers and other actors in the market chain more prepared to take risks and invest in income and employment enhancing innovations. | • Policy analysis will be conducted to improve the formulation and implementation of enabling agricultural policy<br>• The needs and means of strengthening institutional capacity and information management will be addressed<br>• Community-based organizations involved in the research will be empowered to make their views known to policy makers. | | |

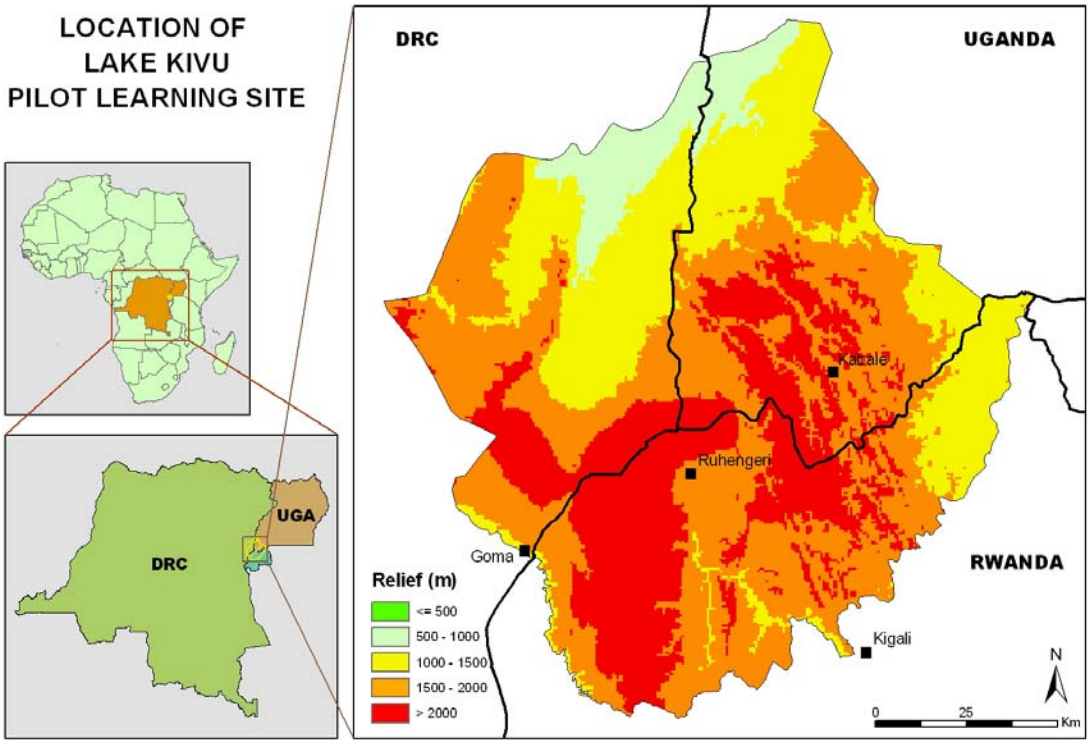
**Potential roles of the CGIAR Centres**

This PLS has a long history of engagement of CGIAR centres and their NARS partners. Those currently active in the site area include IITA, ICRISAT, ILRI and WARDA. IITA, ICRISAT and ILRI have had a long collaboration in the development of dual-purpose (food-feed) crops that have accelerated crop-livestock integration. ICRISAT has done important work on sorghums and soil fertility. WARDA is making increasing contributions through improving rice production in the *fadamas* (inland valleys), where the shorter season NERICAs not only promise higher yields, but also allow second crops (for example, vegetables). There is significant potential for positive interactions in the PLS between the products of the different centers and the NARIs and universities to make a much greater impact than has been achieved in the past.

The Kano PLS meets the site for the ICRISAT-led GEF-funded Desert Margins Programme at its Southern wetter boundary and the PLS spreads into Nigeria which is the major market for livestock and other arid land products. Thus the two programmes will have important value adding interactions.

**Potential partners in the PLS:** An extensive list of potential partners in this PLS is shown in Table 4.2. The long-term presence of the NARS (including major universities such as Ahmadu Bello, Bayero and Tafawa Balewa universities) and several CGIAR centres has produced a series of promising interventions. In spite of this, there is still widespread poverty and food insecurity. The Challenge Programme will capitalize on the past work but through IAR4D will bring all the stakeholders together to jointly address problems in an innovation systems approach, including addressing from the outset the requirements for rapid and widespread scaling out.

### 4.1.3 East Africa PLS: Lake Kivu (Democratic Republic of the Congo, Rwanda and Uganda)



## Description of the Area

The site chosen for the ASARECA subregion is named "Lake Kivu" after a major feature of the area. The Pilot Learning Site spans approximately 20,000 $km^2$ in the triangle where northern Rwanda, the eastern Democratic Republic of the Congo (DRC), and southwestern Uganda meet (see map above). The target area was chosen because it is a "hotspot" for the sub-region of East and Central Africa (ASARECA), along several dimensions:

1. **Concentration of population and poverty:** The site has an estimated total population of about 15 million (calculated using available GIS spatial data), with very high population density ranging from 400 persons/$km^2$ in the south to about 700 persons/$km^2$ in North Kivu. More than two-thirds of the population live below the poverty line and 70-90% of the population relies on smallholder agriculture, with average farm sizes of 0.5 hectares.

2. **Unique natural resource endowments:** Several globally important conservation areas are located within the PLS, including Mugahinga/Parc Nationale des Volcan (joining DRC, Rwanda, and Uganda) and the Bwindi Impenetrable Forest in Uganda. These areas have unique biodiversity – mountain gorillas, other wildlife habitat, flora in rainforest ecologies, and indigenous rainforest people. There is a pressing need for viable development strategies areas that border on such protected sites, which simultaneously improve livelihoods and minimize encroachment on park areas, potentially threatening biodiversity.

3. **The "emerging from conflict" syndrome:** All three countries in this PLS have been enmeshed in varying degrees of conflict in recent years, with Uganda currently stable, Rwanda in a process of recovery and reconstruction, and the DRC still facing disruption. The "emerging from conflict" syndrome is all too common in Africa and in this sub-region; thus, ASARECA feels it is well justified to work in these conditions to see how to get the recovery to be fast and far reaching, which is critical to preventing the recurrence of conflict. The differences between the three countries in terms of emergence from conflict and stable policy environments offer a very good comparative assessment of agricultural policy and institutional set-up – particularly where market-led agricultural growth and NRM is concerned.

This is a humid to semi-humid mountain zone with temperate-tropical conditions. However, by 2050 it is predicted that the target area will experience increases in LGP closer to the lake, as well as reduced LGP in small areas within Rwanda and Uganda. Seventy percent of the area is mountainous, with altitudes ranging from 1000 to more than 4000 masl (average about 1700masl). Annual rainfall is relatively high, ranging from 1500-2000 mm (South Kivu) to 1600-2200 mm (North Kivu) with somewhat less rain in Uganda – 1000mm-1500mm (Kabale). Most of the target area has a long LGP (of more than 9 months).

Soil erosion is a major problem in the cultivated areas and it is estimated a significant amount of top soil is lost each year and/or is moving downslope leaving shallow, depleted areas upslope. Flooding and poor drainage particularly in valley bottoms and on some hillside areas during the rainy season is another problem that leads to soil erosion, siltation and flooding. In Uganda, wetland ecosystems (for conservation) are threatened by land excision for agriculture. Many rivers are polluted from mining activities for gold, coltan and diamonds in DRC.

Farmers in the three countries keep livestock, grow tree crops, coffee, tea, pyrethrum, maize, bananas, potatoes, sorghum, beans, vegetable crops and some rice in valleys, and engage in agro-forestry. Livestock comprises about 40% of the agricultural activities in the area, with about 200-500 Tropical Livestock Units per $km^2$. TLU density is high in Rwanda and Uganda, but low in DRC. Tree-crops and agro-forestry include coffee, banana, tea, some fruits, etc. Production of coffee, tea, potatoes and vegetables and active trading between Rwanda (a sizeable importer of food) and the other neighbouring countries means that there is experience in interacting with markets.

Cross-border trade has a good potential, but some sporadic political conflicts are preventing the realisation of its full potential. Most goods are currently flowing into Rwanda and the DRC. Rwanda currently has a food deficit, and DRC and Uganda are food supplying. Given the high population

density, small farm size, and reasonably good climatic conditions, farmers are currently at the 'high end' of intensification. However, there is high poverty. What is needed are better returns to land and labour through further intensification and diversification and better access to markets. The conditions provide opportunities for farmers to diversify, specialize more in high value enterprises where there is demand, and thus exploit to the full local comparative advantage. High population pressure in the area calls for and justifies agricultural intensification and specialisation for the local markets for food and other products, and there is potential to supply larger more specialty markets (e.g., capital cities).

In addition, the area is part of the "water tower" for the Lake Victoria-Nile Basin, and therefore has potential for participating in the envisaged transfer of production from the highly water inefficient crop production in the drier areas of the basin to areas with low potential evapotranspiration in order to achieve "more crop per drop." With the emergence of peace in the area, the opportunities in local food markets will be enhanced by expanding mining and tourism. This non-farm income can be coupled to the potential for intensified management of run-off water allows for the production of nearly every product and can open opportunities to develop non-traditional agricultural and other NR products from forest products (including selling carbon credits), trees-on-farm as well as cultivated horticultural (including beans and potatoes) and herbal and medicinal crops. Better integration of livestock and milk processing (yoghurt, cheese) could fill local market demand and limit exports currently coming in from other countries.

There are islands of successful initiatives that can be scaled up, for example, many crop, tree crops and livestock, soil fertility, soil and water conservation, IPM technologies, community group and enterprise management methods, collective action for NRM and marketing initiatives, a carbon-sequestration experiment, and experimentation with information resource centres and new partnership modalities between IARCs, NARSs, and NGOs. A value added by IAR4D will be the synergies that are expected from linking up what are currently a number of promising but isolated activities.

## Problem statement and challenge for the Lake Kivu Site

The triangle formed at the junction of northern Rwanda, eastern DRC and southwestern Uganda is densely populated with people in extreme poverty on a rich natural resource base – volcanic soils, significant biodiversity, and ample water. This said, the resource base is highly vulnerable to erosion, water is not managed efficiently, and biodiversity is under threat. Although there are some good major roads, internal infrastructure is not well developed which, coupled with limited local and regional marketing systems and experience, limits the ability to commercialize. The region has been affected by precarious policy and institutional arrangements due to past or recent political crises and this also influences the ability for the populace to reach out and achieve development. There are significant numbers of R&D organizations working in the region and achieving islands of success on components of development through pilot projects, however these remain disconnected and scaling up and out is a major deficit.

The challenge therefore is to foster a harmonized cross-border approach that fosters sustainable exploitation of natural capital for production and marketing of high value and value added products to provide higher returns to land and labour for densely populated mountain smallholders enabling them to break away from poverty, recover from strife and support conservation of globally important biodiversity.

## Entry points

Rural enterprise development will be the main focus as a start up activity, where the whole innovation process will be explored in a pilot learning mode for each enterprise and associated market chain. The selection of a diversity of promising enterprises will also ensure that important lessons can be learned (e.g. different types of enterprises for different types of situations and target groups). Initial analyses of options would include formal market surveys, stakeholder consultation and looking for best bets for various socio-economic and biophysical conditions (niches), including buffer zone areas. Associated methods, information, technologies and organizational principles and techniques will be drawn as much as possible from R&D experiences that various partners (research, NGOs, private sector, etc) are involved in currently.

### Researchable hypotheses addressing specific problems, constraints and opportunities

1. That strong producer organizations have increased bargaining power and ability to collectively market produce and thus increase returns (income) to land and labour;
2. That investments to sustain and maintain the natural resource base are more sustainable when they are linked to market oriented production or when there are financial incentives for conserving natural resources and biodiversity;
3. That increased livelihood options linked to markets including joint management for buffer zone inhabitants will decrease pressure on conservation areas and biodiversity and increase returns to land and labour;
4. That investment in partnership arrangements that integrate R&D expertise and perspectives will achieve greater impact through scaling out islands of success;
5. That innovative information organization and sharing systems will enhance uptake of technologies and improve decision making;
6. That strengthened local governance through improved community facilitation improves ability to influence development policy and advocate for support to local marketing and NRM initiatives

Table 4.3 summarizes a number of additional features of how work might be carried out in this PLS, subject to further inquiry with stakeholders once Phase I activities are launched in the area. The table also includes an extensive list of likely partners who may conduct work in the site area.

### Potential Roles of CGIAR Centres

Several CG Centres are currently working in this PLS with a number of partners (NARIs, extension agencies, NGOs) on various aspects of NRM, commodity research and organizational issues that lend themselves to enterprise and market chain development. CG Centres are providing expertise and research on: policy, social, institutional, and methodology development and process research methods; trade-off analyses, GIS and modelling; and strategic work related to commodities (e.g. understanding factors leading to bean root rot, biotechnology on variety development with NARO). Several CG Centres have been involved in the African Highlands Initiative, including integrated work with the PRGA Systemwide Program. CG Centres are able to bring in techniques, methods, and germplasm from other parts of the developing world (especially Latin America and Asia), as well as from different regions within Africa. The African Highlands Initiative and CIAT are working on understanding and managing institutional arrangements (between research and development organizations) and institutional change (in NARIs and NGOs), and actively facilitate the institutionalisation of approaches and policies at national, regional international levels that support market-oriented productivity. ICRAF, CIAT and AHI are specifically looking into poverty and gender dimensions and ways to foster better inclusion. CIAT, ICRAF and CIP, along with FOODNET, are looking into development of various enterprises and associated processes of enterprise development. ILRI, CIAT and IFPRI have GIS capability, along with local partners, and are applying this to developing a better understanding of poverty dimensions, land management, and policy formulation,. Other CG centres (and associated ASARECA networks) that work collaboratively with NARS (NARO, INERA, ISAR, and universities) and can make contributions include: ILRI (A-AARNET) on poverty mapping, modelling, livestock technologies and enterprise development; IMWI (SWMNET) on water management, technologies and valuation issues; CIMMYT (MWIRNET) on maize; ICRISAT (ECARSAM) on sorghum and pulses; INIBAP (BARNESA) on bananas; IPGRI (EAPGREN) on plant genetic resources; CIAT (ECABREN) on beans; CIP (PRAPACE) on potato and sweet potato; and ICRAF (TOFNET) on trees on farm.

### 4.1.4 Southern Africa PLS: NE Zimbabwe, central Mozambique and southern Malawi

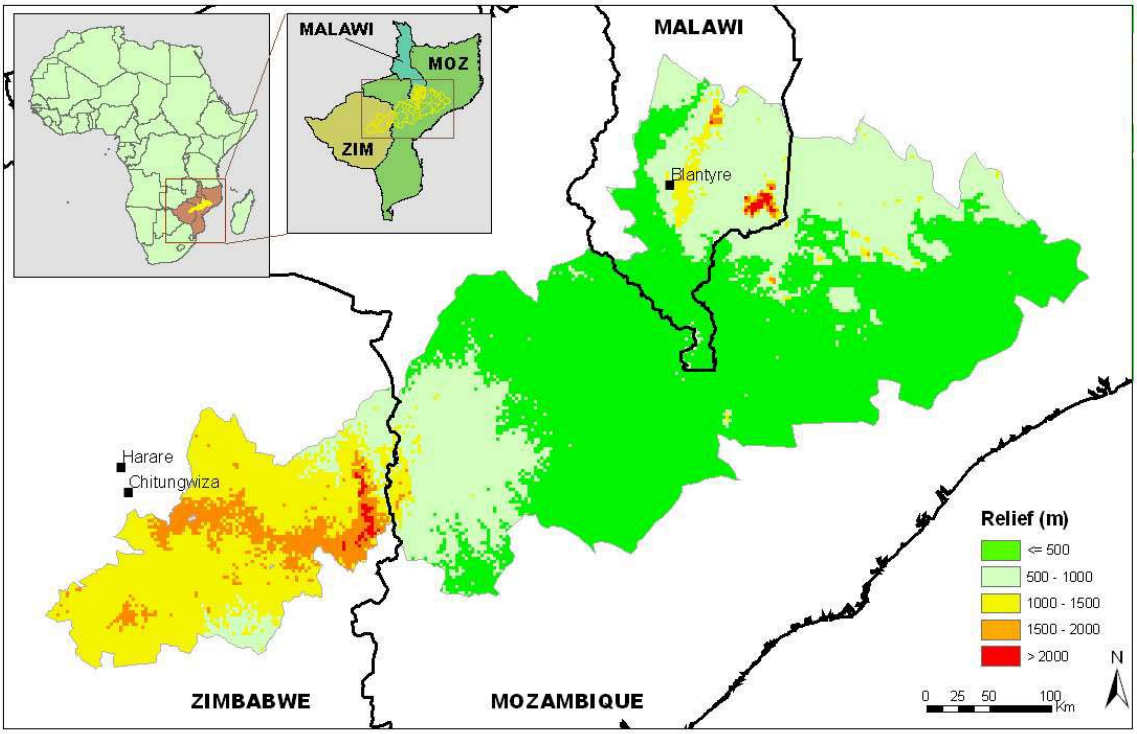
The Pilot Learning Site chosen for the SADC subregion consists of the transect or corridor from Southern Malawi through Mozambique to Mashonaland East Zimbabwe, Manicaland (Nyanga Rural) and Manica (Barwe) (see map). This site covers approximately 275,000 $km^2$ and has a total population of

## Table 4.3. Summary of intervention approach at Lake Kivu Pilot Learning Site

| Research Hypotheses | Outputs / Outcomes | Entry Points | Relevant Science & Tools | Potential Partners |
|---|---|---|---|---|
| 1. That strong producer organizations have increased bargaining power and ability to collectively market produce and thus increase returns (income) to land and labour. | • Methods for strengthening producer organizations, collective action, bargaining power (for NGO, service provider, development worker, producer group use)<br>• Evidence of strong producer groups that are collectively marketing (holding meetings, lobbying & negotiating, steady membership, good leadership with accountability to members, organized systems)<br>• Evidence of better returns to land and labour (income) due to collective marketing | The rural enterprise concept is an approach to enable smallholders to take advantage of commercial opportunities from which they are normally excluded because of their small volumes and lack of quality control and timeliness. A number of separate initiatives on different but de-linked components are already being carried out in the Pilot Site by a variety of organizations. However, the 'value added' of the SSA-CP and the IAR4D approach, will be to foster and learn how to amalgamate the existing research and development efforts to enable smallholders to get better farm-gate prices and enter new markets. NRM and policy interventions will be linked to enterprise and market chain development. The IAR4D approach will bring different stakeholders together to establish common visions, partnership modalities, and team work to improve management of broader innovation systems, (related to markets, NRM, or more holistic integrated, improved livelihood strategies for poor and other marginalized groups. There will be better | **Formal studies, surveys and models will be used to:**<br>• Conduct assessments / feasibility studies and associated methodologies to determine market demand<br>• Integrate (social, economic, environmental and institutional dimensions) and trade-off analyses to establish and demonstrate best bet combinations of known technologies (*varieties, breeds, husbandry practices, processing, packaging and transportation*) for various biophysical and social niches. This will include identifying and assessing the risks and benefits to producers and other players involved in the product chains and the impact at different scales, e.g., farm, landscape and national impacts to aid the formulation of enabling policies.<br>**Participatory action-process research will be employed to:**<br>• Improve ways that various actors involved along the market chain (farmers, farmer organizations, traders, private sector, policy makers) can analyze markets.<br>• Identify ways to build capacity to manage innovation and adaptation systems that blend technologies, practice and knowledge from research, local and other sources.<br>• To enable innovation within existing farm and common property rights related to the enterprises.<br>• Improve livelihood strategies currently being pursued by various | **DR Congo**<br>National Center for Research in Natural Sciences (CRSN), Lwiro; Mulungu Agricultural Research station (INERA); National Volcanology Observatory (OVG), Goma; Universite Catholique in Bukavu Diobass Plataform Kivu (umbrella NGO group) ECABREN (ASARECA Bean Network). CIAT, TSBF<br>**Rwanda**<br>ISAR (Rwanda Agricultural Research Institute); National University of Butare, University of Ruhengeri and the College of Agriculture in Gisenyi ATDT (Agricultural Technology Development and Transfer, USAID-supported project); PRAPACE, TOFNET, FOODNET and other ASARECA networks<br>Many NGOs (World Vision, CRS, and numerous local ones) that are moving from food and relief situation to development focus. Diana Fossey Gorilla Conservation International |
| 2. That investments to sustain and maintain the natural resource base are more sustainable when they are linked to market oriented production or when there are financial incentives for conserving natural resources and biodiversity. | • Participatory methods to evaluate and adapt NRM technologies that include local & science knowledge<br>• Trade-off models, policy research, and other multi-disciplinary methods that can be used by multiple stakeholders (policy makers, users, service providers, private sector) to improve NRM decisions and investment targeting<br>• Economic valuation of environmental services and degradation to inform decisions on enterprises and need for policy support<br>• Soil and water management technologies developed and adapted to circumstances<br>• New policies and support structures that support investment in carbon, water and other environmental services<br>• Methods and operational models for setting up water or C-payments<br>• Evidence that farmers are investing in NRM inputs & adopting NRM technologies related to commercialized NR and other enterprises | | | |
| 3. That increased livelihood options linked to markets including joint management for buffer zone inhabitants will decrease pressure on conservation areas and biodiversity and increase returns to land and labour. | • Methods for negotiating and implementing win-win 'joint' plans, finding alternative livelihood strategies, mechanisms<br>• Economic valuation of environmental services and degradation to inform decisions on enterprises and need for policy support<br>• Technologies available that aid in achieving optimal solutions for maximizing returns on a landscape & farm scale in buffer zone areas<br>• Evidence that strategies for conserving parks using joint park management are providing returns to locals<br>• Evidence that compatible livelihood strategies are providing returns to locals & relieving pressure on parks<br>• Better protection of environmental services provided by conservation areas. | | | |

| | | | | |
|---|---|---|---|---|
| 4. That investment in partnership arrangements that integrate R&D expertise and perspectives will achieve greater impact through scaling out islands of success. | • Methods for assessing & sustaining partnerships that integrate R&D interests & expertise<br>• Scaling up methods<br>• Technologies developed, adapted & available for NR / other enterprises<br>• Local successes will be emulated by neighboring communities leading to endogenously generated development<br>• Evidence that integration of social, biophysical, policy and economic components and know-how has made a difference<br>• Evidence of scaling up of prototypes into larger areas<br>• Evidence of scaling up of prototype results into more institutions (methods and technologies) | meshing of methods with technologies and policies. Based on stakeholder demands, the IAR4D teams will assemble appropriate scientific and technical expertise to work with different actors in the enterprise chains to address priority constraints on innovation. | social groups, particularly around conservation areas.<br>• Develop robust approaches to policy dialogue.<br><br>**Modern techniques and methodologies will be employed in participatory technology development to:**<br>• increase product diversity, quality, quantity<br>• increase added value and employment by local processing<br>• improve NRM and ensure that market-led intensification is sustainable<br><br>**Other tools include:**<br>• Participatory modelling and analysis to improve systems integration so as to assist farmers, community and stakeholder interest groups to assess trade-offs, economic returns to investments, and sustainability.<br>• Focus group discussions coupled to formal surveys<br>• Participatory monitoring and evaluation and feedback techniques used by stakeholders and jointly analyzed and reflections, adjustments and results capture<br>• Social and institutional analyses<br>• Information technologies and methods that improve accessibility and niche analysis, e.g. GIS-based spatial mapping of opportunities, constraints, potentials and appropriateness of existing technologies. | CIAT, ICRAF<br><br>**Uganda**<br>NARO; Mbarara University of Science and Technology, Kabala University, and Makerere University<br>AHI and partners (CARE, ICRAF, NARO, CIAT, Makerere, Africare, Africa 2000 Network, Kabale Farmers Assoc, CIP).<br><br>Numerous international and local NGOs, CBOs and projects in Kabale and Kisoro Districts. WWF, IUCN, WCS, Ecotrust, FAO and the ICCN support and/or conduct research on conservation of biodiversity, and natural resources with local partners.<br><br>Local government is a keen partner in all of the activities undertaken at district down to parish levels.<br><br>**CG Centers:** CIAT, CIMMYT, CIP, ICRAF, IFPRI |
| 5. That innovative information organization and sharing systems will enhance uptake of technologies and improve decision making. | • Methods for improving linkages of actors in market chain<br>• Methods to improve sharing of information for enterprise development and functioning: market information, technologies, associated NRM, traders & marketing organizations<br>• Trade-off models, policy research, and other multi-disciplinary methods that can be used by multiple stakeholders (policy makers, users, service providers, private sector) to improve enterprise decisions and investment targeting<br>• Evidence of better informed and targeted research enabling innovation by smallholders & conservationists<br>• Evidence of locally run information sharing systems | | | |
| 6. That strengthened local governance through improved community facilitation improves ability to influence development policy and advocate for support to local marketing and NRM initiatives. | • Methods that enhance local capacity to formulate and implement by-laws, negotiate, solve conflicts<br>• Trade-off analyses, GIS, models & other analytical tools that assist multi-stakeholders with divergent interests in analyses and decision making<br>• Technological solutions available that promote NRM & marketing initiative implementation<br>• Evidence that policy makers more inclined to dialogue & attend to or support demands of their rural constituents<br>• Evidence of new by-laws and structures / actions that are supporting implementation<br>• Producer and market interest groups have governance mechanisms / know-how to influence policy | | | |

**LOCATION OF THE ZIMBABWE/MALAWI/MOZAMBIQUE CORRIDOR PILOT LEARNING SITE**




about 11.5 million. It encompasses different gradients when moving northwards from Zimbabwe to southern Malawi, such as low to high population densities and an increase in average annual rainfall and length of growing period. The PLS is characterized by a trans-boundary effect in which the three countries share similar farming systems (classified as mixed maize systems), but with livestock decreasing in importance as one moves from south to north.

The corridor has good potential for agricultural intensification. Major legume commercialization initiatives are already underway in the three countries, driven by NUSFARM in Malawi, Mozambican Leaf Tobacco in Mozambique, and Reapers in Zimbabwe, with support from the respective National Agricultural Research and Extension programs, donor communities, IARCs and NGOs such as CRS, World Vision and CARE. Major cross border food crop trade played an important role in averting wide spread food insecurity in this region in 2002 and 2003. The SSA CP could capitalise on further high-potential opportunities in the PLS such as:

- introduction of improved varieties (meeting market trait demands at local, national,regional and international levels) of beans, groundnuts, pigeon pea and chickpeas throughout the PLS;
- introduction of improved varieties (higher yields, disease-resistant, enhance nutritional value) of cassava, bananas and sweet potatoes in more humid areas;
- improving inter-country controls of pests and diseases, harmonizing regional biosafety, food safety, quarantine and seed laws, and for strengthening rapid-response networks; and
- capacity-building in biotechnology, especially in fields of tissue culture, diagnostics and molecular markers.

### Problem statement and challenges for the Mozambique/Malawi/Zimbabwe Site

The corridor that runs between Mozambique, Southern Malawi and North Eastern Zimbabwe provides a unique opportunity to explore how public-private sector partnerships and cross border trade can be used to drive the sustainable intensification of crop and livestock production systems, and thus alleviate food insecurity, raise household incomes and encourage a reinvestment in the natural resource base. The challenge is to develop and promote production systems, public-private sector

partnerships and regional capacity that capitalize upon existing commercialization initiatives and the informal cross border food crop trade.

### Specific problems, constraints and opportunities

Current shortcomings in agricultural research policies and strategies include the lack of a market-oriented smallholder production approach in which research is market led, demand driven and follows the commodity chain approach. Another gap is the poor integration of research and extension, which would improve the transfer and adoption of technology. Policies and intervention strategies are needed to redress the high rate of natural resource degradation, especially related to soil, water and biodiversity. Issues of soil fertility improvement, soil and water management, development of irrigation, promotion of integrated livestock-wildlife-crop production systems, and development of drought mitigation strategies have not been given adequate attention. There is also a need to strengthen the capacities of community institutions and farmers' organizations to support agricultural production systems, and to back this up with information and communication for rural development.

Capacity building, in both the public and private sector research and extension institutions, is a vital requirement to ensure development and impact occurs in and outscales from the research sites. The subregional organization and research institutes (both NARES and IARCs) need to experiment with a wider range of partnerships in order to be more productive and achieve greater impact. Over the last two to three years different projects in the region have pursued partnerships with millers, brewers, traders, NGOs, seed companies, the animal feed industries and the fertilizer industry. These projects are now in a position to provide examples on how these partnerships work and what each partner should expect from the other, and begin to share these experiences more widely.

### Researchable hypotheses addressing specific problems, constraints and opportunities

- That identification of production constraints and opportunities for the communities within the PLS, including Training for Transformation with an emphasis on contracting within both input supply and output markets, will have a major impact on technology uptake, natural resource management and ensure benefits accrue to disadvantaged households.
- That modelling tools, combined with participatory approaches, will help develop new production system configurations, and evaluate their resilience and profitability under different biophysical, social and economic scenarios
- That involvement of producer organisations in the development of public-private sector partnerships will stimulate input-output supply markets, enabling policy environments for increased cross border trade and drive technology development, adaptation and subsequent adoption by smallholder farmers.
- That increased market access for smallholder farmers through development of rural retail traders will increase net incomes and provide incentives for investment in their ecosystem and reduce overall degradation of the natural resource base.

Table 4.4 summarises a number of additional features of how work might be carried out in this PLS, subject to further inquiry with stakeholders once Phase I activities are launched in the area. The table also includes an extensive list of likely partners who may conduct work in the site area.

### Potential Roles of CGIAR Centres

The CGIAR centres already active in the three countries include CIMMYT, ICRAF, ICRISAT, IITA, TSBF-CIAT, and participants in the Water and Food Challenge Program in the Limpopo Basin. Each centre is engaged in research and capacity building in their mandate areas, and there is evidence of increasing collaboration such as in the Rockefeller-funded Soil Fertility Consortium. Individually the centres are working on a number of issues, ranging from IARC core business of germplasm development and delivery for maize, sorghum, groundnuts, pigeon pea, cassava and sweet potato, to agronomic, natural resource management and marketing interventions with an emphasis on public-private sector linkages. Through IAR4D the collaboration will be enhanced by focusing on common focal problems to which they will contribute from their comparative advantages to achieve greater and more widespread impact.

## Table 4.4. Summary of intervention approach at NE Zimbabwe, South Malawi and Central Mozambique Corridor Pilot Learning Site

| Research Hypotheses | Outputs / Outcomes | Entry Points | Relevant Science & Tools | Potential Partners |
|---|---|---|---|---|
| 1. That **Training for Transformation** with an emphasis on contracting within both input supply and output markets, will have a major impact on technology uptake, natural resource management and ensure benefits accrue to disadvantaged households. | Adoption of new technologies will be encouraged by the income assurance provided by market contracts. | • Identification and selection of appropriate legumes that will grow across the pilot learning site;<br>• Identification and selection of appropriate root and tuber crops (cassava and sweet potato) that will enhance yields and improve food security across the pilot learning site;<br>• Development of market information systems at both local, national, regional and international levels relevant to the needs of different household resource categories;<br>• Identification of the feasible entry points for intensification amongst the poorest households;<br>• Identification of what kinds of special support enable disadvantaged households (female headed or HIV/AIDS affected) to participate in commercialization;<br>• Development and promotion of legume seed supply systems;<br>• Development and promotion of supply systems for improved cassava planting material;<br>• Bio-fortification of root and grain crops for improved nutrition;<br>• Development of legume production practices that overcome biophysical constraints such as soil fertility and complement existing farming systems, including intercropping;<br>• Development of legume production systems that meet the market traits demanded by local, regional and international markets. This includes further breeding as required and improved agronomic practices;<br>• Indentification of the institutional changes required to enable the information flows required for commercialization and intensification of production systems. | **Formal studies, surveys and models to:**<br>• Modelling tools, combined with participatory approaches, will be used to help design new production system configurations, and evaluate their resilience and profitability under different biophysical, social and economic scenarios;<br>• GIS tools will be used to analyze and define development domains<br>• Biophysical and economic models will be used to assess productivity and sustainability of proposed interventions under a range of external economic drivers<br><br>**Participatory action-process research will be employed to:**<br>• Participatory approaches to identify production constraints and opportunities for the communities along the transect, including Training for Transformation with an emphasis on contracting within both input supply and output markets.<br><br>**Other tools include:**<br>• Biotechnology to assist in the breeding of germplasm that meets both market trait demands and the biophysical constraints of the natural resource base. | **Zimbabwe:**<br>**Core institutions:** AREX; Reapers; Department of Livestock Production. **Other potential collaborators:** Universities; Dept Natural Resources/Natural Resources Board; Department of Veterinary Services; Research Council of Zimbabwe; Rural District Councils; Catchment Councils (ZINWA); Zimbabwe Farmers Union; ARDA; National AIDs Coordination Council; Tobacco Research Board; NGOs; Local Food Industry; ITDG; African Fertilizer; UNEP; UNDP; Kellogg Foundation:: Water and Food Challenge Program – Limpopo Basin; Desert Margins Project<br><br>**Mozambique:**<br>**Core institutions:** INIA; Mozambique Leaf Tobacco.<br>**Other potential collaborators:** Universities; Provincial Directorates of Agriculture; INERA; SIMA; PROAGRI; Development Centre Provincial/District Government Structures Environmental Action Coordination; NGOs; ARIs (Michigan State University, Cornell); Local Food Industry<br><br>**Malawi**<br>**Core institutions:** NUSFARM; DART.<br>**Other potential collaborators:** Universities; Provincial/District Government Structures; Local Food Industry; Malawi Leaf Tobacco. CARE; Concern Universal<br><br>**Institutions common in 3 countries**<br>SADC-FANR units: Secretariat, GIS and Remote Sensing Unit, Land and Water Management Project; WATERnet; Rockefeller Soil Fertility Consortium; World Vision; CGIAR Centers (CIAT, CIMMYT, ICRAF, ICRISAT, IITA, IWMI, IFPRI) |
| 2. That involvement of **Producer Organizations** in the development of public-private sector partnerships will stimulate input-output supply markets, and drive technology development, adaptation and subsequent adoption by smallholder farmers. | The private sector support service provided for tobacco producers will be extended to include a broader variety of crops grown by smallholders. | | | |
| 3. That **enabling policy environments for increased cross border** trade will generate increased incomes for smallholders | Increased cross border trade leading to advanta-geous specialization leading to increased and more secure smallholder incomes. | | | |
| 4. That Increased **market access for smallholder farmers** through development of rural retail traders will increase net incomes and provide incentives for investment in improved natural resource management. | Increased incomes and improved livelihoods resulting from better natural resource management and maintenance of ecosystem services. | | | |

ICRISAT continues to develop appropriate groundnut and pigeon pea varieties and is developing a number of public-private sector partnerships that will lead to the increased commercialization of these crops within the PLS. At the same time ICRISAT has been working closely with CIMMYT to help SADC-FANR develop protocols for the regional release of improved germplasm, with IITA and CIAT making increasing contributions with respect to cassava, sweet potato, cowpea and beans. Complementing the efforts of the respective crop improvement programs in the region the natural resource management and economics teams have been exploring the constraints around soil fertility management and the marketing approaches agro-chemical companies have for the smallholder farmers in the region.

### 4.1.5. Programmatic complementarities between PLSs in different subregions

The three sites have the common attributes of poverty, high human pressure on natural resources, and reasonable access to markets. They are all vulnerable to aggravating soil nutrient deficiencies and loss of biodiversity. These problems are equally urgent and compelling in all three sites but they offer widely differing development pathways to be found through the application of IAR4D. The following contrasts are provided to illustrate the kind of advantages that will be derived by the teams at the three sites working in complementary IAR4D modes and sharing approaches and results with each other.

The **Kano-Katsina-Maradi** Pilot Learning Site will provide lessons on how the factors behind the success of bright-spots (where there has been considerable development and the existence of promising technologies) can become the drivers of scaling out. The research on the interactions between intensification and sustainability will be particularly informative as technologies such as improved cowpeas, that are beginning to take off, find their place amongst other innovations in the farming systems. Bright spots are also emerging in the other PLSs, and their out scaling will benefit from lessons learned in the Kano PLS. With the present markets that have limited integration and adverse input-output price ratios in the **Lake Kivu** PLS there is little incentive for the smallholders to adopt innovations. This creates an urgent need to determine ways of promoting collective marketing of both traditional and speciality as well as "value-added" commodities by smallholders and matching that with appropriate quality standards and bulking up to meet the requirements of the buyers. The results of this research on the interactions between markets and intensification in the Lake Kivu PLS will provide useful information to the other two sites when they seek to promote high value and niche crops to raise the incomes of smallholders. The three sites are at different stages of development and in different socio-economic settings and will require different public-private partnerships in marketing and extensions but many of the key requirements for successful delivery to smallholders will be similar. IAR4D in the **Zimbabwe-Mozambique-Malawi** corridor will provide early lessons on ways and means of involving the private sector because it can take advantage of the private extension services provided to tobacco growers. This will inform research at the other PLS as they have more marketable surpluses and require buyers and input suppliers with extension capacities.

All three sites have cross border marketing trade that could be expanded if the policy environment was more conducive. However, they represent very different historical, economic and agricultural circumstances that will require different policy responses to create efficient markets with low transaction costs, which indicates useful contrasts in analysing which policies work and why. According to projections of human populations to 2030 they also have very different rates of change – over 30 years, a more than doubling for Kano (2.4% per year), 90% increase for Kivu (2.2 % per year), but only 44% for ZMM (1.2 % per year) – which will influence the possible development pathways.

These are only indicative examples of how progress at each site will benefit the others. The importance of the different interactions will change but the comparative analysis of research approaches and outcomes will ensure that pitfalls and duplications are avoided and that, with experience, more rapid progress will be made.

## 4.2 Module 1: Validating IAR4D at three initial Pilot Learning Sites

The term "Pilot Learning," used to refer to both sites and site teams, describes a basic feature of the innovation systems approach of IAR4D and how it will be executed. The initial PLSs and PLTs will be intentionally selected to test and apply IAR4D principles and methods, paving the way for wide-scale

application of the IAR4D approach. The "pilot learning" approach embodies the concept of "all partners jointly learning by doing," with the aim of generating both substantive outcomes and methodological innovations. These will be synthesised and mainstreamed on a continent-wide scale during later phases.

Pilot Learning Teams will at a minimum include at least one NARI from each site country, two CGIAR Centres, and other stakeholders capable of adding value in terms of addressing identified constraints. A key early activity will consist of facilitated processes of consultation and team building to ensure that all necessary stakeholders are represented on the team and contribute effectively to the collective learning process. Team building will include engaging with farmers and other land-users to foster ownership of the IAR4D process among all stakeholders, and particularly among end-users.

Research at the Pilot Learning Sites will thus have the following characteristics:

- Scientific programmes will be designed around focal problems and opportunities that provide entry points for removing specific high level constraints to SSA CP goals and objectives, through the participatory implementation and application of IAR4D. They must address the needs of disadvantaged constituency groups, particularly women and HIV/AIDS-affected households.
- The research will be demand-driven and executed by multidisciplinary Pilot Learning Teams drawn from a range of institutions and organisations representing the full range of stakeholders supported by facilitation and mentoring.
- The teams (and the institutions and organisations from which they are drawn) will have demonstrated commitment to building capacity, and to adapting in membership and approach as the dimensions of the constraints are defined and confronted.
- They will not only tackle the immediate problem defined as the entry point, but also explore, the wider dimensions of the constraints in an integrated manner, which will lead to knowledge of broader systemic and geographical significance.

### 4.2.1 Research activities

Planning of each Pilot Learning Team's site-specific research agenda will be done with the participation of the full team and stakeholders. Entry points will be refined and the interactions with other components of the resource-to-policy continuum will be analysed. It will be particularly important to formulate research that integrates all four SSA CP objectives. For example, if market failure is identified as the focal problem (see Section 2.3), the research must take account of the way markets encourage or impede system intensification (Section 2.1), and the positive and perverse incentives for natural resource management (Section 2.2), and how the functioning of the markets are enabled or constrained by prevailing policies (Section 2.4). The balance between these components will vary according to conditions at the particular site, including the availability of "best bet" technology options, institutional capacity, the policy environment, etc.

Volume 2 of the proposal comprises a rich and valuable source of scientific information and concepts that will assist and facilitate the process of defining the research programmes. Specific research locations at various scales will be selected within the Pilot Learning Sites and biological and socio-economic characterisation will be conducted where necessary. Wherever advantageous, these locations should be built on sites of ongoing or previous work to capitalise on existing data. Additional biological or socio-economic diagnostic studies will be carried out where necessary. A synergy between the research and development actors and the farmers and community groups may be achieved through using participatory action research, Farmer Field Schools and other similar actions.

Short-, medium- and long-term impacts will be achieved through the selection of projects that will complement and build on successful past and ongoing research, so that the benefits of IAR4D may be more readily demonstrated. Outcomes will be rapidly transferred between teams through the facilitation and mentoring service, and a coherent set of research outputs and associated outcomes will be available for out-scaling and up-scaling.

As an outcome of the Inception Phase, Pilot Learning Team proposals for full IAR4D will include:

- a well articulated statement of the focal problem or opportunity, how it will serve as an entry point requiring international research worthy of a CGIAR Challenge Programme;
- the major hypotheses and the science by which they will be tested;
- the outcomes and *ex ante* impact assessments on livelihoods expected of the research;
- the goals, objectives, activities and outputs and milestones and indicators of progress;
- logical frameworks and research work plans with time lines;
- full details of proposed research activities, including methods to be utilised;
- plans for capacity building and organisational change;
- information on partner organisations, indicating their capabilities and likely contributions to the full spectrum of project activities (including expertise in the biological and social science disciplines needed for IAR4D);
- a detailed and justified budget, together with information describing the capacity of the lead institution to assume financial and operational accountability; and
- a plan for progress reports, outcome mapping and impact assessment to be submitted to the SROs and the Programme Coordinator for forwarding to the CGIAR Science Council for evaluating progress and determining initiation of the other SSA CP modules.

### 4.2.2 Review of progress at the initial Pilot Learning Sites

Research at the three initial Pilot Learning Sites will take a minimum of five years to generate significant measurable benefits for large numbers of farm households. However, based on experiences with INRM and the African Highlands Initiative, it is expected that there will be tangible outcomes within one to two years that will provide a basis for the CGIAR Science Council to assess progress and the potential of IAR4D. Data sources will include:

- the work programmes for IAR4D produced by the initial Pilot Learning Teams;
- detailed descriptions of the project sites, specific research locations within PLSs, and the focal problems being addressed;
- detailed descriptions of the Pilot Learning Teams and the roles and responsibilities of partners. This will include identification of the lead organisations, their legal status and capacity for fiduciary, reporting and management responsibilities, and the Memoranda of Agreement between partner organisations;
- evidence of the technical capabilities of the team members to carry out their assigned roles;
- evidence of consultation among partners and the involvement of all stakeholders in planning and decision-making processes;
- reports on research results and outcomes;
- reports on capacity building and organisational change actions; and
- reports on actions carried out to ensure effective communications and information exchange among the research partners.

These reports will enable the CGIAR Science Council to assess the specific constraints being addressed, the site-specific scientific research being conducted at the Pilot Learning Sites, the partnerships working at those sites, and the role of the CGIAR Centres, in order to determine whether or not sufficient progress has been made to justify support for Module 2.

## 4.3. Module 2: Internalising and integrating IAR4D in NARSs agendas through expansion of IAR4D sites and activities

On the basis of the success already achieved with INRM and the strong interest and commitment expressed by stakeholders in the SSA CP development process, a second module has been designed as described below, to facilitate rapid programme expansion as soon as there is a "go ahead" from the CGIAR Science Council. This will be facilitated by actions in the programme preparatory phase by which each SRO has already identified six or more candidate sites, from which three were identified as possible sites for the Module 1.

Module 2 provides for a further six IAR4D sites, for a total of nine sites (three per subregion), offering considerably greater opportunity to conduct IAR4D under contrasting circumstances. This is considered the minimum number of sites for effective dissemination and internalisation of the IAR4D paradigm across the subregions. With this many sites, African scientists and other stakeholders will be able to observe the IAR4D approach in action – if not in their own countries, at least in neighbouring countries. Adding more sites will also serve to soften the risk of individual project failures, creating a fail-safe and "safe-fail" context whereby individual team "hiccoughs" can serve as learning material without jeopardising confidence in the Programme or IAR4D.

Having said this, it must be stressed that the actual number of IAR4D teams that will eventually be funded will depend entirely on what the NARSs, SROs and investors deem appropriate, which may be less (or more) than the six proposed here. Module 2 will be implemented as a series of IAR4D projects funded on a competitive basis and managed at the subregional level. The projects will all have specific research and development goals, based on the components outlined in Chapters 2 and 3.

The suite of Module 2 Pilot Learning Sites will be carefully selected to provide effective, contrasting demonstrations of the impact of IAR4D, optimising the opportunities for learning from comparisons between divergent environmental, economic and policy environments across sub-Saharan Africa. They will be structured to explore the full potential of IAR4D to improve livelihoods under different circumstances, with a view to catalysing mainstreaming of IAR4D by NARS in sub-Saharan Africa. Teams proposing to work across Anglophone, Francophone and Lusophone borders will be encouraged, with a view to benefiting from the contrasting experiences and approaches. The IAR4D Teams will be required to define the proposed sites in agro-ecological and socio-economic terms along with the nature of the entry points. In some cases, the sites and teams may be built on existing benchmark areas and collaborative projects and programmes, such as those listed in Section 4.1.2 to 4.1.4.

In selecting sites, the concept of integration will be an important determinant, including management of water, land, and genetic resources of all types in the broader context of natural resource management, which includes the interactions of markets, policies and production systems from a gender-disaggregated livelihood (farmer) perspective. As with the Module 1 PLSs, the possibility may be explored of linking into "bright spots" (Anderson 2003) – locations where communities are already succeeding with sustainable development approaches – to enable learning about what factors underpin success and how these could be replicated elsewhere. This would provide opportunities for swift and demonstrable impacts.

These factors will be amongst the criteria that will be incorporated into a carefully developed strategy for site selection and the subsequent participatory identification of entry points as followed by the SRO Task Forces in selection of the three initial sites. It will be critical in the first phase to capture the main types of agricultural development problems within a region as a means of identifying appropriate entry points and defining early steps in the development process. As in the case of Module 1 PLTs, a stepwise project development process will be followed starting with expression of interest, followed by forming teams to develop concept notes for initiating IAR4D, and ultimately full IAR4D proposals. This process will allow the SROs and the Programme Coordinator to interact with the teams early in the project development process, to advise them on site definition and team composition. More information on the funding and implementation of the research is provided in Section 5.2, which describes the Competitive Grants Scheme for funding IAR4D teams.

## 4.4. Links with other programmes and projects

One of the many advantages of the CGIAR Sub-Saharan Africa Challenge Programme is that it will work closely with a broad range of target community beneficiaries and bring the best local and regional skills and organisations together to undertake agricultural research for development. However, to take full advantage of contrasting circumstances and approaches to identify best practices, care will have to be taken to avoid duplication and identify synergies with ongoing bilateral, regional and global projects that have similar objectives. This applies especially to the other CGIAR Challenge Programmes, System-wide Programmes (SWPs) and Ecoregional Programmes (ERPs). The most relevant CGIAR programmes with which the SSA CP will interact are listed in Table 4.5. Alliances will be sought for

**Table 4.5. Programs and projects with which the SSA CP will collaborate**

| Level | Program/project name [(co)-convening CGIAR centre(s) in brackets] | Acronym |
|---|---|---|
| CP | Water and Food [IWMI-CIAT-IFPRI-IRRI-ICLARM] | |
| CP | Biofortification [CIAT-IFPRI] | |
| CP | Unlocking genetic diversity in crops for the resource poor [CIMMYT-IRRI-IPGRI] | |
| ERP | African Highland Initiative [ICRAF] | AHI |
| ERP | Desert Margins [ICRISAT] | DMP |
| ERP | Humid and Sub-Humid Tropics of Sub-Saharan Africa* [IITA] | EPHTA |
| ERP | Inland Valley Consortium [WARDA] | IVC |
| SWP | Alternative to Slash-and-Burn [ICRAF] | ASB |
| SWP | Genetic Resources [IPGRI] | SGRP |
| SWP | HIV-AIDS [WARDA] | SWIHA |
| SWP | Integrated Pest Management [IITA] | SP-IPM |
| SWP | Livestock [ILRI] | SLP |
| SWP | Malaria in Agriculture [IWMI] | SIMA |

* Ended recently but its benchmark sites are still ongoing and worth including in the SSA CP

sharing resources and crafting complementary agendas with these programs, possibly through joint calls for project proposals. In this way, the SSA CP will attain substantial win-win synergies. For example, the Challenge Programme on Biofortification could provide new germplasm for better African health and nutrition. The Challenge Programme on Unlocking Genetic Diversity in Crops for the Resource Poor could provide innovative tools and germplasm with improved stress tolerance (e.g., to drought). The Challenge Programme on Water and Food could provide technology or knowledge relevant to water management issues.

Another important partnership will be with Global Environment Fund (GEF) projects, activities related to international initiatives such as the United Nations Convention to Combat Desertification (UNCCD) such as the Deserts Margin Programme and the Convention on Biological Diversity (CBD), and other undertakings, such as the African Agricultural Technology Foundation (AATF), which aims to facilitate public-private partnerships to provide access to (bio-) technology that could help African farmers.

## 4.5. Indicative schedule of events

The following is an indicative schedule for implementing the SSA CP.

### Years 1–2

- Establishment of Programme Steering Committee (PSC);
- Appointment of the Programme Coordinator;
- Call for Expressions of Interest in participating in initial IAR4D teams;
- Initiation of the first module with selection by SROs and Programme Steering Committee of the Nuclear Pilot Learning Teams that form after the Expressions of Interest have identified potential collaborators;
- Facilitation and Mentoring teams appointed;
- Invitations to selected teams to prepare Concept Notes for Inception Stage Activities;
- Approval of Concept Notes by SROs and PSC on basis of independent review;
- Inception Stage Activities carried out by the three Pilot Learning Teams;
- Submission of reports and full proposals to the relevant SRO and PSC by Pilot Learning Teams at end of Inception Stage;
- Review and endorsement of reports and proposals by the SROs and Programme Steering Committee and submission to CGIAR Science Council;

- Review of reports and proposals by the Science Council.

## Years 2–6

The timing of the move into full IAR4D implementation for Module 1 Pilot Learning Teams and the initiation of Module 2 will depend on gaining the approval of the Science Council. However, growing interest in IAR4D in Africa, the outcome of the Final Preparatory Phase with the identification by the SROs of additional sites, and the progress with the SRO competitive grants schemes that will process the Challenge Programme grants, all indicate the potential for a quick take off.

# CHAPTER 5. PROGRAMME MANAGEMENT

*This chapter describes the proposed approach to Programme governance and management, competitive grants administration, and the budget and financing mechanisms that will support the SSA CP. The chapter concludes with a section describing calculations of the economic return on investments in the Challenge Programme.*

## 5.1. Programme governance and management

Successful implementation of the SSA CP will depend on effective and efficient governance. To ensure that benefits flow to Africa's smallholder farmers and pastoralists, the Programme must be able to guarantee quality research through the practice of good science, and the security of donor and partner investments through sound financial accountability.

The governance structures described in this chapter are based on discussions with stakeholders representing all potential participants. These include those who attended the Programme Formulation Workshop held in Accra in March 2003 and the FARA Plenary in Dakar in May 2003. Governance structures also draw on the CGIAR Guidelines for Challenge Programmes, lessons learned from active Challenge Programmes (i.e., Crop Biofortification, and Water and Food), comments on the SSA CP pre-proposal by the interim Science Council, and communications between FARA and the CGIAR Secretariat. Throughout the process there has been continuing discussions with the SROs on the governance structure at meetings such as the meeting on SSA CP final preparatory steps held at FARA Accra on 20 February 2004 and presentations by FARA at the ASARECA Committee of Directors meetings on 23 February and 28 May 2004.

Programme governance must be able to adjust so as to not represent an unreasonable overhead in the initial stages before the investment has built up, and yet be capable of facilitating the participation of many different stakeholders and supporting difficult institutional changes. As indicated in Section 4.2, the SSA CP will start with only one Pilot Learning Team per subregion of sub-Saharan Africa. Governance and management structures will therefore be limited at first to a minimal Programme Steering Committee and a Programme Coordinator with only basic staff support. The SROs will be resourced and relied upon to oversee and support the Pilot Learning Team in their respective subregions, with the Programme Coordinator responsible for the facilitation and mentoring service and providing cross-team linkages for sharing experiences through methodology analysis and dissemination and information and knowledge management. The Programme Coordination Unit will also provide a secretariat for the reviews by the Programme Steering Committee, SROs and the CGIAR Science Council.

If and when the CGIAR Executive Committee signals approval for the full SSA CP, the Programme Coordination Unit will require strengthening and occasional additional scientific capacity to assist the Steering Committee in assessing proposals and progress reports.

This flexible Programme governance and management structure will be capable of ensuring rigorous quality control and accountability. Despite the magnitude of governance tasks to be accomplished – i.e., introducing, validating and disseminating a new paradigm for agricultural research, and overseeing impact assessment – governance is budgeted at all stages to be below 9% of total annual Programme costs. This proportion decreases with increasing numbers of PLSs.

### 5.1.1. Stakeholders

Participation in the SSA CP will be open to all stakeholders in agricultural research for development in sub-Saharan Africa. Consistent with its mandate as the apex body for agricultural research in Africa, FARA will be responsible to them for the conduct of the SSA CP. This will ensure the involvement of the broad spectrum of institutions that comprise FARA, including in alphabetic order:

- advanced research institutions from the North and South;
- CGIAR centres;

- community-based organisations;
- farmer organisations;
- national agricultural research institutions;
- non-governmental organisations;
- private enterprise;
- subregional research organisations; and
- other players in the production-to-consumption chain.

### 5.1.2. Programme Steering Committee

#### Terms of Reference

One of the first tasks of the SSA CP Steering Committee will be to develop its own terms of reference for approval by the FARA Executive Committee, in consultation with the CGIAR and other principal investors. The terms of reference will *inter alia* clearly delineate the SSA CP Steering Committee's roles and responsibilities and will set out the channels for fulfilling its reporting obligations to the FARA Executive Committee. It is expected, however, that the terms of reference will include the following:

- make policies related to the SSA CP;
- determine programme objectives and priorities (including scientific priorities);
- assist, as required, SROs to conduct independent reviews of concept notes and proposal;
- ensure adherence to quality standards in programme activities and assess performance;
- jointly with the SROs develop and issue requests for concept notes and proposals;
- oversee the recruitment of the Programme Coordinator;
- advise on allocation of financial resources for approved proposals and other programme activities;
- maintain links with SROs, NARSs, CGIAR, Challenge and other major Programmes, and constituents and stakeholders generally;
- ensure compliance with agreements made with the investors;
- mediate conflicts; and
- ensure outreach to and communication with stakeholders.

The Programme Steering Committee will ensure that the SSA CP uses the best science and methods in a coherent manner at the Pilot Learning Sites and that there is consistency with value addition throughout the Programme together with the SROs, it will develop guidelines and conditions for the proposals and the criteria by which successful proposals will be selected, and it will confirm submissions based on the recommendations of the SROs. Resources will be provided for the Steering Committee to engage expertise on a consultancy basis to help SROs review grant proposals and the accomplishments of grantees.

The Programme Steering Committee will be ultimately responsible to the FARA Executive Committee for governance of the Programme, based on clearly defined roles and obligations.

#### Programme Steering Committee membership

The SSA CP Programme Steering Committee will be comprised of representatives of the principal stakeholders. In addition to providing professional service to the Committee, the members will also be expected to provide a two-way link between their own constituencies and the SSA CP. There will be not more than 12 independent members including:

- FARA 1 member
- ASARECA 1 member
- CORAF/WECARD 1 member
- SADC/FANR 1 member
- NEPAD 1 member
- CGIAR Centres 2 members
- Advanced research institutes 1 member
- Farmer organisations 1 member
- Community-based organisations 1 member
- NGOs 1 member
- Private enterprise 1 member

The FARA member will chair the Committee, and the FARA Executive Secretary and the Programme Coordinator will be ex-officio members. Members will serve for two years, with an exception in the initial phase for some to serve three years to enable staggered terms. If there is not an appropriate gender balance on the Committee, the membership from farmer and community based organisations may each be increased by one.

### 5.1.3. Responsibilities and functions of the SRO Secretariats

The Pilot Learning Teams will be selected, approved and report to the Committee of Directors of the corresponding SRO. In compliance with the principal of subsidiarity, in which decisions will be made at the lowest practical level, the SROs will oversee those components of the SSA CP that are most appropriately dealt with at the subregional level. These will primarily relate to the implementation of activities at the Pilot Learning Sites. Each SRO will devise its own way of providing support and decision making in accordance with its own structures.

Programme-wide functions that will be coordinated by the Programme Coordination Unit will require negotiations and agreement with the SROs as to how they will operate in the subregions. The terms of reference and the modes of operation will be in accordance with those applied to analogous activities carried out under the auspices of the SROs.

### 5.1.4. The Programme's relationship to FARA and other FARA responsibilities

FARA will have overall responsibility for the conduct of the programme and for accounting to the investors. FARA was incorporated as a UK company limited with guarantee and has been formally recognised and legally established in Ghana with a status analogous to an agency of the United Nations.[36] FARA and NEPAD have signed an agreement making FARA the technical arm for the research component of NEPAD's Comprehensive African Agricultural Development Programme (CAADP). FARA has established administrative, communications and accounting capacity at its headquarters in Accra. It has gone through its first Audit for the year ended 31 December 2003. FARA has an agreement with ILRI whereby ILRI receives and manages funds for FARA through a special account. This arrangement could be maintained for the SSA CP.

Recognising that the Sub-Saharan Africa Challenge Programme will be only one of FARA's responsibilities, the Programme will be structured to ensure that the SSA CP is clearly separated from other FARA functions and activities (see Figure 5.1 for a schematic presentation of the FARA-SSA CP relationship). The separation will be structured to assure investors that funds provided for the SSA CP will be used strictly for the intended purposes, with distinct, transparent and traceable records and accounts.

The FARA Executive Secretary, acting on behalf of the FARA Executive Committee, will oversee the promotion and facilitation of the Challenge Programme, building on FARA's role in advocacy, promoting partnerships, and facilitating exchange of information and training. FARA will also provide programme-wide back-up for resource mobilisation, as has done in developing the SSA CP proposal.

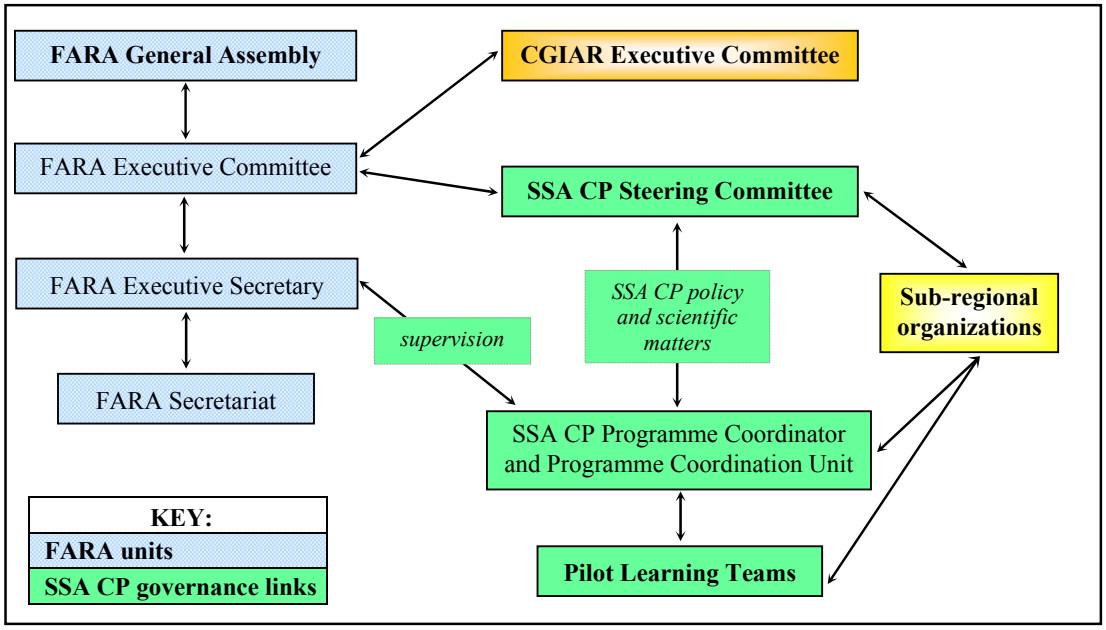
### 5.1.5. Programme Coordination Unit

Reporting to the FARA Executive Secretary will be the SSA CP Programme Coordinator, who will manage the Programme Coordinating Unit. The Programme Coordinator will be an African with an outstanding record of achievement in research management. S/he will report to the Programme Steering Committee on Programme policy and technical matters; for day-to-day administration, the s/he will function as a senior FARA staff member.[37]

[36] For more information about FARA's purpose and structure, see the website at www.fara-africa.org/.

[37] More details of the terms of reference for the SSA CP Programme Coordinator are provided in Annex A-6.

**Figure 5.1. The SSA CP in relation to other FARA activities**




The Programme Coordinator will be responsible *inter alia* for:

- managing the Programme Coordination Unit;
- reporting and accounting to the Programme Steering Committee;
- reporting to the SROs;
- administrative reporting and accounting to FARA's Executive Secretary;
- complying with FARA's and investors' financial and performance audit requirements;
- reporting and accounting to investors through the Programme Steering Committee; and
- coordinating Programme wide activities and support to the Pilot Learning Teams.

The Programme Coordination Unit will have a small permanent staff that will enable it to function efficiently at any level of funding without becoming an excessive burden. At a minimum, the Programme Coordinator will have enough administrative, financial management, accounting, secretarial and logistical support staff for her/him to accept responsibility for the day-to-day coordination of the programme.

### 5.1.6. Management of the Pilot Learning Teams

Each Pilot Learning Team will have its own leadership and management structures to make decisions about operations at the Pilot Learning Sites. The day-to-day leadership of the Pilot Learning Teams will be determined by the members of the Teams themselves. In each case, there will be a Lead Agency, which will be legally responsible for managing and accounting for funds, for overseeing progress of activities at the site, and for reporting progress and outcomes to the relevant SRO and the Programme Steering committee. The Lead Agency will accept responsibility for compliance with the conditions of its contract with the relevant SRO including accounting for and reporting to the SRO and FARA for the use of funds provided by the Programme. Thus, the lead institution will need to show its capacity for due diligence in all financial and other operational aspects of project management. Lead Agencies will be properly constituted, fully legal institutions that maintain accounts to internationally accepted standards, such as, but not necessarily, CGIAR centres.

## 5.2. The Competitive Grants System

The selection and funding of the three initial Pilot Learning Teams will be decided by the Programme Steering Committee on the basis of recommendations from the SROs, utilising the SROs' existing mechanisms for selecting proposals and determining funding. However, the SRO selection process will generally adhere to the sequence of steps described below for the competitive grants scheme proposed for Module 2 (the expanded Programme).

The SSA CP's grants will be implemented through the established SRO competitive grants schemes with specific conditions to ensure a level playing field, with provision for new entrants, and to make merit the overriding criterion for all prospective participants in the Pilot Learning Teams. Participation in the SSA CP, and therefore eligibility to apply for grants, will be open to all FARA members, i.e. all stakeholders in agricultural research for Africa's development, public and private. All teams must include at least one member institution of the national agricultural research system in each country where Pilot Learning Sites are located, and two CGIAR Centres operating in the region. Any of these institutions could serve as the lead implementing agency of a Pilot Learning Team.

Competitive grants for Pilot Learning Teams will be implemented by a process that goes from Expressions of Interest, through Concept Notes to Full Proposals. The Programme Steering Committee will give full guidelines for all stages. Approval and disbursement of grants for any stage will not constitute a commitment to any subsequent stage. Each stage will be assessed on the merit of the proposal at the time that it is reviewed. There is no *a priori* impediment to institutions being members of more than one consortium or for working at more than one site, provided that there are no conflicts of interest.

The decisions concerning the grants will be amongst the most critical that the Programme makes because they will determine the content, mode and outcomes of the Programme as a whole. Each stage of the process – the expressions of interest, concept notes and full proposals – will be reviewed by the appropriate SRO, depending on where the research will be conducted, and by the Programme Coordinator, before submission to the Programme Steering Committee for confirmation.

### 5.2.1. Stage 1: Expressions of Interest

The SSA CP process will begin with the SROs having had the go ahead from the Programme Steering Committee to issue a call for Expressions of Interest from all parties who may wish to participate in "nuclear Pilot Learning Teams.. This is particularly aimed at identifying parties who may not be aware of their common interests, and at drawing in farmer organisations and community-based organisations that may not have the contacts or experience to develop more formal concept notes.

The requirements of the Expressions of Interest will be very simple, designed to encourage all potential participants to indicate their interest and capacities for IAR4D without undue expenditure of time or money. The process at this stage will seek three items: (a) identification of a site and the focal problems (entry points), including indications of the wider interactions that will be addressed in an integrative manner; (b) evidence of commitment to collaborative working, learning and changing; and (c) an indication of potential contributions to developing Concept Notes, including the range of potential stakeholders amongst their constituents. Responses to the calls for Expressions of Interest will be publicised to ensure that all potential players are aware of each other and can form the most appropriate nuclear Pilot Learning Teams. This will guard against the all too frequent occurrence of researchers engaged in similar research in the same locations not being aware of each others presence, which results in wasteful duplication.

### 5.2.2. Stage 2: Inception stage

A limited number of teams composed of groups submitting Expressions of Interest will be invited to develop Concept Notes for the inception stage. These will be applications for funds to carry out consultative processes, project design, preparatory capacity building and institutional changes necessary for developing comprehensive proposals for full implementation of IAR4D. Concept Notes will be screened by the SROs, using their established competitive grants mechanisms and procedures.

In ASARECA's case, for example, this would be included in the arrangements for Funding Stream C which is envisaged for research that could be undertaken by CGIAR and non-CGIAR international agricultural research centres and advanced research institutes and private sector research providers. Concept notes will be assessed against predetermined criteria developed by the Programme Steering Committee to determine which of the prospective teams should be offered funding for the inception stage including full proposal development.

In addition to NARIs and other NARS members, IARCs and ARIs, Pilot Learning Teams may include farmer groups, processing, marketing and consumer groups, extension staff, NGOs and CBOs. Partners are expected to come from both the private and the public sector, with inclusion of women's groups particularly encouraged. In general, teams will be expected to include not only well established institutions, but also smaller and less experienced organisations. However, this arrangement of asymmetric partnerships will apply only to African national institutions. In other respects, the criteria will favour the assembly of the strongest possible teams from the ranks of all stakeholders, African and non-African, public and private. To facilitate the involvement of new players and unfamiliar partners in IAR4D, the nuclear pilot learning teams will be supported by facilitation and mentoring staff, who will have expertise and experience in advancing integrated projects for agricultural research for development. This will ensure that all stakeholders in the production-to-consumption chain, including women and other disadvantaged groups, can fully participate in the projects.

Funds awarded on the basis of approved Concept Notes will cover the costs of participatory development of full proposals by the Pilot Learning Teams. A grant award at this stage will not imply any obligation for further grants, which will be based on the progress of the teams and the quality of their proposals.

### 5.2.3. Stage 3: Full Implementation of IAR4D

A major product of the inception stage will be the formation of Pilot Learning Teams capable of initial implementation of an IAR4D Project, definition of the integrated research agenda and the development of a full proposal. Detailed criteria for success will be developed by the Programme Steering Committee, but will rest heavily on the demonstrated capacity of the Pilot Learning Teams to conduct IAR4D projects with realistic goals, and following the principles outlined in earlier chapters of this proposal. On approval of full proposals, the teams will be guided and supported to fully engage in IAR4D activities as described in Chapters 2 and 3.

The competitive grants system will also include calls for organisations, or consortia of organisations, to provide programme-wide activities and support services to the Pilot Learning Teams on behalf of the SSA CP Coordinating Unit. The grants for full Pilot Learning Projects will be administered through the relevant SRO Competitive Grants Schemes. Since it is envisaged that there will be no more than three to four Pilot Learning Sites per subregion, and that the grants to each Pilot Learning Team will be subject to agreements with a single lead institution, this should not be an unreasonable burden for the SRO Competitive Grants Schemes.

Formal grant agreements between the lead institution and the other Pilot Learning Team members, will set out obligations concerning the development of and adherence to work plans, as well as reporting and accounting requirements. Grant agreements will cover up to a maximum of 54 months, but with firm commitments for no more than 18 months at a time. Continuation after each 18-month period will be dependent on satisfactory performance. Satisfactory performance will be determined by the SROs and the Programme Steering Committee, based on the assessment of stakeholders at the Pilot Learning Sites and the opinion of the Programme Coordinator.

## 5.3. Programme budgets and fund-raising strategy

### 5.3.1. Budgets

The SSA CP budgets are designed to parallel the modular design of the Programme so that independent decisions can be made about which modules will be funded and when. This also allows the Programme

financing plan to indicate the intended sources of funding, which will be sought from government and ODA budgets that relate to purposes of the modules.

Table 5.1 provides a summary budget for the overall SSA CP, with the full complement of nine PLSs. Table 5.2 presents the budget disaggregated by line item. It shows that 81% of the budget will go directly to the teams with a further 4% going to facilitation and mentoring which is considered to be part of the research process. With nine teams full funded just over 5% of the budget would be required for programme governance and management. Detailed budgets for each of the Challenge Programme's components are provided in Annex B. The funding requirements are:

- For the first inception phase with 3 Pilot Learning Sites: US$ 2.3 million
- For the first full IAR4D implementation at 3 PLSs: US$ 24.7 m, making a total of US$ 26 m inclusive of inception phase
- For a further 6 PLSs an additional US$ 44m will be required making the total programme requirement US$ 70 m.

**Table 5.1. Summary budget of the Sub-Saharan Africa Challenge Program (US$ '000)**

| Budget component | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Total | % of total budget |
|---|---|---|---|---|---|---|---|---|
| Pilot Learning Teams | 1,398 | 7,168 | 13,116 | 13,227 | 13,208 | 8,486 | 56,602 | 80.8 |
| Facilitation and mentoring | 278 | 753 | 526 | 394 | 394 | 263 | 2,608 | 3.7 |
| Out scaling and up scaling | 0 | 1,253 | 1,548 | 1,956 | 1,953 | 476 | 7,186 | 10.3 |
| Programme governance & management | 585 | 672 | 736 | 756 | 743 | 170 | 3,663 | 5.2 |
| **TOTAL** | **2,261** | **9,846** | **15,926** | **16,332** | **16,298** | **9,395** | **70,060** | **100.0%** |

**Table 5.2. Funding and support for nine Pilot Learning Teams (full budget, US$ '000)**

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Total |
|---|---|---|---|---|---|---|---|
| **Factor***l | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | |
| Three initial PLTs starting year 1 | 1,398 | 0 | 0 | 0 | 0 | 0 | 1,398 |
| First set of PLTs conducting full IAR4D | 0 | 4,372 | 4,372 | 4,483 | 4,243 | 0 | 17,470 |
| Second set of PLTs starting year 2 (six add'l teams) | | 2,796 | 0 | 0 | 0 | 0 | 2,796 |
| Second set of PLTs conducting full IAR4D | | | 8,744 | 8,744 | 8,965 | 8,486 | 34,939 |
| Facilitation and mentoring for first three teams | 278 | 197 | 131 | 131 | 131 | 0 | 869 |
| Facilitation and mentoring for second set of teams | | 556 | 394 | 263 | 263 | 263 | 1,739 |
| Methodology analysis and dissemination | 0 | 169 | 169 | 159 | 159 | 0 | 657 |
| Incremental cost of more PLS | 0 | 0 | 51 | 51 | 48 | 48 | 197 |
| Information and knowledge management | 0 | 0 | 59 | 48 | 59 | 0 | 166 |
| Incremental cost of more PLS | 0 | 0 | 0 | 59 | 48 | 59 | 166 |
| Local awareness and capacity for IAR4D | 0 | 0 | 185 | 185 | 185 | 0 | 555 |
| Incremental cost of more PLS | 0 | 0 | 0 | 370 | 370 | 370 | 1,109 |
| Postgraduate exposure to IAR4D to first set of PLS | 0 | 361 | 361 | 361 | 361 | 0 | 1,446 |
| Incremental cost of more PLS | 0 | 723 | 723 | 723 | 723 | 0 | 2,891 |
| Impact assessment | 140 | 118 | 118 | 135 | 118 | 0 | 628 |
| Incremental cost of more PLS | 0 | 42 | 35 | 35 | 41 | 35 | 188 |
| Programme Steering Committee | 207 | 207 | 207 | 207 | 207 | 0 | 1,035 |
| Incremental cost of more PLSs | 0 | 62 | 62 | 62 | 62 | 62 | 311 |
| Programme Coordination | 238 | 243 | 243 | 243 | 243 | 0 | 1,210 |
| Incremental cost of more PLSs | 0 | 0 | 71 | 73 | 73 | 73 | 290 |
| **Total** | **2,261** | **9,846** | **15,926** | **16,332** | **16,298** | **9,395** | **70,060** |

The new IAR4D paradigm provides the SSA CP with a wide range of promising opportunities, but it is foreseeable that, at least until the IAR4D approach has a proven track record, it may not access sufficient funding to support Pilot Learning Sites and teams in more than a few countries of sub-Saharan Africa. The need to demonstrate results as a prerequisite to full implementation of the SSA

CP, drives the logic of the modular approach to launching PLSs and teams. While the proposal advocates an eventual nine Pilot Learning Sites, the actual number of sites will be determined by the Programme's ability to attract resources.

Table B.11.1 in Annex B contains the budget for **Module 1**. The total proposed budget is US$26 million over five years. This will ensure that the multiple partners will be able to be meaningfully engaged and that the supporting services required for out scaling and up scaling are provided for from the outset. This is in contrast to the more usual project in which many of the partners receive inadequate funding and therefore cannot fully participate and in which out scaling is neglected resulting in minimal impact.

Annex B, Table B.11.2 sets out a budget for **Module 2**, assuming the launch of only two additional IAR4D teams in each of the subregions. Since it is not possible to estimate budget requirements for Module 2 sitework until PLTs are selected and develop detailed proposals, it is assumed for the time being that all IAR4D teams will receive the same budget. It is estimated that supporting six additional IAR4D teams will require a total of US$44 million over 6 years.

### 5.3.2. Funding strategy

The funding strategy of the SSA CP will be designed to tap a wide range of resources and funding windows in order to obtain adequate financing for the Program. The strategy will seek funding that is both unrestricted (for general Programme support) and restricted (targeted to specific Programme activities or locations). Fund-raising efforts will particularly aim to attract new resources beyond those normally earmarked for the CGIAR centres. Table 5.3 shows that the investment of funds that may otherwise go directly to CGIAR centre projects, will be leveraged 44:56 to increase the total funding for agricultural research, thereby meeting one of the principle goals of the CGIAR Challenge Programmes and of FARA. For their part, investors will be asked to accept that a mix of funding will be required for proper implementation of the holistic IAR4D approach.

**Table 5.3. Financing Strategy for Module 2 nine Pilot Learning Sites**

| Expected funding source | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Total | % |
|---|---|---|---|---|---|---|---|---|
| CGIAR/World Bank | 2,275 | 3,000 | 3,000 | 3,000 | 3,000 | 0 | 14,275 | 20 |
| CGIAR members | -19 | 6,846 | 3,000 | 3,000 | 2,010 | 2,010 | 16,847 | 24 |
| Governments & ODA | 5 | 0 | 9,926 | 10,332 | 11,288 | 7,385 | 38,937 | 56 |
| **Total (US$ ,000)** | **2,261** | **9,846** | **15,926** | **16,332** | **16,298** | **9,395** | **70,060** | **100** |

The process of submitting competitive proposals will resolve the potential dichotomy created by the need for IAR4D to be demand-driven and focused, while still allowing the pursuit of the full range of funding opportunities whether restricted by subject, location or institution. Attracting adequate financial support for a viable competitive grants process will be particularly important because the competitive grants are the means for implementing merit-based criteria in the selection of Pilot Learning Teams.

Recognising that the SSA CP is just one of numerous programmes concerned with natural resource management, care will be taken to identify other bilateral and multilateral programmes and ensure that the SSA CP is complementary and value-adding rather than duplicative. A major instrument in that process will be co-funding arrangements that will bring separately funded activities together to take advantage of synergies.

Regardless of the type of funding provided, donor agencies will be encouraged to participate in Programme activities, as a means of building investor confidence and ownership. Processes for out-scaling and up-scaling Programme results to reach greater numbers of poor people, should appeal to investors who want to allocate their funds in ways that generate broad impact. In the medium to long term, investor confidence will be determined by the level of impact that the SSA CP can demonstrate. As indicated in Section 3.4, impact assessment will be built into the Programme from the outset, so that proper benchmarks are established and impartial, external evaluation is conducted with due diligence. Monitoring, evaluation and impact assessment procedures will enable investors to track and assess the merits of Programme outputs that they may later wish to include in development assistance programmes.

### Approaches to attracting unrestricted funding

A declining but still important number of investors provide funds with few programmatic restrictions, provided that the funded is based on well-reviewed work programmes and assurance of high-quality, transparent accounting and reporting systems that guarantee that funds are well spent. The funding strategy includes approaches to traditional and non-traditional providers of such unrestricted funding.

**Traditional unrestricted funding sources:** National and international development agencies comprise the traditional sources of unrestricted funding. The SSA CP will make a direct appeal to them based on shared agendas that focus on improving livelihoods and conserving natural resources. Donors and the SSA CP also share a commitment to achieving the Millennium Development Goals and the objectives of other initiatives such as the Convention to Combat Desertification and the Convention on Biological Diversity, to which the SSA CP will make direct contributions.

**Non-traditional sources of unrestricted funding:** FARA is a new African-owned and African-led institution and, as such, it should appeal to public and private grant-making institutions that are interested in new ways of doing agricultural research and development in Africa. FARA will also encourage African governments to invest in IAR4D projects that will be carried out in their countries and regions. In line with NEPAD priorities, FARA will advocate the inclusion of agriculture and IAR4D activities in development assistance strategies such as the Poverty Reduction Strategy Papers, to make them eligible for financing from agencies such as the European Development Fund.

### Restricted funding

Funding agencies are increasingly required by law and by choice to invest in specific priority activities and/or locations. The SSA CP will respond to this by keeping the Pilot Learning Sites as discrete management and cost centres to which restricted funds can be directed and traced. Each Pilot Learning Site will have its own work plan, which will indicate objectives and activities aligned with the interests and priorities of potential investors.

**Subject area restricted funding:** The structure of the SSA CP will allow for mixed, but traceable, funding of activities at Pilot Learning Sites so that investors can tie funding to specific activities or areas of work. For example, at any given site, several themes may be addressed as components of IAR4D, each of which may be funded by different investors.

**Location restricted funding:** European and North American governments tend to have location priorities for their development assistance programmes. The Pilot Learning Site approach provides ample opportunity to mesh with investors' regional and country priorities. It will also facilitate access to opportunities for funding of activities under internationally supported programmes such as the Programme for Heavily Indebted Poor Countries.

**Co-funding and other institutionally restricted funding:** The SSA CP has received expressions of interest in co-funding from a range of networks addressing natural resource management in sub-Saharan Africa. More interest is anticipated once the SSA CP proposal is approved. In addition, where an SSA CP participating institution can obtain financing that contributes to an approved proposal or work plan, this will be a welcome form of co-funding, enabling further resources to flow to the Programme.

## 5.3.3. Developing and maintaining stakeholder confidence

The SSA CP's principles of governance and management will ensure the transparency required for stakeholders to have confidence in all Programme phases. All grantees will be expected to adhere to the core Programme principles of inclusiveness and transparency in decision making and financial management, which will be vital to maintain stakeholder commitment.

### Involving stakeholders

This proposal for a Sub-Saharan Africa Challenge Programme is the product of a long process of consultation between NARSs and CGIAR centres to promote integration and harmonisation of their

activities. The development of the SSA CP has also involved informal consultations as part of the continuous day-to-day interactions between stakeholders, and formal consultations through questionnaires, the submission of position and keynote papers, and the SSA CP Programme Formulation Workshop organised by FARA in March 2003.[38] Volume 2 of this proposal contains the March 2003 workshop papers, which will serve as reference materials during programme implementation.

This tradition of consultation will be maintained throughout the life of the Programme. It will be particularly intensive in the inception phase of the Programme, when consultative meetings will be held in each of the subregions to refine priorities and formulate work programmes. Provision is made for these activities in the budget of the Programme Coordination Unit.

**Reaching local governments:** As in other regions of the world, there is a trend in Africa towards devolving more authority to local governments. With this decentralization comes an increasing diversity in circumstances, capabilities, and modes of governance. Each Pilot Learning Team will have to develop its own means of reaching out to and involving decision makers and influential persons in local authority. To build support for IAR4D at the local government level, Programme outputs will be presented through oral, written and visual forms that are appropriate to different audiences, in order to assist those audiences to understand Programme outcomes and transfer them to the wider community. The direct involvement in Pilot Learning Teams of community based and farmers' organisations will give beneficiaries an important role, not only in determining the research agenda but also in helping to disseminate results to policy makers and other authorities.

**Reaching national governments;** Inclusion of national agricultural research institutions in the Pilot Learning Teams is a necessary but not sufficient condition to ensure that IAR4D is taken up on a large scale across countries. For that to happen, it is also necessary to influence decision makers in politics and senior positions in Ministries of Agriculture, Environment and Finance. This will require significant effort and purposeful planning to contact and involve influential people concerned with environmental issues in these institutions. The location of the Pilot Learning Sites will be critical to attract the attention of decision makers, so this must be featured as one of the PLS selection criteria. Where they exist, poverty maps will also be useful tools for identifying needy communities that could benefit from IAR4D interventions and/or from out- and up-scaling activities.

**Reaching regional organisations:** As part of its advocacy work, FARA will promote public awareness of the IAR4D approach and of the work and outcomes of Pilot Learning Teams. In Africa, this will involve tailoring messages for the African Union (AU) and its institutions such as the Science, Technology and Research Council (STRC), Semi-Arid Food Grain Research and Development (SAFGRAD), and the Inter-African Bureau for Animal Resources (IBAR), to foster acceptance of IAR4D as a useful approach to addressing poverty and environmental degradation. FARA will similarly convey information about IAR4D to intergovernmental and regional bodies such as the New Partnership for Africa's Development (NEPAD), and the Regional Economic Communities (RECs) such as the Common Market for East and Southern Africa (COMESA), the Economic Community of West African States (ECOWAS) and the Inter-Governmental Authority for Development (IGAD).

**Reaching United Nations organisations:** The SSA CP is closely aligned with the agendas of United Nations institutions such as FAO, the Economic Commission for Africa (ECA), the International Fund for Agricultural Development (IFAD), the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP), the World Bank, and the Global Environment Facility (GEF). Likewise, the SSA CP approach is congruent with international initiatives such as the Convention to Combat Desertification and the Convention on Biological Diversity. The SSA CP will serve as an important vehicle for achieving the objectives of all these institutions in Africa, and complementing and adding value to other ongoing work. The SSA CP will also ensure that IAR4D practitioners are aware of how their goals and objectives relate to international agreements such as the Kyoto protocol, WTO and the Doha agreements. The work of the Pilot Learning Teams will need to capitalise on the positive effects of these agreements, and expose and mitigate their negative effects on the livelihoods of smallholders in Africa.

[38] See Workshop Report in Volume 3

## 5.4. Economic assessment and conclusion

This proposal has shown how the SSA CP will address the multiplicity of factors that drive poverty and food insecurity in sub-Saharan Africa, with the objective of sustainably improving the livelihoods of African smallholders and pastoralists – and that it will do so with much greater impact than has been achieved by agricultural research in the past. It will integrate multi-disciplinary, cross-sectoral research with stakeholder-driven processes of adaptive management and innovation. By promoting incentives, access to inputs and information, and the reorientation of institutions needed to create enabling environments, it will build social capital and investment in natural resources by smallholders and pastoralists and other players in the production-to-consumption chain. The Programme will focus on promoting agricultural intensification balanced with sustainable natural resource management, the development of functioning markets and enabling policies, and improved management and use of agricultural information and knowledge.

The research agenda will be demand-driven through participatory identification of entry points. These cannot be fully determined *a priori*, although potential entry points and significant outcomes have been identified (see Chapter 2). In achieving targeted outcomes, the Programme will demonstrate the utility of IAR4D and foster its acceptance by participating institutions. The Programme also encompasses comprehensive research and promotion for out- and up-scaling, including a major capacity building component.

This approach will have multiple benefits, including:

1. improvements in the livelihoods of smallholders and pastoralists, especially women;
2. conservation of natural resources, including biodiversity;
3. more robust and efficient markets, including agricultural input and output markets and better provision of rural credit for smallholders;
4. improved policy-making capability and better policies that benefit smallholder agriculture;
5. stimulation of infrastructure investment and a stronger role for the private sector;
6. strengthened human capacity in different sectors (including a significant strengthening of multi-disciplinary team work), and a major contribution to keeping that capacity in the region; and
7. improved integration of agricultural research, development, and policy making institutions, and an enhanced flow of useful information among these organisations and between them and smallholder farmers and pastoralists.

The sub-Saharan Africa Challenge Programme is intended to run for 15 years. A sustained effort over the medium to long term will be required to achieve the SSA CP objectives at a sufficient scale to break and reverse the negative trends in sub-Saharan African agriculture. However, a major CGIAR criterion for Challenge Programmes is that they must show impact in the first five years. A tangible measure of this will consist of the numbers of smallholders and pastoralists whose livelihoods are improved, and the extent to which they are improved. To secure continued investment, the Programme will need to demonstrate that the trends in these numbers indicate worthwhile returns to the investment in IAR4D.

The proposal calls for a total investment in research of US$70 million for the first six years. This represents the external funding required for the project, but does not include in-kind contributions from, for example, farmers participating in the project or other agencies who contribute their own time and resources. Assuming that these in-kind contributions are worth an additional 25% of the project value, then the total investment from all sources for the nine Pilot Learning Sites would amount to an estimated $93 million over the projected 15 years.

The minimum number of farm families expected to be reached through activities at the nine sites is set at 300 in the second year, going to 3,000 by year 4 and thereafter rising at about 33% per annum to reach 138,000 in the 15th year, i.e. about 11,500 farm families per site. This is considered a modest target when compared with the 19,000 farmers who adopted outputs of forage research carried out in Kaduna, northern Nigeria in the 1980s (Elbasha, Thornton & Tarawali 1998). There are similarities in

the approaches to research done in Kaduna and IAR4D (Waters-Bayer, Bayer & Critchley 2003), but the Kaduna research did not have supporting facilitation and mentoring or out- and up-scaling capabilities. Nor did it have access to the power of modern computers and information and communications technologies. The AHI is predicting to reach 25,000 households at one site.

The base net incremental income per household that may be attributed to IAR4D is assumed to rise from US$1 per day (US$365 per annum) to a maximum of US$4 per day (US$1,460) by Year 6. That is a modest rise of less than $1 per member of the household. The total incremental income for the 9 Pilot Learning Sites would be US$138 million per annum in the 15th year. That compares with US$360 million derived from NERICA rice in seven rice-producing countries of West Africa (Dalton 2003). If these modest targets are reached, the investment in research will achieve an internal rate of return (IRR) of 34% and, at a 10% discount rate, a net present value (NPV) of US$185 million.

Sensitivity analyses indicate that, if the rate of increase of adopters is reduced to one-third the total number of adopters by year 15 will be 92 thousand and the IRR will drop to 25% with an NPV at 10% of US$101 million. If the maximum incremental income is also reduced to just over US$3 per day, the IRR falls to 21% with and NPV at 10% of US$62 million.

This analysis only calculates the estimated value of direct benefits to farmers in and near the Pilot Learning Sites. Thus, it is a very conservative estimate of the returns to investment in the overall Challenge Programme. Calculating the value of benefits flowing from items 2-7 in the list on the previous page is conceptually difficult under any circumstances. In any case, making such calculations would be only a hypothetical exercise at this time, since it is impossible to predict all the outcomes of the Programme, much less quantify them. However, it is expected that benefits flowing from these other outcomes will far outweigh the immediate impact on participating farmers, and indeed they represent the most important contributions of the Sub-Saharan Africa Challenge Programme to transforming the landscape of agricultural research and development in Africa.

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# ACRONYMS AND ABBREVIATIONS

***(Note: some of these acronyms are used only in Volume 2)***

| | |
|---|---|
| A-AARNET | ASARECA Animal Agriculture Research Network |
| AATF | African Agricultural Technology Foundation |
| AfDB | African Development Bank |
| AHI | African Highlands Initiative |
| APAARI | Asia Pacific Association of Agricultural Research Institutions |
| ARIs | Advanced research institutes |
| ASARECA | Association for Strengthening Agricultural Research in Eastern and Central Africa |
| ASB | Alternatives to Slash and Burn |
| AU | African Union |
| BARNESA | Banana Research Network for Eastern and Southern Africa |
| CAADP | Comprehensive African Agriculture Development Programme (NEPAD) |
| CAAS | Chinese Academy for Agricultural Science |
| CAS | Central Agricultural Services (CGIAR unit) |
| CASIN | Centre for Applied Studies in International Negotiations |
| CBD | Convention on Biological Diversity |
| CBOs | Community-based organisations |
| CCD | Convention to Combat Desertification |
| CD-ROM | Compact Disk – Read Only Memory |
| CFM | Consolidated Financing Mechanisms |
| CGIAR | Consultative Group on International Agricultural Research |
| CIFOR | Center for International Forestry Research |
| COMESA | Common Market for Eastern and Southern Africa |
| CORAF | Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricoles |
| EAPGREN | East African Plant Genetic Resources Network |
| ECA | Economic Commission for Africa (United Nations) |
| ECABREN | East and Central Africa bean Research Network |
| ECARSAM | East and Central Africa Research on Sorghum and Millet |
| ECOWAS | Economic Community of West African States |
| EDF | European Development Fund |
| EMBRAPA | Empresa Brasileira de Pesquisa Agropecuària |
| EPHTA | Eco-Regional Programme for Humid and Sub-Humid Tropics of Africa |
| FANR | Food, agriculture and natural resources |
| FAO | Food and Agricultural Organisation of the United Nations |
| FARA | Forum on Agricultural Research in Africa |
| FORAGRO | Regional Forum for Research in Agriculture |
| GEF | Global Environment Facility |
| GFAR | Global Forum on Agricultural Research |

| | |
|---|---|
| GISD | Geographic Information for Sustainable Development |
| GMO | Genetically modified organism |
| GRM | Genetic resource management |
| HIPCs | Heavily indebted poor countries |
| HIV/AIDS | Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome |
| HRD | Human resource development |
| IAR4D | Integrated Agricultural Research for Development |
| IARCs | International agricultural research centres |
| IBAR | Inter-African Bureau in Animal Resources (African Union) |
| IBRD | International Bank for Reconstruction And Development (World Bank) |
| ICAR | Indian Council for Agricultural Research |
| ICAR | International Committee for Animal Recording |
| ICRA | International Centre for development oriented Research in Agriculture |
| ICRAF | International Center for Research in Agroforestry (World Agroforestry Centre) |
| ICRISAT | International Crops Research Institute for the Semi-Arid Tropics |
| ICT | Information and communication technology |
| IEHA | Initiative to End Hunger in Africa |
| IFAD | International Fund for Agricultural Development |
| IFDC | International Fertilizer Development Center |
| IFPRI | International Food Policy Research Institute |
| IGAD | Inter-Governmental Authority for Development |
| IITA | International Institute of Tropical Agriculture |
| ILRI | International Livestock Research Institute |
| INERA | Insitut National Pour l'Etude et la Recherche Agronomiques (DR Congo) |
| INRM | Integrated natural resource management |
| IPGRI | International Plant Genetic Resources Institute |
| IPM | Integrated Pest Management |
| ISAAA | International Service for the Acquisition of Agribiotech Applications |
| ISAR | Insitut des Sciencesa Agronomiques du Rwanda |
| iSC | CGIAR Interim Science Council |
| ISFM | Integrated Soil Fertility Management |
| ISNAR | International Service for National Agricultural Research |
| MAPP | Multi-Country Agricultural Productivity Programme |
| MDGs | Millennium Development Goals |
| NAREs | National agricultural research and extension institutions |
| NARIs | National agricultural research institutes |
| NARO | National Agricultural Research Organisation (Uganda) |
| NARSs | National agricultural research systems |
| NEPAD | New Partnership for Africa's Development |

| | |
|---|---|
| NGOs | Non-governmental organisations |
| NRM | Natural resource management |
| OECD | Organisation for Economic Co-operation and Development |
| PARPACE | Regional Potato and Sweet Potato Improvement Programme in Eastern and Central Africa |
| PRGA | Participatory Research and Gender Analysis |
| PRSPs | Poverty Reduction Strategic Plans |
| PSC | Programme Steering Committee |
| R&D | Research and development |
| RFPs | Requests for proposals |
| SACCAR | Southern Africa Centre for Co-operation in Agricultural Research and Training |
| SADC | Southern African Development Community |
| SAFGRAD | Semi-Arid Food Grain Research and Development (African Union) |
| SAPs | Structural adjustment programmes |
| SFIs | Sustainable financing initiatives |
| SMEs | Small and medium enterprises |
| SPAAR | Special Programme for Agriculture in Africa |
| SPFS | Special Programme for Food Security |
| SROs | Subregional research organisations |
| SRSCs | Subregional Subcommittees |
| STRC | Science and Technology Research Council (African Union) |
| SWMNET | Soil and Water Management Network |
| SWNM | Soil Water and Nutrient Management |
| SWOTs | Strengths, Weakness, Opportunities and Threats |
| TCARD | Technical Co-operation for Agricultural Research and Development |
| TCART | Technical Committee for Agricultural Research and Training |
| TOFNET | Trees on Farm Network |
| TSBF-CIAT | Tropical Soil Biology and Fertility Institute – International Center for Tropical Agriculture |
| UNDP | United Nations Development Program |
| UNEP | United Nations Environment Program |
| USAID | United States Agency for International Development |
| WAICENT | World Agricultural Information Centre |
| WARDA | West African Rice Development Association |
| WECARD | West and Central African Council for Agricultural Research and Development |
| WSSD | World Summit for Sustainable Development |
| WTO | World Trade Organisation |