



FARA STRATEGIC PLAN 2007–2016

Companion Documents

Enhancing African Agricultural Innovation Capacity

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Enhancing African Agricultural Innovation Capacity

**FARA Strategic Plan 2007–2016
Companion Documents**

**15 September 2006
Accra, Ghana**

**Forum for Agricultural Research in Africa
PMB CT 173 Cantonments
2 Gowa Close, Roman Ridge
Accra, Ghana**

2008

Citation: FARA (Forum for Agricultural Research in Africa). 2008. *Enhancing African Agricultural Innovation Capacity : FARA Strategic Plan 2007–2016 Companion Documents*. 15 September 2006. Accra, Ghana. 80 pp.

FARA encourages fair use of this material. Proper citation is requested.

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ISBN 978-9988-1-1060-X (print)

ISBN 978-9988-8438-5-2 (pdf)

This study was commissioned by FARA:

Part 1. FARA Advocacy and Resource Mobilization (A&RM) Strategy, *Eugene Terry*

Part 2. African agriculture and environment: assessment, sustainable development pathways and changing roles for R&D, *Marco Wopereis*

Part 3. Principles and application of subsidiarity, *Hermann Pfeiffer*

Part 4. HIV and AIDS mainstreaming, *Benjamin Treveh*

Editing and design: www.bluepencil.in

Print: www.pragati.com



Foreword

The Forum for Agricultural Research in Africa's (FARA) 2007–2016 Strategic Plan describes how it will add value to the support provided by the Sub-Regional Organizations (SROs) to strengthen African national agricultural research systems (NARS). The Plan outlines how the Forum will advance the achievement of the goals and objectives of the African Union's New Partnership for Africa's Development (AU-NEPAD) by contributing to the latter's Comprehensive Africa Agriculture Development Programme (CAADP), and specifically to CAADP Pillar IV, which covers agricultural research, and technology dissemination and adoption.

The Plan builds on the numerous consultations FARA has held since its founding in 1997. These consultations have dealt with diverse continent-wide issues related to agricultural research and development, the development of strategies and plans for the African SROs, as well as specifically with FARA's development of this Plan.

The set of papers included in this Companion Document is the product of consultancies that the FARA Secretariat specifically commissioned to provide further information and expert advice on key issues that permeate its new Strategic Plan. The papers cover four () topics: i. Advocacy and resource mobilization (A&RM); ii. African agriculture and environment: Assessment, sustainable development pathways and changing roles for research and development (R&D); iii Principles and application of subsidiarity; and iv. HIV and AIDS mainstreaming.

Dr Dennis Kyetere
Chair, FARA Board

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FARA Executive Director



Part 1

FARA's advocacy and resource mobilization strategy

1. Background and rationale

FARA is committed to advancing the African vision for agricultural research to achieve an annual average agricultural production growth rate of at least 6% by 2015. This will enable the African Union to meet its objectives of alleviating poverty, ensuring food security and enabling sustainable economic development. FARA seeks to build Africa's capacity for agricultural innovation to enable the region to achieve the African vision and to make agriculture the continent's engine for economic growth. This will require strong, efficient and effective national agricultural research and capacity building systems, reinforced by dynamic SROs supported by FARA.

FARA's value proposition is to underpin the ability of SROs to support NARS. It provides the continental perspectives and global linkages to increase the scope and depth of the agricultural expertise and resources required for the restoration of agricultural growth, food security and rural development in Africa. This is required to achieve CAADP's goal to attain an annual agricultural growth rate of 6%¹ as endorsed by the African Heads of State and Government.

CAADP's Pillar IV – agricultural research, technology dissemination and adoption – is a long-term component of the comprehensive framework that aims to achieve accelerated gains in productivity. Pillar IV requires:

- An accelerated rate of adoption of the most promising available technologies, to support the immediate expansion of African agricultural production through more efficient linking of research and extension systems to producers.
- Mechanisms to reduce the costs and risks of adopting new technologies.
- Technology delivery systems that rapidly bring innovations to farmers and agribusinesses, thereby making increased adoption possible; notably through the appropriate use of new information and communications technologies (ICT).
- The enhancement of the ability of African agricultural research systems to efficiently and effectively generate and adapt new knowledge and technologies to increase output and productivity while conserving the environment.

The key interventions for the scientific and technological transformation to achieve sustained productivity gains that will make African agriculture competitive are: (i) an increase in

1. *Framework for African Agricultural Productivity (FAAP)*, 2006 – A FARA/AU/NEPAD Working Document

investments in research and technology development; (ii) an increase in the share of private sector funding in agricultural research; and (iii) promotion of institutional and financial reforms aimed at making NARS more sustainable. Successful implementation of CAADP Pillar IV further requires transformation of African agricultural systems from the outmoded and ineffective linear and top-down research-extension-farmer model into a knowledge-based agricultural system. These reforms are designed to improve production efficiencies through: the adoption of improved technologies; adequate access to productive resources; well-functioning markets and infrastructure; and an enabling policy environment.

FARA's first Strategic Plan (2002–2012)² and Implementation Framework (2002–2006) established three pillars as the core of its work: the need to raise awareness, promote appropriate policy options, and leverage financial and intellectual support for agricultural development (advocacy and resource mobilization). While FARA has accomplished a good deal in its first five years, many of its activities have been conducted in an opportunistic fashion as part of the many and diverse responsibilities of the Executive Director, rather than being driven by a clearly defined strategy. Although the FARA Secretariat was successful in catalysing increased funding for sub-regional activities, the anticipated corresponding financial support for programmes at the national level from national governments has not yet materialised. The commitment by African governments to allocate 10% of their budgets to agriculture is yet to be realised. African agricultural science and technology still depends on foreign aid to the level of around 40% of its total funding requirements³.

FARA's revised 2007–2017 Strategic Plan reflects the changing circumstances and recent

lessons learned within the African agricultural research and development landscape⁴. The most important of these include:

- The strengthening and growing authority of African continental and regional organisations such as the African Union, as well as SROs and regional economic communities (RECs).
- The impact of globalisation on the competitiveness of African agriculture as a whole, and specifically on smallholders and pastoralists.
- Renewed international interest in Africa as declared in the Sea Island and Gleneagles G8 summits, and growing commercial ties with Brazil, China and India.
- The loss of human and institutional capacity due to under-resourced expansion of university enrolments, and the emigration of Africa's best agricultural professionals, and restricted recruitment under structural adjustment policies.
- The shorter, more extreme and mostly adverse weather cycles attributable to climate change.
- The quadruple interrelated impacts of emigration from agriculture of the young, increasingly important role of women, and the escalating numbers of women and children-headed households and loss of breadwinners due to HIV/AIDS.

The revised Strategic Plan envisions FARA supporting the SROs and NARS to develop and increase their innovation capacity in agricultural research for development (AR4D) through five “networking support functions”:

- Advocacy and resource mobilization for agricultural research
- Access to knowledge and technologies
- Regional policies and markets
- Capacity strengthening
- Partnerships and strategic alliances

2. *FARA Strategy 2002-2012*

3. *Realising the promise and potential of African agriculture – Science and technology strategies for improving agricultural productivity and food security in Africa*. An InterAcademy Council Report, 2004.

4. *FARA's 2007-2016 Strategic Plan – Enhancing African Agricultural Innovation Capacity*, Accra: FARA, 2007.

This document describes the approach of the advocacy and resource mobilization networking support function, which aims to contribute significantly to the achievement of FARA's overarching goal of making agriculture the engine of Africa's development. This function complements the other networking support functions, which collectively address the priorities and targets linked to CAADP.

2. Foundations of the advocacy and resource mobilization strategy: what is FARA advocating?

The purpose of this strategy is to provide Africa's SROs and their NARS with appropriate advocacy and resource mobilization support to achieve the CAADP Pillar IV goal: *"enhancing the ability of agricultural research systems to efficiently and effectively generate and adapt new knowledge and technologies needed to increase output and productivity while conserving the environment; acceleration of adoption of the most promising technologies through the efficient linking of research and extension systems to producers; and development of technology delivery systems*

that quickly bring innovations to farmers and agribusinesses."

Translating the CAADP Pillar IV goal into practical action and investment requires a concerted effort to build a constituency and ownership (advocacy) for this effort. Specifically it requires:

- Creating a basis for informed choice in setting investment intervention priorities.
- Formulating and funding of additional concrete projects (resource mobilization).
- Integrating NEPAD programmes into African development budgets of national development plans and of RECs.
- Taking concerted action to promote private sector engagement and interest.

CAADP Pillar IV is intended to be achieved through the **Framework for African Agricultural Productivity** (FAAP, see Box 1) which:

- Addresses the under-investments in agricultural research and development and infrastructure, and the resulting institutional weaknesses linked to the fragmented, ad-hoc and unstructured nature of internal and external support and investment in agricultural research, technology dissemination and adoption.

| Box 1. Framework for African Agricultural Productivity: principal elements | |
|--|---|
| FAAP – Principal elements | FAAP addresses: <ol style="list-style-type: none"> 1. Capacity weaknesses 2. Insufficient end-user involvement 3. Ineffective farmer-support systems 4. Fragmentation among elements of the innovation system (research/extension/training/farmers' organisations/private sector/consumers) |
| Institutional reform, including the efficient use of resources to increase productivity | Empowerment; subsidiarity; pluralism in delivery; evidence-based approaches; integration of agricultural research; incorporation of sustainability; utilisation of improved management information systems; cost sharing for financial sustainability; integration of gender |
| Increasing total investment | Increased scale of investments – country, sub-regional, and global |
| Harmonising funding | <ol style="list-style-type: none"> 1. Aligned and coordinated financial support – moving from project mode (of funding) to programmatic support 2. Adoption of common processes for planning, common financial management procedures 3. Establishment of multi-donor trust funds |

- Raises the profile of agriculture and agricultural research at the continental/sub-regional levels and advocates for increases in the scale of Africa's Agricultural Productivity Investments.
- Promotes awareness of Africa's potential and need to:
 - capitalise on the demonstrated high returns to investment in agricultural research and development;
 - capitalise on agriculture's proven track record of success for growth and poverty reduction;
 - adopt significant necessary and possible improvements in its agriculture;
 - adopt reforms for transformation of African agriculture, which will include generic as well as specific interventions across sub-Saharan Africa; and
 - provide greater and higher quality human and institutional capacity in the form of improved tertiary education to ensure a better curriculum in agricultural sciences.

FARA's advocacy and resource mobilization strategy should be guided by the key FAAP objectives and principles, which include:

- Institutional reforms, including the efficient uses of available resources
- Increases in total investments
- Harmonisation of funding

Further, the strategy will include interventions that aim to: (i) correct the systematic fragmentation in the African agricultural institutional capacity support system; and (ii) promote effective integration of farmers' organisations, the private sector and consumers in the financing and institutional support for research, extension, and training.

FARA has adopted a **Hierarchy of Objectives (results-based) Framework** for the implementation of the advocacy and resource mobilization **Operational Plan**, and the achievement of the **key results** and outcomes expected from the plan. (See Box 2)

The first deliverable (key result) – **reformed African agricultural institutions and services** – requires advocacy and resource mobilization programmes, campaigns and/or dialogues that focus on how to:

- Empower end-users in setting priorities and work programmes.
- Adopt the subsidiarity approach for responsibility and control over resources for research/extension/training at the lowest appropriate level.
- Adopt the pluralism principle in the delivery of agricultural research/training by a broad range of service providers (universities, NGOs, public and private sectors).
- Adopt evidenced-based approaches, with emphasis on data analysis for priority setting and strategic planning.

Box 2. FARA advocacy and resource mobilization strategy – hierarchy of objectives/results-based framework

Objective (CAADP goal): ***To achieve an annual average African agricultural production growth rate of at least 6% by 2015.***

Advocacy and resource mobilization strategic objective: ***To enhance FARA's capacity to provide the SROs and their NARS the appropriate support to increase their capacity to contribute to the achievement of the CAADP goals.***

Results (deliverables):

1. **Reformed African agricultural institutions and services.**
2. **A new financing framework for African agriculture that promotes a research system that is efficient, effective, and has high potential for rapid and widespread impact on agricultural productivity.**

- Integrate agricultural research with extension/private sector training/capacity building/education to respond to innovation capacity needs.
- Explicitly incorporate sustainability criteria in political commitment, diversification in sources of funding, adoption of environmentally sound technologies.
- Systemically utilise improved management information systems.
- Adopt cost-sharing mechanisms with end-users to increase stake in efficiency of service provision and improve financial sustainability.
- Integrate gender considerations at all levels of research and development.

FARA's first deliverable is to foster multi-stakeholder innovation platforms that effectively integrate interventions related to productivity, natural resource management and markets within an appropriate policy framework – the approach known as IAR4D – (see Box 3). FARA is the only forum/institution with the appropriate political, technical, and organisational competence to promote and manage this platform at the continental level. FARA's multi-stakeholder innovation platform role implies the need to engage governments, foundations, donors and other investors to leverage political, human and financial support for IAR4D.

A further advocacy goal specific to FARA's role at the continental level is to lobby for and negotiate favourable outcomes relating to Africa's overall interest in agricultural development, trade and the environment.

In addition, the advocacy and resource mobilization strategy envisions interventions that create and recognise a culture of excellence in African agricultural research and development through:

- Documentation and promotion of outstanding achievements in Africa.
- Creation of mechanisms that encourage institutions to attain excellence, and to recognise it through honours and awards (at continental, sub-regional and national levels).

The second deliverable is **a new financing framework for African agriculture that will promote research systems that are efficient, effective, and have a high potential for rapid and widespread impact on agricultural productivity**. This requires programmes, campaigns and/or dialogues that:

- Implement the Paris Declaration on Aid Effectiveness Principles to ensure that African countries exercise effective leadership and coordination of development actions (see Box 4).
- Liaise with donor countries/organisations to ensure that they base their overall support on African countries' development strategies.
- Establish common mechanisms and procedures to align and coordinate development partners' support with national funding resources.
- Develop, in consultation with donors, SROs and NARS, a common agricultural research and development agenda.

Box 3. Research and development agenda of Integrated Agricultural Research for Development (IAR4D):

Overall Objectives

1. To develop technologies for sustainable intensification of subsistence-oriented farming systems.
2. To develop smallholder production systems compatible with sound natural resource management (NRM).
3. To improve the accessibility and efficiency of markets for smallholder and pastoral products.
4. To catalyse the formulation and adoption of policies that will encourage innovation to improve the livelihoods of smallholders and pastoralists.

Box 4. Paris Declaration on Aid Effectiveness (Principles)

1. Developing countries exercise effective leadership over their development policies, strategies, and coordinate their development actions.
2. Donor countries base their overall support on recipient countries' national development strategies, institutions and procedures.
3. Donor countries are transparent in their actions for harmonised and collective effect.
4. All countries manage resources and improve decision-making for results.
5. Donor and developing countries pledge mutual accountability for development results.

- Promote, in consultation with stakeholders, mutual accountability mechanisms and common systems for monitoring and evaluation (M&E).

3. Operationalising FARA's approach to advocacy and resource mobilization

FARA's advocacy and resource mobilization strategy shall be implemented through an Operational Plan based on the priorities and targets identified by the SROs and NARS. In their respective Strategic and Operational Plans. Support for the evolution of African agriculture and the conduct of agricultural science depends on external (to Africa) and internal political and policy environments, which have a major effect on budgets and behaviour in the agricultural sector. Details of the advocacy and resource mobilization operational plan will be determined based on an analysis of these external and internal political and policy environments.

The Operational Plan will identify interventions that enable FARA to provide the appropriate platform for leveraging increased access to political, technical and methodological support, as well as financial investments to support African agricultural productivity-related activities, policies, plans and institutions. This will ensure enhanced continental perspectives, global linkages, and the broad scope and range of agricultural expertise and resources required to achieve the CAADP Pillar IV goals. The Operational Plan will also assess the risks and benefits of specific advocacy and resource mobilization initiatives.

The Operational Plan shall make provision for leaders at the continental, sub-regional and national levels respectively, with the skills and capacity, to:

- Canvass for general support for agricultural research and development in the sub-regions and in national programmes.
- Create and strengthen access and connections to leverage interventions and actions within the sub-regional and national political and resource environment, specifically the national governments, bilateral donor activities, NGOs and development partners and foundations operating those environments.
- Provide FARA with local knowledge of the political scene and be a resource in developing higher-level advocacy strategies, and understand how to use the FARA Secretariat to best further advocacy at the national level.

The FARA advocacy and resource mobilization activities are designed to influence those who make policy decisions and bring about changes in policies relating to investments in African agricultural institutions and services reforms for increased productivity. A capacity building programme will be developed for national and sub-regional advocacy and resource mobilization leaders to provide them with tools and skills to:

- Understand the policy-making process so as to better identify the targeted policy changes in support of FARA's goals.

- Identify the specific actions expected from targeted audiences in order to bring about the desired outcomes.
- Develop advocacy and resource mobilization Operational Plans to effectively manage a broad range of related activities.
- Identify, reach and engage the appropriate targets and processes with communications material and messages tailored to the needs of the specific end-users that will influence the targeted policy changes.
- Develop a communications programme that will highlight the progress and achievements of the FARA Secretariat and FARA stakeholder groups that contribute to the CAADP goals, and the mechanisms to provide continuous updates on progress.
- Develop appropriate advocacy and resource mobilization monitoring and evaluation performance indicators.

An operations manual shall be developed that incorporates the specific and detailed tools, instruments and approaches, to achieve the reactive changes expected from the interventions described above.

A high priority activity to be addressed in the Plan is the need to define the critical elements in the communications material and messages to be tailored to the needs of the specific end-users. A workshop convened by the FARA Secretariat as a first step in the operational plan process, shall bring together communications personnel of the appropriate national governments, sub-regional organisations, NGOs and development partners, bilateral and multi-lateral donors and foundations. Its purpose is to determine stakeholder-specific communications requirements.

3.1. Executing the FARA advocacy and resource mobilization strategy at continental and sub-regional levels

The evolution of African agricultural productivity systems is facilitated by appropriate interventions through FARA in its role as an African umbrella organisation, as well as a coalition of

agricultural development stakeholders, with its key constituents being the SROs and their NARS, which form the foundation on which FARA has been established. FARA provides the platform to initiate innovation (processes of change), so that innovation capacity in AR4D in Africa can be catalysed and promoted.

It monitors local policy developments and provides analysis and inputs on the implications of policy on sectors relevant to FARA's mission and its constituencies. At the continental and sub-regional levels, the FARA Secretariat and the SROs generate knowledge that can be used to make scientifically based policy decisions.

FARA being a decentralised organisation, the procedures and processes for leveraging of the advocacy and resource mobilization interventions **follow the subsidiarity principle** so as to ensure that decisions are taken as closely as possible to the base (the lowest practical level). This principle ensures accountability, transparency, and efficiency at all levels from the local up to the continental, and that decisions are made using the existing structures and state of operation at each level based on identified priorities and targets. This also ensures that local responsibilities and ownership are strengthened. Constant checks are made to ensure that action at the higher level (continental) is justified in the light of possibilities available at lower levels (i.e. sub-regional, national and local levels). It is imperative, based on this principle, that there is open communication on actions and progress between and among all levels at all stages of the implementation of the advocacy and resource mobilization strategy.

*In Priority actions for improving African agricultural productivity at national, sub-regional and continental levels*⁵ FARA sets out that with regard to initiatives relating to advocacy and resource mobilization and associated activities, the following actions should be undertaken primarily at the **national level**:

5. Personal communication, Monty Jones.

- **Strengthening capacity** – specifically the capacities of government ministries in critical areas such as: (a) policy-making; (b) trade issues and regional market integration; (c) definition, harmonisation and enforcement of international and regional conventions, regulations, guidelines and standards, in particular in critical areas relating to genetic resources, intellectual property, sanitary and phytosanitary regulations seeds laws and other vital inputs, relating to trade, food quality and safety and pest management; (d) agricultural statistics; (e) priority setting; (f) monitoring and evaluation systems.
- **Empowering farmers** – specifically to: (a) stimulate reviews of legal and regulatory frameworks to create supportive institutional environments; (b) advocate research on innovative financing of farmers, input suppliers and produce merchants.
- **Improving efficiency of agricultural institutions and support services** – specifically: (a) research on the financing needs of public and private sector providers; (b) strengthening the financial and management autonomy of public research institutions with a governance body, including all stakeholders responsible for demand-driven research, extension and training programmes; (c) competitive grant mechanisms for priority research open to all qualified research institutions.

The following priority actions should be undertaken at the **sub-regional level**:

- **Empowering farmers** – specifically: (a) inter-NARS collaboration for sharing tasks and expertise; (b) collaboration in cross-border opportunities and issues; (c) exchange of best practices in farmer empowerment.
- **Strengthening the efficiency of agricultural institutions and support services** – specifically: (a) action on cross-border issues and opportunities; (b) strengthening financial and management autonomy of public research institutions; (c) competi-

tive grant schemes for priority research; (d) studies and preparation of action plans for selected strategic issues such as national food security policy.

The following priority actions should be undertaken at the **continental level**:

- **Strengthening capacity** – specifically: (a) advocacy for national and international investments to strengthen Africa's scope to build capacity for the implementation of CAADP across the continent; (b) improving the skills base in priority areas and promoting adoption of innovative agricultural research approaches that leverage cross-sectoral and multi-disciplinary partnerships.
- **Empowerment of farmers** – specifically: (a) assign farmer empowerment a high priority for the development of an innovation systems approach.
- **Strengthening effectiveness of agricultural institutions and support services** – specifically: (a) advocacy for increased investments by governments and development partners in technology dissemination and essential support services; (b) facilitate institutional changes that will promote public-private-farmer collaboration; (c) provide assistance, through the FAAP co-ordination office, in proposal development and resource mobilization.

The leadership for the elaboration of the FARA advocacy and resource mobilization Operational Plan and its overall implementation is assumed to be a major function of the FARA Secretariat. Investments have been committed for a team supported by a specialist. The major advocacy and resource mobilization spokesperson for FARA is the Executive Director.

In this context, the FARA Secretariat will provide leadership and critical analysis to determine the appropriate interventions for advocacy and resource mobilization initiatives directed at the following targets:

- AU/NEPAD – for strategic support of the shift to FAAP as an instrument for increas-

ing both public and private resources to fund agricultural growth programmes.

- Donor organisations and investing partner countries—for action on pledges to operate in a collective, harmonised and transparent manner in their efforts to aid African agriculture.
- The African Development Bank.
- African governments—for action in support of pledges to exercise leadership over their development policies and to deliver on their commitments to spending 10% of their national budgetary resources on agriculture.

The decision as to who shall represent FARA and act as a spokesperson in official fora shall be determined based on the subsidiarity principle. At the continental level, where the FARA Executive Director is unable to participate and speak on FARA's behalf, or when special expertise is required, the FARA Secretariat requests an appropriate alternative. Material setting out the official FARA position relating to the specific topic or subject matter to be discussed shall be prepared by the Secretariat's advocacy and resource mobilization Lead Specialist.

The SROs play a major role, which complements the efforts of the FARA Secretariat, and their resources, goals and influence contribute to the identification of appropriate institutional and individual target audiences at which the advocacy and resource mobilization initiatives will be directed. The operational plan will describe mechanisms to facilitate appropriate communications channels between the FARA Executive Director and his/her SRO counterparts to ensure smooth-functioning on all related issues.

All four of FARA's SROs are at various stages of the participatory process to define their strategic and operational plans to deliver on the goals of CAADP Pillar IV, and contribute to enhanced productivity, value additions and competitiveness of regional agricultural systems. The Association for Strengthening

Agricultural Research in Eastern and Central Africa (ASARECA)⁶ and West and Central African Council for Agricultural Research and Development (CORAF/WE CARD⁷) are the most advanced, with ASARECA's draft operational plan describing how it will implement its strategy over the next five years (2007–2011), and CORAF/WE CARD currently having finalised their own five-year operational plan for strategy implementation.

The SROs' operational plans define specific interventions at the sub-regional level to ensure that their organisations achieve a highly visible profile among their stakeholders, and that their roles and achievements are accordingly valued.

ASARECA has identified seven key programmes for its operational plan:

- Staple crops
- Non-staple priority crops
- Livestock and fisheries
- Agro-biodiversity and biotechnology
- Natural resource management and forestry
- Policy and advocacy
- Capacity development and institutional strengthening including innovation processes for technology uptake and up-scaling.

ASARECA's operational plan proposes the following advocacy-related deliverables that are intended to promote high visibility⁸:

- Establishment of a public/media relations function within the new Information and Communications Unit (ICU), including development of an ASARECA corporate publicity programme.
- Participation in international, regional and sub-regional fora.

6. ASARECA *Operational Plan 2007-2011 –Towards the Improved Delivery and Impact of Regional Agricultural Research* Draft Version 2, January 2007

7. CORAF/WE CARD *Strategic Plan Review, Operational Plan Development*, Workshop Reference Material, March 2007

8. ASARECA *Communications and Knowledge Management Strategic Plan* (unedited version), 2006

- Re-branding of the organisation, including development and implementation of brand application guidelines.
- Establishment of a donor relations function within the ICU.

ASARECA's revised organisational structure makes provision for Ministers of Agriculture to become its patrons, presumably to facilitate advocacy and resource mobilization.

CORAF/WECARD has proposed the following eight programme options:

- Livestock, fisheries and aquaculture
- Staple crops
- Non-staple crops
- Natural Resource Management
- Biotechnology and biosafety
- Knowledge management
- Policy, markets and trade
- Capacity strengthening and coordination

Underlying the implementation of the proposed CORAF/WECARD strategy are the following core functions of the SRO, which were defined in the strategic planning process:

- Capacity strengthening
- Coordination
- Knowledge management and advocacy

Knowledge management as defined in the CORAF/WECARD draft operational plan covers a wide range of issues and mechanisms and is closely linked to dissemination and uptake of knowledge, advocacy, coordination of effort and experiential learning. The programmes relating to the knowledge management core functions are implemented at different levels. Specifically, for advocacy and resource mobilization, CORAF/WECARD proposes close coordination at the continental level, with FARA to ensure the effective flow of information that supports the mobilization of funds. The operational plan also envisages interaction with a broad range of development partners to encourage the mobilization of resources in support of the strategic plan. The

advocacy programmes and processes are assigned to the ICU of the SRO Secretariat.

Linkages between FARA and the RECs have been emphasised as part of FARA's role in implementing Pillar IV of the CAADP. Regional advocacy and resource mobilization initiatives constitute a major activity in the overall operational plan in support of programmes defined in the SRO operational plans. Resource support to strengthen NARS is mobilised through linkages with the programmes created by the RECs for the implementation of the CAADP agenda in their regions.

The Common Market for Eastern and Southern Africa (COMESA), for example, has prescribed the routes to be taken at the national and regional levels for CAADP implementation. Accordingly, to ensure that regional agricultural development programmes are CAADP-compliant, COMESA assists member states to target the agreed objectives of reaching Millennium Development Goal (MDG) 1 (eradication of extreme poverty and hunger and reduction by half of the proportion of people living on less than a dollar a day), and the delivery of 10% of national budgets to agriculture to attain a sustained 6% sector growth rate.

ASARECA and COMESA have signed a Memorandum of Understanding (MOU)⁹, through which they agree to cooperate in agricultural research and extension for the mutual benefit of their members. The agreement states specifically that ASARECA and COMESA shall individually or jointly mobilise financial resources for collaborative activities that they agree upon. There have been ongoing discussions to formalise a process whereby European Development Funds (EDF) will be allocated to ASARECA through COMESA to finance its own and its partner's, NARS', activities dedicated to the CAADP goals.

9. Memorandum of Understanding, The Common Market for Eastern and Southern Africa (COMESA) and The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), 2003

CORAF/WE CARD and Economic Community of West African States (ECOWAS) have also signed a cooperation agreement¹⁰ aimed at promoting effective implementation of innovative food and agricultural research programmes. To this end, ECOWAS has designated CORAF/WE CARD as its technical arm for the implementation of its agricultural priority research programmes. The areas of cooperation are stipulated in the agreement and relate to the framework of the ECOWAS Agricultural Policy (ECOWAP), and the Strategic Cooperation Plan developed by CORAF/WE CARD, with particular emphasis on research and dissemination of research findings (CAADP Pillar IV) in key areas elaborated in the agreement.

The special provisions in the ECOWAS-CORAF/WE CARD agreement stipulate that CORAF/ WE CARD will promote, through its Operational Research Units, cooperation, co-ordination and information exchange between stakeholders involved in agricultural and agro-food research. ECOWAS, for its part, within the context of this agreement, undertakes to facilitate mobilization of resources that enable CORAF/WE CARD to implement research priorities aimed at realising the ECOWAP objectives. It assists CORAF/WE CARD to effectively function as a coordinator to ensure greater efficiency

CORAF/WE CARD also signed a cooperation agreement with the Union Économique et Monétaire Ouest Africaine (UEMOA) in 2006¹¹ to promote regional competitive programmes for NARS activities.

It is proposed that all four SROs should seek similar opportunities for their RECs to play an increasing role in advocacy and resource mobilization in agricultural research and

development priorities. Opportunities may exist through ECOWAS, COMESA, and Communauté Économique des États de l'Afrique Centrale (CEEAC) as well as with the regional monetary unions West African Economic and Monetary Union (WEMU), UEMOA and Communauté Économique et Monétaire de l'Afrique Centrale (CEMAC) as well as with NEPAD and the AU.

ASARECA and the Scientific, Technical and Research Commission (STRC) of the African Union have signed an MOU¹² that appoints the former as STRC's associated institution in the eastern and central African region. Under the agreement, where available, the African Union provides ASARECA assistance and resources from member states and/or other sources to strengthen agricultural and NRM research in eastern and central Africa.

3.2. International conventions and agreements in support of sub-regional operational plans

As stated above, capacity is required at the national level to determine actions on a range of issues relating to international/regional conventions, regulations, guidelines and laws concerning trade and exchange of materials, goods, services and information. The FARA advocacy and resource mobilization operational plan shall define appropriate interventions for the harmonisation of these conventions as they relate to the implementation of CAADP Pillar IV at the SRO and NARS levels. Harmonisation should lead to greater efficiencies within the sub-region and consensus on procedural interpretation and action across national borders for increased benefits to stakeholders.

10. Cooperation Agreement between the Economic Community of West African States (ECOWAS) and the West and Central African Council for Agricultural Research and Development (CORAF/WE CARD), 2005

11. Accord de Cooperation Entre L'Union Economique et Monetaire Ouest Africaine et CORAF/WE CARD

12. Memorandum of Understanding between Organisation of African Unity – Scientific, Technical and Research Commission (OAU-STRC) and ASARECA, 2001

To this end, the advocacy and resource mobilization operational plan shall develop sufficient capacity to promote sub-regional collaboration and networking through an exchange of information, research and development, capacity building, adoption of common approaches and methods, and regional integration. Negotiating skills, as they relate to the conventions and agreements stated below and as part of a broader vision of achieving the CAADP goals, shall also be developed.

Interventions, policies, and programmes to safeguard Africa's interests in agricultural development, trade and the environment should ensure that FARA's constituent entities comply with, and benefit from, the relevant international and regional agreements, laws, rules and regulations, such as: (i) the Convention on Biological Diversity; (ii) the Biosafety Protocol; (iii) the International Undertaking on Plant Genetic Resources for Food and Agriculture; (iv) the Agreements of the World Trade Organization (WTO), including Trade-Related Aspects of International Property Rights (TRIPS), multilateral agreements in trade in goods, and agreement on agriculture; (v) agreements on the Application of Sanitary and Phytosanitary Measures (SPMS); (vi) the United Nations Framework Convention on Climate Change; and (vii) the Convention for the Control of Desertification.

FARA has determined that harmonisation of seed policies, laws, regulations and procedures are critical to ensure increases in the flow of seeds across boundaries in its sub-regions. Harmonised seed policies enhance the prospects of attracting investments in the seed industry; expand markets; and increase availability and accessibility of seed to farmers. Following the approach proposed by ASARECA¹³, FARA and the SROs are taking appropriate action to define interventions in their operational plan that address:

- Varietal evaluation, release, and registration procedures
- Seed certification procedures
- Phyto-sanitary issues
- Plant variety protection issues
- Import/export procedures, including documentation and conditions governing foreign investments in the seed sector

3.3. *Management of intellectual property*

According to FARA, management of intellectual property is a critical component of its IAR4D system, and indeed, all its region-wide programmes. It is proposed therefore that for each of these programmes, there is a clear and efficient delineation of approaches to exploit intellectual property.

FARA has therefore signed an MOU with the African Agricultural Technology Foundation (AATF)¹⁴ to engage in activities of mutual interest to raise agricultural productivity in Africa through research, technological development delivery and uptake. Specifically, AATF will advise FARA on public-private partnership matters in agriculture, and support FARA and its founding African members [ASARECA, CORAF/ WECARD, Southern Africa Development Community–Food Agriculture and Natural Resource Directorate (SADC–FANR), and Association of Agricultural Research Institutions in the Near East and North Africa (AARINENA)] and their NARS on intellectual property protection and technology licensing issues.

The SROs follow processes similar to those of ASARECA to codify the development and use of intellectual property.¹⁵ The advocacy and resource mobilization operational plans define interventions for the formulation of best practices in AR4D to be adopted by collaborators, and set out policy that provides:

13. ASARECA/ECAPAPA, *Seven Years of ECAPAPA, 1997-2004, Evolution and Performance*.

14. Memorandum of Understanding between FARA and African Agricultural Technology Foundation (AATF, 2006).

15. ASARECA Draft Intellectual Property Policy Manual, 2006.

- Clear objectives and principles of conduct in the management of intellectual property.
- Guidelines as to how and when intellectual property protection will be sought and exercised.
- Mechanisms for control over the use of intellectual property-protected material by recipients to ensure such use is consistent with FARA's mission and goals.
- Safeguards which ensure that FARA remains accountable to its beneficiaries.
- Guidelines for the use of intellectual property rights for the purpose of benefit-sharing.

4. Advocacy and resource mobilization implementation and results (inputs, activities, outputs, outcomes and goals)

The advocacy and resource mobilization strategy outcomes shall be evaluated in terms of the level of qualitative and quantitative compliance with FAAP objectives and principles, which are, in turn, related to the overall objective of the FARA strategy. Qualitative compliance relates primarily to the strategic objective of reformed African agricultural institutions and services, while quantitative compliance relates primarily to the new financing framework for African agriculture. The qualitative and quantitative compliances will be assessed through the use of key performance indicators at each level of responsibility.

Monitoring and Evaluation (M&E) units are in place at the FARA and the SRO Secretariats to develop overall frameworks to track progress towards outputs and outcomes (compliance) as defined by the performance indicators. These frameworks will provide the guidelines and procedures for the collection and analysis of data and information on indicators¹⁶. The M&E units will track both implementation

(inputs, activities, outputs) and results (outcomes and goals). Implementation monitoring is undertaken through the use of management tools (budget, staffing plans, and activity plans), and integrated with the implementation process. Results monitoring is through outcome mapping and participatory impact assessment. A capacity building programme that is specific to the needs of a results-based M&E system, equips members of the unit with the necessary skills to utilise the instruments for tracking implementation and results as described above.

The strategic objective (results) expected from the advocacy and resource mobilization strategy is not achieved solely through interventions in this field. The interventions from the other FARA networking-support functions (access to knowledge and technologies, policy and market analyses, and partnerships) also contribute significantly to it. The M&E capacity building is designed to include other stakeholders as appropriate to increase the scope for mapping outcomes and qualitative approaches for impact assessment.

Process performance indicators for reformed African agricultural institutions and services are required for:

- Government policies formulated to result in increases in investments in rural infrastructure; expansion of market opportunities; removal of formal and informal barriers to trade; establishment of food quality and safety standards; promotion of intellectual property rights, non-farm economy, and rural livelihoods.
- Institutional reforms for enhanced innovations capacity in AR4D through the integration of productivity interventions, markets, natural resource management and policies; integration of the private sector into institutional reforms to attract private interstate and out-of-state investments.
- Institution and service reforms to build a rural knowledge-based system that has working relationships with the health,

16. ASARECA, Monitoring and Evaluation Series Number 1- *Concept Paper for Operational Plan Development*, 2006

Box 5. FARA advocacy and resource mobilization strategy: new financing framework targets.

| New Financing Framework Targets – CAADP Pillar IV | New Continental Financing Framework Targets |
|---|--|
| <ul style="list-style-type: none"> • Total investment requirements estimated at US\$ 4.598 billion by 2015 • A rise of 7.2% in annual commitment – from US\$ 0.199 billion in 2002 to US\$ 0.496 billion in 2015 • Short-term requirements 2006– 2010 would amount t US\$ 1.5 billion • Medium-term requirements 2011–2015 would total US\$ 2.2 billion (Source – CAADP 2003) | <ul style="list-style-type: none"> • Agricultural research and development expenditure at the national level increases to 10% of national budgetary resources • Aggregate spending to boost Africa's agricultural productivity increases to at least US\$ 4 billion by 2010 • Current investment of about US\$ 25 million a year at sub-regional and continental levels increases to about US\$ 500 million • Global investments in African agriculture maintained at roughly US\$250 million (Source – FAAP 2006) |

education, rural planning and development sectors.

Performance indicators for quantitative assessment of progress towards a new financing framework for African agriculture are required for:

- Level of new investment funding for agricultural research from development agencies, the private sector and African governments.
- The rate of progress in doubling the current annual spending on agricultural research in Africa within 10 years .
- The rate of increase in spending an average of 7.2 % of the annual budget a year during the next decade.
- The rate of progress in achieving the financing requirement for CAADP Pillar IV, including agricultural research, technology dissemination and adoption, to support activities at the national, sub-regional and continental levels of the estimated US\$4.598 billion by 2015.¹⁷ (See Box 5).

Process performance indicators are required also for appraising intermediate results in achieving the new financing framework:

- Common mechanisms and procedures to align and coordinate development partners' support with national resources must be adopted.
- Common agricultural research and development agenda at the different FARA constituent levels agreed upon.
- Mutual accountability agreed upon through common systems of monitoring and evaluation.
- Increased resources from the public and private sectors allocated to fund agricultural growth programmes.
- Innovative methods for attracting operational funds from: (i) revenues from producer levies; (ii) devolution of commodity research to producer groups; (iii) commercialisation of research product and services through alliances with private sector entities; and (iv) development foundations.

17. African Union/NEPAD, *Comprehensive Africa Agriculture Development Programme*, 2003



Part 2

African agriculture and environment: assessment, sustainable development pathways and changing roles for research and development

1. Introduction

Over 70% of Africa's population is rural and depends directly on the land and the natural environment for its livelihood and well-being (IFAD, 2001). Maintaining the quality of the resource base of their land (soils, water, biodiversity) has a direct impact on its productivity, and thereby on poverty alleviation, human well-being, and economic development.

Despite the majority of the total labour force working in agriculture, the region is still unable to feed its growing population. In sub-Saharan Africa, more than 200 million people, mainly women and children, are undernourished (FAO, 2006). Average cereal yields in sub-Saharan Africa are the lowest in the world. The import of cereals in Africa as a whole increased from about 35 MT of cereals per year in 1993 to 50 MT per year in 2002 (FAO, 2004). In 1995, food imports accounted for 17% of the total food needs in the region. The rate is expected to at least double by 2010 (NEPAD, 2003).

Production increases that have been achieved over the past decades in sub-Saharan Africa

have been mainly obtained through expansion in cultivated area rather than through increases in yield (Henao and Baanante, 2006). This is in stark contrast to the rest of the world. Globally, over the past 40 years, intensification of cultivated systems has been the primary source (about 80%) of increased outputs (Cassman and Wood, 2005). For all developing countries, over the period 1961–1999, expansion of harvested land¹⁸ contributed to 29% of the growth in crop production, while increases in yield contributed 71%. However, for sub-Saharan Africa, increases in yield contributed only 34% [Bruinsma (2003) cited in Cassman and Wood (2005)].

Africa is one of the continents most vulnerable to climate variability and change because of multiple stresses and low adaptive capacity (IPCC, 2007). Climate change may, therefore, have substantial impact on the livelihoods of a large share of the African population (UNEP, 2006). Livestock assets may partly protect farmers against environmental shocks, especially

18. Harvested land accounts for both expansion in arable land and increases in cropping intensity.

in arid and semi-arid zones. Livestock contribute, on an average, to 35% and up to 80% of the agricultural gross domestic product (GDP) in some sub-Saharan African countries. For more than 70% of the rural poor, livestock is a component of their livelihood, providing them with both income (meat, milk, skins) and draught power (ILRI, 2007).

A healthy and productive environment is generally seen as critical to the success of Africa's development agenda and to achieving the MDGs. MDG 7 (ensuring environmental sustainability) underpins many of the other MDGs. It aims for principles of sustainable development to be integrated into national policies and programmes; environmental degradation to be reversed; poor people to gain access to safe drinking water and sanitation; and slums to be upgraded. Progress towards these targets is not being achieved. The proportion of land covered by forests continues to decline in sub-Saharan Africa (from 29% in 1990 to 27% in 2005); more than half of its population (63%) lacks access to basic sanitation and safe drinking water; and cities in sub-Saharan Africa are growing rapidly as are their slums (UN, 2006). Weak progress on this MDG will compromise achievement of the other MDGs and overall investments in poverty reduction (DFID, 2006).

The importance of the environment as a building block for sustainable agricultural development is reflected in the objectives and targets of the World Summit on Sustainable Development Johannesburg Plan of Implementation (UN 2002) and NEPAD, 2003. Neglecting the environment puts future generations at risk. The challenge for Africa is to use its natural resources to achieve sustainable agricultural growth while preserving it for future generations.

People derive multiple values from natural resources. The millennium ecosystem assessment conceptual framework (MA, 2003) distinguishes provisioning, regulating, supporting, and cultural services. Provisioning services include food, water, fibre, fuel and materials for

shelter; regulating services cover regulation of floods, drought, pests and diseases; supporting services include soil formation, carbon sequestration, water purification and nutrient cycling; and cultural services may be related to recreational benefits or religious convictions. Services other than provisioning services are difficult to quantify and have rarely been priced. Natural resources may also have a value to secure future options, i.e. non-use or sustainable use may conserve habitats, soil fertility, groundwater resources and biodiversity that may have important direct or indirect value in the future (UNEP, 2006). From the perspective of many ethical, religious and cultural points of view, ecosystems may have intrinsic value, independent of their contribution to human well-being (MA, 2003).

Unfortunately, the poor are often unable to capture the full benefits associated with the use of natural resources (UNEP, 2006). Land tenure problems may cloud the future for tenants, limiting their investment in natural resources that can preserve or enhance future direct or indirect value. Poor farmers may lack access to knowledge and markets to commercialise natural products, such as non-timber forest products. Transformation and commercialisation of processed goods may be beyond their control, or they may not be sufficiently vocal to claim an equitable slice of the marketing value chain.

Decisions concerning the environment have often been approached piecemeal, but rarely by pursuing multiple objectives. Pursuit of one objective such as increasing food production has often been at the cost of progress towards other objectives such as conserving biodiversity or maintaining water quality (MA, 2003). In Africa, slash and burn practices and increasingly shorter fallow periods to respond to rising food demands, have put a great strain on soil fertility and led to major mining of soil fertility, loss of organic matter, and soil erosion. The main environmental impacts of agriculture in Africa come from overgrazing, the conversion of natural ecosystems to agriculture and heavy reliance on low-input cropping systems,

leading to gradual breakdown of soil fertility. In addition, in high input systems, such as in peri-urban or irrigated systems, application of excess agricultural nutrients and pesticides often pollute surface and groundwater and restrict multiple uses of such waters.

The major challenge for Africa in the future is to enhance the output of farming systems while minimising the impact on the environment. Responding appropriately to this “double burden” represents a critical long-term challenge to modern agriculture (Conway, 1999, cited in Cassman and Wood, 2003). Sustainable agricultural practices can meet current and future societal needs for food and fibre, for ecosystem services, and for healthy lives, and do so by maximising the net benefit to society after weighing all the costs and benefits (Tilman et al., 2002). Alternative pathways to productive and sustainable agricultural development must ideally be based on a comprehensive analysis of the costs and benefits of intensifying or diversifying existing agricultural systems and/or converting natural ecosystems into agricultural land. Such pathways will greatly depend on local agro-ecological and socio-economic constraints and opportunities.

This section gives a brief overview of the status and rate of change of the environment in Africa and discusses drivers for such environmental change. Focusing on the level of farming system, the interdependency of agricultural productivity and environment is further analysed. Changing roles for research and development providers to achieve sustainable agricultural development pathways in such farming systems, and implications for FARA's new strategy and networking support functions are also discussed.

2. State and rate of change of Africa's environment

2.1. Land

Approximately 22% of Africa's land area is under forest and 43% is covered by desert

(NEPAD, 2003). The total area of land potentially suitable for cultivation is estimated to be 874 million ha, about 30% of the continent's landmass. About 210 million ha is currently cultivated, but only 150 million ha is harvested yearly (Henao and Baanante, 2006). Nearly 90% of staple food production in sub-Saharan Africa comes from rainfed farming systems (Rosegrant et al., 2002). Rainfall patterns vary widely and give rise to distinct agro-ecological zones (arid savannah, semi-arid savannah, sub-humid savannah, humid forest) that affect farming and farming systems across the continent.

Nearly 500 million ha in Africa are moderately or severely degraded, largely due to pastoral and agricultural systems. Soils are affected by water and wind erosion, chemical degradation (soil organic matter and nutrient loss, salinisation and acidification), and physical degradation (surface crusting and hardpans). Soil degradation is often accompanied by a decline in water-holding capacity and biodiversity. About 50% of land degradation in Africa is caused by overgrazing, 24% by activities related to agriculture, 14% by deforestation, and another 13% by overexploitation of the land for fuel wood (NEPAD, 2003). Land degradation increases desertification, reduces land productivity and causes loss of arable land.

Africa can be roughly divided into six regions with distinct environmental problems (Henao and Baanante, 2006): the arid region (North Africa and areas in southern Africa: salinisation, deforestation, desertification, drought); the semi-arid region (Southern Africa and Sudano-Sahel: soil nutrient mining, desertification); the dry to sub-humid region (West and Southern Africa: deforestation, desertification, erosion, soil nutrient mining); the moist to sub-humid region (Mountain East: erosion and low soil fertility); and the humid region (humid west and humid central and wetlands: low soil fertility).

Drylands in the semi-arid and arid regions (rainfall from 200 to 700 mm per year) make

up 54% of the total agricultural land (FAO, 2004). Drylands are particularly vulnerable to human activities such as expansion of agriculture, overgrazing and deforestation. This often leads to a gradual decrease in vegetation cover, exposing soils to erosion and affecting hydrological regimes, eventually resulting in simplification of the plant community and decreased biodiversity. Climatic variations may accelerate land degradation and ultimately desertification. There is a strong correlation between rainfall and greater land degradation at lower rainfall levels, illustrating the close relationship between land degradation and drought (ICRISAT and GEF, 2004).

Only 60 million ha, or 35% of the harvested land, receives good rainfall with good yield potential. Currently, unused agricultural lands are mainly located in the humid central region, where infrastructure is poor, rainfall variable and there is a high incidence of human, livestock and plant diseases (FAO, 2004). These lands often support rainforests that provide ecosystem services and crucial habitats for flora and fauna. The total forest area in 2000 was about 650 million ha, i.e. 22% of Africa's land area. Deforestation in Africa has been proceeding at a rate of 0.8% per year over the period 1990–2000. Deforestation occurs mainly because of logging for commercial exploitation and conversion for agriculture. Nigeria's burgeoning population puts a tremendous strain on forests. Countries like Ivory Coast and Guinea have lost extensive forests as a result of commercial logging and agriculture. The rural poor use forests for subsistence agriculture, fuel wood and other forest products (FAO, 2003a,b).

2.2. Soil fertility

Soil fertility, defined as a mixture of soil chemical, physical, and biological factors that affect land potential, is inherently low in sub-Saharan Africa, where nutrient-impoverished granites, basement sediments and sands cover about 90% of the African land surface (Smaling, 2005). Many studies suggest that soils in

Africa are rapidly losing nutrients. Analysis of nutrient balances generally indicate that soil nutrient depletion is more important in the Sudano-Sahelian regions of West Africa and in some countries in East Africa, like Sudan, Ethiopia, Somalia and Kenya. These nutrient balances include, on the one hand, major nutrient inflows from rainfall, organic manure, mineral fertilisers, symbiotic N-fixation and sedimentation; and, on the other, nutrient outflows through harvested produce and losses due to erosion, leaching, etc. Estimates of net losses for Africa as a whole are to the tune of 10 kg N, 4 kg P_2O_5 and 19 kg K_2O ha^{-1} $year^{-1}$ (Stoorvogel and Smaling, 1990). Extrapolating these results over space and time, one can calculate that an average of 660 kg N ha^{-1} , 75 kg P ha^{-1} and 450 kg K ha^{-1} has been lost during the last 30 years from about 200 million ha of cultivated land in 37 African countries. More recent data indicate similar values, i.e. total losses of N, P and K nutrients, especially due to erosion, ranging from 30 kg ha^{-1} $year^{-1}$ for Mediterranean and arid north Africa to 60 kg ha^{-1} $year^{-1}$ for the Sudano-Sahelian region (Henao and Baanante, 2006).

However, despite the “gloom and doom” of national-level studies and analyses, there are also important signs at the grassroots level that seem to nuance both the results and their interpretations (e.g. Scoones and Toulmin, 1999). The diversity of, on the one hand, socio-economic and demographic conditions in Africa and, on the other hand, of the farming systems themselves, is enormous and there are indeed several successful stories of adaptation and technological progress (Reij and Steeds, 2003), just as there are also examples of clearly non-sustainable “coping” strategies and severe signs of land degradation.

For example, at the village level, not all the fields are continuously depleted of their nutrients. Some may retain positive nutrient balances, especially those near the homestead (infields), while others, further away (outfields) may have negative balances.

These typical soil fertility gradients are due to preferential application of scarce nutrients from animal manure and other nutrient resources to infields. This ensures at least good yields in these limited areas and saves labour. Soil fertility management strategies need to consider these gradients (Tittonell et al., 2006) and the stock of nutrients in the soil. In some cases, nutrient application strategies may be designed that allow some mining of the soil's nutrients. This was for example done for irrigated rice systems in the Senegal river valley, where emphasis was placed on N and P nutrients, while allowing for mining of the soil's K reserves, as these reserves were estimated to be sufficient for at least a few decades (Haefele et al., 2004).

Soil nutrient depletion is usually accompanied by a loss in soil organic matter status, which may lead to degradation of soil structure and further decline in the capacity of the soil to retain nutrients and moisture. If soil organic matter content declines below certain thresholds, it will be very difficult to recuperate such soils. Nutrient sources available at the farm level to reverse nutrient depletion and boost agricultural productivity may be of mineral and/or organic origin. Organic materials that are produced within a farming system essentially recycle nutrients, except when it comes to nitrogen fixation.

One of the main reasons for nutrient depletion and low yields is lack of mineral fertiliser use in Africa due to unavailability and/or high prices. In Africa as a whole, only 21 kg of N, P_2O_5 and K_2O nutrients are applied per hectare per year, with a very low 9 kg ha^{-1} of N, P_2O_5 and K_2O nutrients if only sub-Saharan Africa is considered. Egypt has the highest rate of mineral fertiliser application (197 kg ha^{-1}) and Central Africa the lowest (0.8 kg ha^{-1}) (FAO, 2004). The right type of fertiliser for the target crop is often not available in Africa, where fertilisers may contain, e.g. too much P compared to N for application to cereals (Vanlauwe et al., 2001, Wopereis et al., 1999). Further, fertilisers in Africa are expensive; but

despite these high costs, mineral fertilisers often yield good returns in both rainfed (Vanlauwe and Giller, 2006; Wopereis et al., 2006) and irrigated systems (Donovan et al., 1999). Application of mineral fertilisers may, in the long run, lead to decreasing base saturation and acidification of the soil. N fertilisers may cause increasing K deficiency, decreasing pH and Al toxicity. On the other hand, long-term inputs of mineral fertiliser may delay the decrease in soil organic matter content upon cultivation by providing more crop residues, including roots. Organic C content of plots with fertiliser application is usually comparable to, or slightly higher than the C content of plots without addition of external inputs (Vanlauwe et al., 2001). The acidifying capacity of N fertilisers may even be beneficial by increasing the level of P in the soil or availability of P from rock phosphate. Africa is relatively rich in rock phosphate deposits. The main problem is their low solubility under non-acid soil conditions; further, the agronomic effectiveness is too low to generate interest in smallholder farmers (Vanlauwe and Giller, 2006).

It is now generally accepted that the best option for African farmers to improve soil fertility management is not organic inputs alone (e.g. through agro-forestry, legumes, composting) or only mineral inputs, but a combination of the two (Vanlauwe et al., 2002; Bationo et al., 2007). In any case, neither of the inputs is usually available or affordable in sufficient quantities. While fertilisers directly supply plant nutrients, organic inputs contribute to build the soil organic matter pool and improve soil structure, often resulting in reduced losses and improved capture of fertiliser nutrients by the crop.

2.3. Water and water scarcity

Africa's annual renewable water resources are abundant and amount to about 5,400 billion m^3 per year. However these water resources are characterised by extreme spatial and temporal variability, with over 60 shared water basins. Africa only uses about 4% of its

water resources (UNEP, 1999). Most of the freshwater comes from seasonal rains, which vary with the climatic zone. The wet equatorial zone produces 95% of Africa's total flow, while the arid and semi-arid zones produce only 5% (NEPAD, 2003). Groundwater is the main additional source of water in many rural areas, including for nearly 80% of the human and animal populations in Botswana. In Libya, groundwater accounts for 95% of the country's freshwater withdrawals. The highest rainfall occurs in West and Central Africa along the equator. Northern and Southern Africa receive 9% and 12% respectively of the region's rainfall. In Western and Central Africa, rainfall is exceptionally variable and unpredictable (UNEP, 1999).

Many African countries already face or will soon face water stress (1700 m³ or less per person annually) or scarcity conditions (1 000 m³ or less per person annually). Fourteen countries in Africa are subject to water stress or water scarcity, with those in northern Africa facing the worst prospects. This will increase to 25 countries by the year 2025. The North African annual average per capita water availability has dropped from 2,285 m³ in 1955 to 958 m³ in 1990, and is expected to reach 602 m³ by the year 2025. In Central Africa, Chad is facing water stress (1,588 m³ per capita per year), whereas the other countries in this region have abundant water resources (with a maximum of 120,382 m³ per capita per year in Gabon). All countries in Eastern Africa face water stress, with the lowest per capita water supply in Kenya (619 m³ per capita per year). Countries in Western Africa have widely variable water resources, with water scarcity problems of increasing magnitude in Ghana (1399 m³ per capita per year), Benin, Burkina Faso, Niger and Mauritania (134 m³ per capita per year). Countries in Southern Africa also have variable water resources, with water scarcity problems of increasing magnitude in Botswana (1357 m³ per capita per year), Malawi, South Africa and Zimbabwe (948 m³ per capita per year). The situation is getting worse as a consequence of rapid

population growth, expanding urbanisation, and increased economic development, and is compounded by unpredictability and climate change (UNEP, 1999; The World Bank, 2006a; Revenga, 2000).

Africa's poor exploitation of its water resources has huge social costs. Currently, about 300 million people lack access to safe water and about 313 million have no access to sanitation, causing major health problems and high infant and maternal mortality rates. In sub-Saharan Africa, only about 51% of the population have access to safe water, and 45% to sanitation. However, in Libya and Mauritius, almost the entire population has access to safe water and sanitation, compared to only about one-quarter in Chad, Ethiopia and Madagascar. Urban residents generally have better access to safe water and sanitation than those living in rural areas (UNEP, 1999; ECA, 2006), where women and children spend much time and effort fetching water from distant sources.

Agriculture is the largest user of water in the region. In virtually all the African countries the percentage of annual fresh water withdrawals for agriculture exceeds 70% and the average for Africa as a whole exceeds 80% (The World Bank, 2006a; Revenga, 2000). Globally, growth in food production in the last 50 years has been roughly matched by a proportional increase in water use, with grain yields rising 2.4 fold between 1950 and 1995 and irrigation water use rising 2.2-fold. Irrigated agriculture accounts for 40% of the global food production, even though it represents just 17% of the global cropland (The World Bank, 2006a). In Africa, only 6% of the cropland is irrigated, and, if sub-Saharan Africa is considered, this percentage drops further to 3% (representing 5 million hectares). The potential for expansion of irrigation is large. Total irrigation potential in the principal river basins of sub-Saharan Africa amounts to 35 million hectares (Sonou, 2002).

Large-scale irrigation has been instrumental in increasing productivity in northern Africa, especially in Egypt and Morocco (Henao and

Baanante, 2006) and in Mali and Senegal (Wopereis et al., 1999). Public-sector installation of irrigation facilities translates into high development costs, with mainly external financing, resulting sometimes in inappropriate designs damaging the environment. Management of such large systems that were originally constructed and operated by governments has now been largely transferred to farmers. Given the urgent need to increase productivity, development of the irrigation sector seems important, but this will mainly need to occur through small-scale systems and supplementary irrigation to reduce costs. Construction costs for irrigation infrastructure are very high because of numerous physical and technical constraints. The average investment costs for medium- and large-scale irrigation with full water control was US\$8,200 per hectare in 1992; it increases to US\$18,300 per hectare if other indirect costs are included, such as costs of roads, houses, and public service facilities (Rosegrant et al., 2002). A greater involvement of the private sector, focusing on higher-value crops, or of NGOs stimulating small-scale individual investment (foot pumps and micro-irrigation), is seen as important to develop water resources in Africa (Sally and Abernethy, 2002).

Unfortunately, most irrigation systems are inefficient, with 40% to 60% of irrigation water never reaching the crop, as it is lost to evaporation and runoff. This contributes to serious environmental problems such as soil salinisation and waterlogging, although water “lost” in this way may end up in aquifers, from where it can be pumped to irrigate nearby fields.

Next to development of increased irrigation potential, it is also of paramount importance to increase productivity in the rainfed areas and to ensure that rainfed land remains productive given changes in climate in the future. The potential of rainfed land is lower and more erratic than irrigated land, but productivity can be enhanced by small-scale water harvesting techniques to increase moisture content in the soil (Zougmore, 2006). However, given the

generally poor fertility status of Africa’s soils, productivity enhancement will always require a balancing of water and nutrients while fencing off yield-reducing factors such as pests, diseases and weeds. Construction of stone lining and grass bunds in Burkina Faso was successful in reducing erosion and water harvesting, but it did not raise sorghum yields unless soil fertility was enhanced through either organic inputs or mineral fertilisers (Zougmore, 2006).

Further, fresh water fisheries are a main source of income and protein for millions of Africans. The main threats to water quality in Africa include eutrophication, pollution from industrial wastes and the proliferation of invasive aquatic plants such as the water hyacinth (*Eichhornia crassipes*) and weeds (*Salvinia molesta*) (UNEP, 1999).

2.4. Climate change

Distinct wet and dry seasons characterise the climate of most of Africa, with equatorial regions generally having two rainy seasons. Rainfall predictability varies widely across the continent, with high predictability and a relatively stable rainfall regime around Lake Victoria in eastern Africa for instance and poor predictability in the West African Sahel. Climate change is not simply something that will happen in the future. The African continent is about 0.5°C warmer than it was 100 years ago (Thorton et al., 2006). Rainfall in the Sahel has been declining over the last few decades. Significant reductions in rainfall and decreasing river flows have been observed over the past decades over large areas in Africa. A 20% decrease in rainfall during the 1970s and 1980s in West and Central Africa translated into a 50% reduction in annual flows of major rivers in the region (Hellmuth et al., 2007; Kabat et al., 2003).

Climate change is caused by global greenhouse gas emissions. Although there is uncertainty about what the average global temperature increase will be (modelled increases range from 1.4°C to 5.8°C by the end

of this century), the different models agree that there will be large regional variability. African countries are generally considered more vulnerable to the effects of climate change than the more developed countries. This is largely attributed to a low capacity to adapt, linked to a high reliance on natural resources, limited ability to adapt financially and institutionally, low per capita GDP and high poverty, and a lack of safety nets (Thorton et al., 2006).

In Africa, the tendency is towards greater extremes. A recent detailed study (Thorton et al., 2006) linked predicted changes in the length of the growing period due to climate change, with data on vulnerability based on indicators associated with natural, social, financial, physical, and human capital on the basis of agricultural system types by country. Results indicate that many vulnerable regions are likely to be adversely affected by climate change in sub-Saharan Africa. These include the mixed arid–semi-arid systems in the Sahel, arid–semi-arid rangeland systems in parts of eastern Africa, systems in the Great Lakes region of eastern Africa, the coastal regions of eastern Africa, and many of the drier zones of southern Africa.

Africa's contribution to greenhouse emissions is negligible; in fact it contributes only 3.6% of global CO₂ emissions (The World Bank, 2006a). Industrialised countries are by far the largest contributors to climate change, and they place an additional burden on management of natural resources in Africa. This is seen as a further reason for financial assistance to the South, in line with the "polluter pays" principle (Kabat et al., 2003). The likely impacts of climate change in Africa present a global, ethical challenge as well as a developmental and scientific challenge (Patz et al., 2005 cited in Thornton et al., 2006).

2.5. Biodiversity in agricultural systems

Africa has more than 50,000 known plant species, 1500 bird species and 1000 mammal species (NEPAD, 2003). Studying biodiversity

in agricultural systems (agricultural biodiversity or agro-biodiversity) is of paramount importance because some of the world's most productive and biodiversity-rich areas fall within the ambit of agricultural land-use areas. Hotspots of biodiversity are generally intensively used, and support large and growing populations (Kaihura and Stocking, 2003).

Agro-biodiversity is a relatively new concept (IPGRI, 2006; Jackson et al., 2005; Kaihura and Stocking, 2003). It encompasses all the plants, trees, animals, insects, microbes, pathogens and fungi in agricultural systems.

Cassman and Wood (2003) make a very useful distinction between biodiversity inside and outside cultivated systems: biodiversity is cultivated in such systems (the genetic resources introduced by the farmer); biodiversity supports the functioning of the cultivated system (associated agricultural biodiversity); and cultivated systems harbour biodiversity that has no direct agricultural functional significance. In addition, cultivated systems have an impact on biodiversity outside the cultivated fields – in surrounding areas – and through both expansion and intensification of agriculture. The diversity of genetic resources (number of varieties and genetic variation within varieties) is generally higher in traditional landrace-based systems as compared to modernised systems, influenced by breeding programmes. Associated agricultural biodiversity includes soil biodiversity important for the soil nutrient and water balance, pollinators, such as bees, flies and moths and natural enemies of crop pests, such as insects, spiders and other arthropods (Cassman and Wood, 2003).

Below-ground biodiversity (soil biodiversity) is an important contributor and indicator of soil health. The importance of this diversity is only just being fully recognised, with most studies being conducted in temperate regions. Soil organisms provide a range of essential ecological services, such as mineral nutrient cycling, carbon sequestration, maintenance of the soil's physical structure and water retention capacity, provision of nutrients to

plants (mycorrhizal fungi and nitrogen-fixing bacteria) and maintenance of plant health through natural predation and parasitism of plant pathogens and pests (TSBF-CIAT, 2007).

Management practices can influence biodiversity in agricultural systems. Reduced agro-biodiversity can increase the vulnerability of farmers, especially those who depend on ecologically sustainable food production, leading them further into poverty (IPGRI, 2006). Generally, agriculture, especially intensive agriculture, is seen as destructive to biodiversity, both below- and above-ground, as it converts natural ecosystems into managed mono-cropped ecosystems. Such intensive agriculture may indeed lead to reduced biodiversity both on- and off-farm, through the use of excessive nutrient inputs and/or pesticides. Pesticides and herbicides degrade ecosystems and decrease biodiversity. More ecologically sound farming systems are being promoted worldwide to protect future values of ecosystems related to biodiversity, as well as to enhance productivity of such systems. Numerous examples now exist of cropping practices and cropping systems that protect biodiversity and apply agro-ecological principles to reduce reliance on external inputs and protect ecosystem services, which at the same time have beneficial effects on crop productivity (IPGRI, 2006; Jackson et al., 2005). Integrated pest management, minimum tillage and multicropping can increase biodiversity. However, if such measures reduce productivity per unit land area and time, this may lead to expansion of crop area – thus trading increased biodiversity within cultivated systems for a decrease in the extent of natural ecosystems and the biodiversity they contain (Cassman and Wood, 2003).

African wetlands have a particularly rich biological diversity, with many endemic and rare plant species as well as wildlife such as migratory birds. However, despite being among the most biologically productive ecosystems in Africa, wetlands are often regarded locally

either as wasteland or as habitats for pests and diseases. If these areas are converted into agricultural land, biodiversity is usually adversely affected.

3. Drivers of environmental change in agricultural systems

Natural resource conditions determine the potential magnitude of environmental services. The actual magnitude of these services may be affected by farmer management. Farmer management may also affect natural resource conditions in the long term, and, therefore, future delivery of environmental services. Farmer management is, therefore, a direct driver of environmental change in agricultural systems, both in terms of environmental services and change in the status of natural resource conditions. Global climate change also affects natural resource conditions. In turn, farmer management is determined to a great extent by natural resource conditions. Such conditions are often highly variable because of erratic weather patterns, high short-range variability in soil types, and history of farm management.

Indirect drivers of environmental change are those that determine farmer decision-making within the farming context, and include farmer assets and health; farmer knowledge, perceptions and degree of organisation (the extent to which local communities are effectively in charge of environmental stewardship); and access to markets, technologies and information. Underlying factors causing environmental change are related to demographics, economic growth and policy and the macro-economic environment (adapted from Cassman and Wood, 2005).

3.1. Direct drivers

Farming systems and practices

The choices farmers make with respect to the production system, technologies and whether to expand into uncultivated areas often have direct implications on environmental resources.

For example, high input systems such as irrigated rice, cotton and horticultural crops often use substantial amounts of fertilisers and pesticides. Cultivation of annual crops on sloping land may enhance the risk of erosion, unless crop residues are left on the soil surface. Fertilisation of crops with manure from livestock may enhance soil fertility of fields near the homestead. In turn, farmers' choices of systems and practices are greatly determined by the natural resource conditions themselves, as explained above.

3.2. Indirect drivers

Farmer assets and health

Large variability exists in terms of farmer wealth and access to resources such as land and labour, even at the village level, with important implications for the choice of production systems and ultimately yields. Vanlauwe et al. (2005) stressed the need for site-specific crop and nutrient management to allow for differences in soil fertility and farmer wealth. This farmer diversity and complexity of growth conditions are very common in Africa and complicate up- and out-scaling of promising technologies.

Poor health has a significant impact on human capacity, with severe social, economic, and environmental consequences. In Africa, 32% of the people are undernourished, a percentage that has not changed since 1990, with prevalence of more than 70% under-nourishment in Eritrea and the Democratic Republic of Congo (The World Bank, 2006a). Of the 45 countries most affected by HIV/AIDS, 35 are in Africa. About 26 million Africans are living with HIV/AIDS (UNAIDS and WHO, 2005). The HIV/AIDS pandemic has resulted in many African farms being run by children who have not profited from parental guidance on best agricultural practices.

HIV/AIDS has especially affected women – 57% of the people affected by HIV/AIDS are women in sub-Saharan Africa. In many parts of Africa, women assume a major

responsibility for the preservation and/or sustainable use of natural resources (The World Bank, 2006a; UNEP, 2006) and their poor health will make it more difficult for them to invest in maintaining the natural resource base of their farms.

Farmer knowledge, perceptions and degree of organisation

The farmers' indigenous knowledge is often invaluable to ensure environmental sustainability of farming systems. Willingness to accept new ideas and technologies often depends on the farmer's age and education level (Cassman and Wood, 2003). Risk avoidance through diversification of agricultural activities is often the main concern for the majority of Africa's subsistence farmers. Sharing of knowledge and collective learning and action within a farmer community may also lead to better co-ordination of farm activities with implications for natural resource conditions, e.g. coordination of planting dates may limit the incidence of damage by insects and, therefore, the need to apply pesticides (Defoer and Wopereis, 2007). Organisation of farmers into cooperatives at the village level may improve management of communal resources, such as grazing grounds, watersheds, wood lots, etc.

Access to markets

Markets, not production, increasingly drive agricultural development (The World Bank, 2006b). An important pillar for agricultural development is improved access to input (labour, land, credit, seeds, fertilisers, pesticides) and output (agricultural products) markets. Improved access to markets may have positive and negative implications for the environment. If access to markets implies mining the natural resources without their replenishment and maintenance, agricultural development will not be sustainable due to the environmental damage. However, markets may also be drivers of sustainable agricultural development, where investments are made to ensure maintenance of productivity and quality of the natural resource base. This will especially be

the case if farmers are not just producers of primary goods, but start to claim an equitable slice of the value chain, and become actively involved in processing and commercialisation of agricultural products. Ensuring that smallholder farmers get an equitable slice of the value chain will generally improve the livelihoods of their families, reduce poverty and take away one of the main drivers of environmental degradation. However, in some cases, increased profits may also lead to more natural land being brought under cultivation.

Market entry for Africa's farmers is often limited by insufficient access to credit and market information, insufficient or variable quality of their agricultural products and organisational difficulties. Food safety and environmental standards imposed by richer countries may in effect translate into indirect trade barriers for African goods (Veena, 2006). However, for many African farmers, relevant markets will often be at a local/national or a sub-regional level rather than at a global level.

Markets for environmental services other than production, such as carbon sequestration, watershed management and biodiversity conservation may gain greater importance in the future (DFID, 2006).

Access to technologies and information

Lack of access to technology and information is still one of the most important indirect drivers of environmental change. The world is changing very fast, driven by science and technology. However, many of the innovations that could potentially be of benefit to Africa are out of reach and benefits are not shared equitably around the planet (InterAcademy Council, 2004a). Studies of economic returns in public sector agricultural research have documented substantial and consistent returns on investment (Cassman and Wood, 2003). Africa's capacity in agricultural science and technology needs to be enhanced, as it is illusory to assume that innovations developed

elsewhere can be of immediate use in Africa. Local scientific and technological capacity is essential for using and contributing to knowledge networks and for adapting and up- and out-scaling of innovations to meet local needs (InterAcademy Council, 2004a).

Many technologies related to soil and water conservation are not adopted because they are often labour intensive. They also often provide benefits only after several years and/or may provide benefits off-site that farmers may not be able to recuperate. These characteristics make them unattractive to farmers in countries where conservation efforts are not subsidised and in situations where assets are limited (including labour) and land tenure insecure (Cassman and Wood, 2003).

3.3. Underlying factors

People and poverty

The population of Africa has grown from 631 million in 1990 to 874 million in 2004, and it is projected to increase further to 1223 million in 2020, with 40% to 50% of the population falling in the below-15-years-of-age category (compiled from The World Bank, 2006a). By 2020, the urban population is expected to be 646 million, up from 302 million in 2000. Rapid population growth and urbanisation has resulted in environmental degradation. Almost 60% of the tropical forest areas that were cleared in Africa between 1990 and 2000 (52 million hectares) were converted into permanent agricultural smallholdings (UNEP, 2006).

Poverty is widespread in Africa but highly variable, e.g. 7% of Tunisia's population, 34% of South Africa's population and more than 90% of Nigeria's population live on less than US\$2 per day (World Bank, 2006a). Poverty limits access to production inputs such as credit and to new technologies that improve crop and natural resources management and purchasing power to buy agricultural products in the market.

The policy, and socio-economic environment

The policy and socio-economic environment determines to a large extent whether farmers are able or willing to invest in measures that preserve the natural resource base and avoid land degradation, to access local, regional and global markets, or to mitigate or reduce off-farm impacts (externalities), such as leaching of nutrients or pesticides into ground or surface water.

Land tenure contracts may discourage farmers from investing in sustainable land management practices, as their future hold on the land is uncertain. This leads to short-term thinking, often resulting in agricultural practices that lead to gradual degradation of natural resources. Governments may “set aside” natural lands to protect wildlife, biodiversity and watershed and define regulatory policies for agriculture in the immediate vicinity of such protected areas.

Water fees paid by farmers in large-scale irrigation systems often do not reflect the real costs of infrastructure maintenance, resulting in large inefficiencies in water use and often land degradation due to poor drainage systems. Also, inconsistent fertiliser policies may discourage input dealers and limit farmer access to such inputs.

4. Pathways for sustainable agricultural development

The diversity of farming systems in which farmers operate is huge. Fourteen major farming systems exist in Africa (Dixon et al., 2001). These systems range from irrigated systems (rice, vegetables, livestock) with a relatively low potential for poverty reduction but a high potential for agricultural growth to rainfed agro-pastoral millet/sorghum systems with a high potential for poverty reduction but a low/moderate potential for agricultural growth. They are at different stages of intensification and/or diversification; operate in vastly different agro-ecological zones; target different crops and/or livestock; and

face vastly different environmental challenges. The question is how can sustainable agricultural development that responds to the need of increases in agricultural output, profitability and environmental protection be achieved in these different farming systems. Three approaches need to be considered to address the direct and indirect drivers and the underlying factors identified in section 3: (i) development of technologies or practices that raise yield levels and profitability and protect the environment; (ii) adapting to the local farming context; and (iii) tackling the underlying policy and socio-economic factors affecting the environment.

4.1. Raising yield levels, profitability and protecting the environment

Increasing yields

The potential or maximum yield of a crop (Y_{\max}) is determined by the climate (minimum and maximum temperatures and solar radiation), sowing date, the characteristics of the variety chosen by the producer, and, in the case of rainfed crops, water availability in the root zone. For a given sowing date, Y_{\max} is not constant but fluctuates from year to year because of climatic variability. The producer cannot change the weather, but he or she can choose a sowing date that will allow him or her to exploit the weather conditions more productively and to select a variety adapted to these conditions. The actual average farmer yield (Y_f) is often much lower because of a range of constraints that interfere with the crop, i.e. *growth limiting* factors, such as lack of water and/or nutrient deficiencies, and *growth reducing* factors, such as weed pressure, diseases and pests. In Africa, yield gaps ($Y_{\max} - Y_f$) are usually very large in both rainfed (Becker et al., 2003) and irrigated systems (Wopereis et al., 1999), and there is, therefore, great scope for increasing yields in existing agricultural lands. Raising yield on existing farmland (intensification) is essential to avoid bringing more natural ecosystems into cultivation.

Increasing nutrient-use efficiency, maintaining and restoring soil fertility

Improving crop nutrient-use efficiency from organic inputs and mineral fertilisers will enhance productivity and lead to fewer nutrient losses, benefiting the environment and increasing profitability.

An important feature of low-input, rainfed smallholder farming in sub-Saharan Africa is the occurrence of strong heterogeneity in crop growth over small distances. Often, crop performance declines with increasing distance from the homestead. Such gradients in crop performance occur due to the interaction between soil fertility and management factors, with farmers allocating more nutrients and more resources, time and effort to fields closer to the homestead, which is considered less risky. Farmers do not deliberately adopt this strategy; rather they do so because of a lack of resources (Tittonell et al., 2005; Tittonell et al., 2006; Giller et al., 2006).

A second important feature of these systems is the heterogeneity in farmers' access to resources. Options to improve nutrient use efficiency and therefore agricultural productivity need to take into account socio-economic factors such as household wealth, family structure, production orientation (self-subsistence, market), main source of income and main types of constraints faced by farmers. Ownership of cattle is often considered to be the most important indicator of wealth status (Tittonell et al., 2005).

Options for enhanced nutrient-use efficiency need to be devised for different categories of farmers, and crop and natural resources management needs to be field specific. Decisions need to be made on how to allocate scarce resources (especially labour, nutrients) across the farm among different fields to optimise production and maintain soil fertility. The low organic matter status of outfields generally means that such fields do not respond to

mineral fertilisers and the recovery and use efficiency of fertiliser nutrients are very low. Their soil fertility status needs to be improved through fallowing, indigenous legumes or application of animal manure. Unfortunately, such fields are often owned by the poorest farmers who do not have access to soil rehabilitation measures. Relatively rich home fields may not respond to mineral fertilisers because water rather than nutrients limit productivity.

In intensive systems such as irrigated rice systems in Senegal, Mali or Nigeria, the main tool to improve productivity and profitability is to enhance the recovery of fertiliser nutrients. This is especially true for nitrogen, as, on an average, 70% of the nitrogen fertiliser is lost in irrigated rice systems in the Sahel. Enhanced fertiliser nutrient recovery can be obtained mostly through improved crop management (synchronising the timing of fertiliser application with plant nutrient demand, timely weeding, etc.) (Wopereis et al., 1999).

Increasing water-use efficiency and development of water resources

Under rainfed conditions, water availability is a function of rainfall, redistribution of rainwater by runoff and run-on, and losses by evaporation and leaching. Given the low inherent soil fertility of most African soils, soil nutrient status rather than soil water availability often limits crop production. However, in areas where soils are shallow, with low water storage capacity or where rainfall cannot penetrate into the soil (e.g. because of crusting), water can severely limit growth even at relatively high levels of annual rainfall because water cannot be used by the crop. Good results can usually be obtained by combining water-harvesting techniques (e.g. breaking the crust and blocking runoff to let water infiltrate into the root zone) and improved soil fertility management (e.g. organic inputs in combination with mineral fertilisers in micro-doses).

In areas with relatively good soil fertility, such as floodplains and inland valley lowlands, lack of water control may cause drought or

flooding, and thereby limit crop growth. In such cases, simple water control measures, such as bunding could reduce risk and give an incentive to increase production through improved soil fertility management.

The water-use efficiency of irrigated systems can be improved by reducing conveyor losses and increasing the efficiency of the irrigated system as a whole. This may entail, among other things, improving the maintenance and lining of canals. Drip irrigation systems, e.g. in horticulture systems, may dramatically increase water-use efficiency (Sally and Abernethy, 2002). At the field level, water use efficiency may be further improved through the introduction of shorter duration and/or more drought-tolerant varieties, reduced water use during land preparation, changing to less water demanding or higher value crops and cropping systems.

To satisfy the food needs of Africa, water and nutrients will play a key role. Best solutions will be region-specific and will involve development of small-scale (supplementary) irrigation rather than the construction of large dams and river diversions, measures to use rainwater and irrigation water more productively, and development of alternative cropping systems or cropping practices that better match the quantity and quality of water available to plant needs.

Integrated pest and disease management

Weeds are a major problem throughout Africa and put great strain on the already overstretched labour resources. Ecologically sound methods to control weeds include the development of more competitive crop varieties (either through breeding or biotechnology), the introduction of simple hand tools to control weeds, or the exploitation of allelopathy mechanisms. Diseases and pests also reduce yields across farming systems, and Integrated Pest Management (IPM) measures can greatly reduce the need to use pesticides.

Mixed farming and sustainable livestock production

Mixed farming systems enable farmers to diversify agriculture, to use labour more efficiently, to have a source of cash for purchasing farm inputs and to add value to crops or their byproducts (Cassman and Wood, 2003). They also represent a means to recycle nutrients within the farm. Livestock production, in particular, can provide an important contribution to sustainable agricultural development in Africa. Livestock grazing, and collection, storage and application of manure to crops are crucial nutrient transfer mechanisms for smallholder farmers. Ruminants are also very efficient in converting low-quality forage into high-protein milk and meat. Crucial issues are the avoidance of over grazing, which can lead to extensive land degradation, and improvement of animal health.

Growing urbanisation may also provide opportunities for mixed crop-livestock systems, but this will require intensification of livestock-keeping methods, such as feeding animals on crop residues and investment in fencing or stabling (Tiffin, 2007).

Improved management of climatic risk

Even without climate change, a large number of African countries will face serious water problems by 2025–2050. Farmers will require increased economic buffer capacity (savings/loans/micro-insurance schemes) and alternative water and crop management options better adapted to changes in water supply. African farmers already make decisions that aim to minimise climate risks and exploit climate opportunities: e.g. they try to time the planting of their crops to coincide with the onset of rains. However, climate change may drastically change growth conditions, and the farmer's indigenous knowledge may be inadequate to respond to such changes. There is, however, potential to improve local climate risk management in water scarce environments through transfer of knowledge between regions, coun-

tries and continents. Some of these measures have already been discussed under the section water and water scarcity (2.3). Combining water-harvesting techniques with integrated soil fertility management techniques will be crucial, as this will ensure more biomass per unit of water (Röckström et al., 2001; Fofana et al., 2004). Strategies to deal with climate change in irrigated agriculture include reducing water losses and decisions on changes in storage capacity (Kabat et al., 2003). In both irrigated and rainfed environments, attention should be paid to alternative cropping practices (land preparation techniques, alternative sowing dates, more drought-tolerant varieties, more intensive weeding) and cropping systems that can better cope with increased climatic risk (e.g. introduction of less water-demanding crops).

4.2. Adapting the farming context

Strengthening rural organisations and collaboration

Community-based organisations and farmer organisations need to play a key role in environmental stewardship, but they are often weak or non-existent. There is a general lack of truly innovative collaborative arrangements that open up local/national, sub-regional or global markets and add value to agricultural produce while protecting natural resources.

From linear technology transfer to innovation systems approaches

Research and extension organisations often promote technical interventions through linear technology transfer approaches and conventional partnerships. A much more holistic approach is needed, that truly involves farmers in education, research and extension (InterAcademy Council, 2004b). Agricultural research and development institutions need to become learning institutions themselves to be able to effectively facilitate environmentally sustainable innovation processes (Defoer and Wopereis, 2007), combining indigenous and

scientific knowledge. A thorough understanding of the local context and of agro-ecological and socio-economic principles in agricultural production processes is required. The Agricultural research and development institutions need to be equipped with systems tools and methodologies to interpret and extrapolate biophysical and socio-economic data and to conduct scenario and risk analyses related to the impact of agriculture on the environment at different scales.

Education

Students need to be exposed to an agro-ecological approach to agriculture and the environment, and be made aware of the importance of markets and value chains for agricultural development. This will require reform of university curricula, and strengthened agricultural science and technology education at primary and secondary school levels (InterAcademy Council, 2004b).

4.3. Policies and incentives to implement sustainable practices

Policies

The policy environment determines to a large extent whether farmers are able or willing to invest in measures that maintain the natural resource base and avoid land degradation, to access local, regional and international markets, or to mitigate or reduce off-farm impacts (externalities), such as leaching of nutrients or pesticides into ground or surface water. Improved land tenure policies are crucial in Africa to give smallholder farmers more security and incentives to invest in natural resources management.

The lack of access to mineral fertilisers is a major drawback to sustainable agricultural development in Africa. Given the low nutrient status of Africa's soils, raising productivity sufficiently to keep pace with population growth will need enhanced use of mineral fertilisers, especially nitrogen fertilisers. Mechanisms need to be developed to ensure improved

access to affordable fertilisers for smallholder farmers; this may include voucher systems, micro-credit schemes and distribution of fertilisers in small packs.

Labelling of agricultural products that are derived from agriculture with minimal impact on the environment may give these goods premium value and lead to better access of markets in the industrialised world. However, introduction of quality standards based on environmental considerations may also lead to greater protection of the western markets.

Prices for irrigation water are usually very low, giving farmers little incentive to improve irrigation practices. Better management of water resources is crucial to mitigate water scarcity problems and avoid further damage to aquatic ecosystems (Revenga, 2000).

Schemes may also be devised to compensate farmers for providing environmental services that benefit others or the society as a whole, such as planting trees to improve carbon sequestration, biodiversity conservation and watershed preservation and management.

Private sector involvement

In general, there is a need for greater incentives for the private sector to increase investments in lower-income developing countries. Unless reward structures also reflect the value of ecosystem services, there will be little incentive for the private sector to invest in sustainable agricultural methods in developing countries. Without adequate investments, yield gains and environmental protection may be insufficient for a transition to sustainable agriculture (Tilman et al., 2002).

5. Priorities and changing roles for agricultural research and development

Considerable knowledge has been accumulated on different approaches to manage crops, livestock and natural resources in smallholder farms in Africa. However these approaches have often been too

fragmented in the past to lead to tangible results. Sustainable agriculture will require new technologies and methodologies that lead to sound decision making at the field, farm and community levels based on indigenous and/or scientific knowledge. Four major changes in agricultural research and development in Africa are needed to respond to the challenge of accelerating agricultural innovation and productivity while protecting the environment. There is an urgent need for: (i) new interactive approaches to creation of knowledge and innovation; (ii) integrated and multi-disciplinary approaches to problems and opportunities; (iii) tools to allow multi-scale analyses; and (iv) greater flexibility in the face of uncertainty.

5.1. New interactive approaches to creation of knowledge and innovation

Dissemination of information can no longer be a one way linear process from research to extension agencies to farmers. Researchers need to start to play a more facilitating role to promote an active and iterative exchange of information among scientists and farmers. Natural resource management in farming systems requires going through iterative cycles of diagnosis, analysis, testing options and monitoring and evaluation. The emphasis should be on agro-ecological principles rather than technology prescription. There is, therefore, an urgent need to abandon linear technology transfer from researcher to farmer in favour of iterative, participatory innovation systems. Such innovation systems should consider and use indigenous knowledge and seek synergies and linkages with scientific knowledge. There is also an urgent need to evolve from information dissemination to knowledge networks, by providing both data and decision-support tools to adapt knowledge to local settings.

5.2. Multi-disciplinary approaches

The complexity and diversity of farmer reality in Africa requires multi-disciplinary approaches to problems and opportunities in agricultural production while protecting the environment. A key issue is to bring ecological sciences to the forefront. Important synergies can be obtained by making use of the environmental services of the natural resource base and judicious use of external inputs, such as mineral fertilisers. Farmers need to be brought into the agricultural value chain to enable them to get out of the poverty cycle and start investing in their natural resources. In general, holistic and integrated approaches combining socio-economic and biophysical disciplines are required to really 'get things together': focusing on people, productivity and markets, and preservation of natural resources. Too often, agricultural problems have remained intractable because of the failure to deal with issues in a sufficiently holistic way (NEPAD, 2002).

5.3. Multi-scale approaches

Transcending scales of space and time in environmental issues is of crucial importance. Tackling the water scarcity issue in Africa will require research and interventions at different scales, from field, to farm to watershed to the river basin level. This moving between scales will require solid datasets and sophisticated data interpretation tools. There is a need for such tools to move not only between field, farm and surrounding land and water bodies dealing with natural resources, but also between field, farm and markets to explore the best-bet options for production, transformation and commercialisation in the agricultural value chain.

5.4. Greater flexibility in the face of uncertainty

The world is changing at an ever-faster pace. Research and development institutions need to become more flexible to rapidly respond to emerging environmental problems and

opportunities. Much can be gained from partnerships and from valuing diversity in knowledge. There is a great need to reinforce and establish north-south and south-south partnerships, e.g. between research and development and farmer organisations and to establish knowledge networks and shared databases on critical environmental issues. Much can also be learned from successes and failures in agricultural development projects "on the ground" and such lessons need to be shared more widely. Research and development institutions need to become learning institutions themselves. Training institutions and universities need to continuously adapt curricula to include up-to-date knowledge on environmental issues.

6. Implications for FARA and its networking functions

FARA's new strategy aims to provide strategic continental and global networking support to reinforce the capacities of SROs and NARS in the following areas: (i) advocacy and resource mobilization; (ii) access to knowledge and technologies; (iii) regional policies and markets; (iv) capacity strengthening; and (v) partnership and strategic alliances. Environmental sustainability cuts across various networking support functions. The importance of environmental issues in promoting sustainable improvement in African agricultural productivity in these networking support functions of FARA is highlighted in the sub-sections that follow.

Advocacy and resource mobilization

Greater public and private investments in technology and human resources are needed to make agricultural systems more sustainable. Global research expenditures in developing countries are less than 1% of the agricultural gross domestic product (Tilman et al., 2002) and often the research is funded by the donor community. For eleven countries in sub-Saharan Africa, agricultural research and development spending as a share of

agricultural gross domestic product amounted to 0.85% in 1981 and fell to 0.76% in 2000 (InterAcademy Council, 2004b). The reduced investment is reflected in output, with African scientists producing less than 1% of the world's scientific publications and Africa's share of world patents being almost nil (InterAcademy Council, 2004b).

FARA must raise awareness of the need for greater investments in agricultural research and development in Africa through the SROs and the NARS. This advocacy role will demand studies on the costs to society if no action is undertaken to reverse or stop environmental degradation, such as the recent desertification study (Requier-Desjardins and Bied-Charreton, 2006).

FARA also needs to play a pro-active role in prioritising environmental issues of importance at the continental level, and facilitate and harmonise interaction between the international donor community, SROs, and private companies. FARA must also play a more pro-active role in approaching donors and influencing future calls for projects, enabling African and non-African scientists to collaborate on environmental issues of mutual concern. It must also ensure follow-up on commitments related to agricultural research and development and the environment made at the continental level, such as in the Action Plan for the Environment Initiative of NEPAD (NEPAD, 2003) and the Framework for African Agricultural Productivity (FARA, 2006).

Access to knowledge and technologies

Access to knowledge and technologies to monitor, anticipate, reverse, mitigate or prevent environmental degradation is seriously lacking in Africa. Much more use should be made of information and communication tools now becoming widely available across the continent. FARA must stimulate the development of mechanisms to access information related to the environment and systems, and decision-making tools that enable interpreta-

tion of information in local contexts. A part of the work will involve stimulating the development of reliable and up-to-date information bases on the status and rates of change in degradation of Africa's natural resources. This will require research on environmental indicators and their up- and down-scaling and harmonised data collection procedures and data standards across the continent. The research is especially important because degradation of natural resources, such as watersheds, river basins and livestock and plant diseases, and threats such as climate change, do not respect national boundaries. Much can be gained from a harmonised approach towards improved access to knowledge and technologies across the continent to make the best use of the human, infrastructural and financial resources available.

Regional policies and markets

Many environmental issues suffer because of poor policies or failures in budget allocation (DFID, 2006). The farmers who depend most on natural resources frequently lack rights of legal access to environmental assets, such as land and water. Women are especially vulnerable. Governments have a range of methods to promote sustainable resource use and good environmental management through appropriate regulation, property rights and market-based instruments. FARA can stimulate cross-continental comparisons of such measures. It may also urge integration of environmental issues into national and regional poverty reduction strategies to ensure that sound management of environmental resources is seen as a prerequisite for sustainable poverty reduction and agricultural development. Environmental issues that are of great concern that could be addressed by improved policy and decision-making are: water scarcity, poor soil fertility, general lack of access to mineral fertilisers, and threats to biodiversity. FARA can also catalyse and harmonise the development of tools to include environmental costs and benefits in economic assessments and cost-benefit analyses. Too

often, environmental impacts are considered “externalities” and not priced or included in decisions (DFID, 2006). FARA needs to stimulate research to explore opportunities to develop markets for investment in environmental services such as carbon sequestration, watershed management and biodiversity conservation.

Capacity strengthening

FARA needs to be particularly concerned with the human and institutional research and development capacities of African countries to effectively address the environmental challenges facing the continent. It needs to build a culture of knowledge networking and continuous learning at the continental level to enable Africa to face the emerging environmental threats and exploit emerging opportunities.

FARA can actively stimulate the reform of university curricula related to environmental sciences in terms of tools and methodologies and topics studied (such as biodiversity, climate change). Such reform should focus on participatory research methods, the importance of markets for agricultural development and investment in natural resources, and agro-ecological principles and systems tools (modelling, GIS) that allow environmental risk analyses at different scales (field, farm, watershed, region). FARA must also endeavour to bring African scientists into the African and international scientific community. When they acquire new skills and combine it with their “in-house” knowledge of farmers and ecosystems, the African scientists will be better equipped to address the environmental issues of concern to Africa’s rural and urban populations.

Agricultural training and education should not be limited to the university level. FARA can play a key role in harmonising training materials and participatory learning and action

research methodologies aimed at extension agents and farmers, which enable the latter to adapt promising technologies and methodologies to local contexts, limiting environmental damage and allowing better management of environmental risk.

Better use of rapidly expanding ICT resources at the continental level (through distance learning) and harmonisation of curricula may enable reaching more people faster and reducing costs for each country individually.

FARA can also stimulate exchange of lessons learned from success and failures in the many agricultural research and development projects in Africa to render future research and development projects more effective.

Partnership and strategic alliances

FARA needs to become the African voice on environmental issues related to agricultural development in regional and international fora and seek enhanced north-south and south-south collaboration with non-African research and development institutions, through the other agricultural research fora in the rest of the world. It also needs to stimulate the establishment of research and development platforms to address environmental issues (such as management of climatic risk) more effectively across the continent, linking centres of excellence in environmental science and management within and outside Africa, and to promote interdisciplinary and multidisciplinary work. FARA could play a major role in avoiding the excessive separation of research communities, e.g. agriculture and environment. FARA needs to set its priorities and directly mobilise African and non-African scientific communities to tackle the region’s environmental challenges.

References

- Bationo, A., B. Waswa, J. Kihara and J. Kimetu (editors). (in press). *Advances in integrated soil fertility management in sub Saharan Africa: challenges and opportunities*. Springer.
- Becker, M., D.E. Johnson, M.C.S. Wopereis, A. Sow (2003). Rice yield gaps in irrigated systems along an agro-ecological gradient in West Africa. *J. Plant Nutr. Soil Sci.* 166(1) 61–67.
- Bruinsma, J. (ed.) (2003). *World agriculture towards 2015/2030. An FAO perspective*. London: Earthscan Publications Ltd.
- Cassman, G., and H. Wood (2005). Cultivated systems. In *Millennium Ecosystem Assessment, Ecosystems and human well-being: current state and trends*, pp. 745–794. Washington, DC: Island Press.
- Conway, G. (1999). *The doubly green revolution: Food for all in the 21st century*. Ithaca: Cornell University Press.
- Defoer, T. and M.C.S. Wopereis (2007). Apprendre pour changer: la gestion de la culture de riz dans les bas-fonds. In: M. Gafsi, J. Brossier, P. Dugué et J.Y. Jamin (eds). *Exploitations agricoles familiales en Afrique de l'ouest et du centre : définition, enjeux, perspectives*. Paris: Edition Quae.
- DFID (2006). *DFID's approach to the environment*. Glasgow: Department for International Development.
- Dixon, J., A. Gulliver, D. Gibbon (2001). *Farming systems and poverty: Improving farmers' livelihoods in a changing world*. Rome and Washington D.C: FAO and World Bank,
- Donovan, C., M.C.S. Wopereis, D. Guindo, B. Nèbié (1999). Soil fertility management in irrigated rice systems in the Sahel and Savanna regions of West Africa. Part II. Profitability and risk analysis. *Field Crops Research* 61: pp. 147–162.
- ECA, Economic Commission for Africa (2006). Water in Africa: Management options to enhance survival and growth, pp. 10. <http://www.uneca.org/awich/nepadwater.pdf>
- FARA (2006). *Framework for African Agricultural Productivity (FAAP)*. Accra: FARA Secretariat.
- FAO (2006). *The state of food insecurity in the world 2006. Eradicating world hunger – taking stock ten years after the World Food Summit*. Rome: FAO.
- FAO (2004). *Africa statistical yearbook and selected indicators of food and agriculture 1993–2003*. Rome: FAO.
- FAO (2003a). *State of the World's Forests 2003*. <http://www.fao.org/DOCREP/005/Y7581E/Y7581E00.HTM>
- FAO (2003b). *Forestry Outlook Study for Africa – African Forests: A View to 2020*. FAO, Rome, Italy : African Development Bank, European Commission and the Food and Agriculture Organization of the United Nations.
- Fofana, B., M.C.S. Wopereis, R. Zougmore, H. Breman, A. Mando (2004). Integrated soil fertility management, an effective water conservation technology for sustainable dryland agriculture in sub-Saharan Africa. *WCT Symposium Proceedings*, South Africa, pp. 109–117.
- Giller, K.E., E.C. Rowe, N. De Ridder, H. Van Keulen (2006). Resource use dynamics and interactions in the tropics: scaling up in space and time. *Agricultural Systems* 88: pp. 8–27.

- Häfele, S.M., M.C.S. Wopereis, A.M. Schoenbohm, H. Wiechmann (2004). Long-term fertility experiments for irrigated rice in the West African Sahel: effect on soil characteristics. *Field Crops Research* 85: pp. 61–77.
- Hellmuth, M.E., A. Moorhead, M.C. Thomson and J. Williams (2007). *Climate risk management in Africa: learning from practice*. Palisades, NY: The International Research Institute for Climate and Society (IRI), The Earth Institute at Columbia University.
- Henao, J., Baanante (2006). *Agricultural production and nutrient mining in Africa: implications for resource conservation and policy development*. Muscle Shoals: IFDC (http://www.africafertilizersummit.org/Background_Papers/03%20Henao%20and%20Baanante--Agricultural%20Production.pdf)
- ICRISAT and GEF (2004). *Turning adversity into opportunity. The desert margins program. Towards sustainable management of the desert margins of sub-Saharan Africa*. Project document 2002–2008.
- IFAD (2001). *Rural Poverty Report 2001: The challenge of ending rural poverty*. International Fund for Agricultural Development. New York: Oxford University Press <http://www.ifad.org/poverty/index.htm>.
- ILRI (2007). *Improving the livelihoods of poor livestock keepers in Africa through community based management of indigenous farm animal genetic resources*. <http://www.ilri.org/research/Content.asp?CCID=41&SID=85>
- InterAcademy Council (2004a). *Inventing a better future: A strategy for building worldwide capacities in science and technology*. Amsterdam: IAC Secretariat.
- InterAcademy Council (2004b). *Realizing the promise and potential of African agriculture: Science and technology strategies for improving agricultural productivity and food security in Africa*. Amsterdam: IAC Secretariat.
- IPCC (2007). *IPCC WGII Fourth Assessment Report*. <http://www.ipcc.ch/SPM6avr07.pdf>
- IPGRI, 2006. A global platform for agricultural biodiversity research. http://www.sgrp.cgiar.org/Publications/AFU_Flier_simple.pdf
- Jackson, L., K. Bawa, U. Pascual and C Perrings (2005). Agrobiodiversity: A new science agenda for biodiversity in support of sustainable agroecosystems. DIVERSITAS Report No. 4: pp. 40. <http://diversitas-international.org/docs/Inter.%20Diversitas.pdf>
- Kaihura, F. and M. Stocking (editors) (2003). *Agricultural biodiversity in smallholder farms of East Africa*. Tokyo: United Nations University Press.
- Kabat P., R.E. Schulze, M.E. Hellmuth, J.A. Veraart (editors) (2003). Coping with impacts of climate variability and climate change in water management: A scoping paper. DWC-Report no. DWCSSO-01. Wageningen, Netherlands: International Secretariat of the Dialogue on Water and Climate.
- MA, Millennium Ecosystem Assessment (2003). MA Conceptual framework. In: *Millennium Ecosystem Assessment, Ecosystems and human well-being: A framework for Assessment*, pp. 1–25. Washington, DC: Island Press.
- NEPAD (2002). *Comprehensive Africa Agriculture Development Programme*, Midrand, South Africa: NEPAD.

- NEPAD (2003). *New partnership for Africa's development: Action plan for the environment initiative*. Midrand, South Africa: NEPAD.
- Patz, J.A., D. Campbell-Lendrum, T. Holloway, J.A. Foley (2005). Impact of regional climate change on human health. *Nature* 438: pp. 310–317.
- Requier-Desjardins, M. and M. Bied-Charreton (2006). Investing in recovery of arid land. Working paper prepared for a workshop held in Rome, 4–5 December 2006, 53 pp.
- Revenge, C. (2000). Will there be enough water? In (G. Mock, ed.): *Analysis of Global Ecosystems: Freshwater Systems*. http://earthtrends.wri.org/features/view_feature.php?theme=2&fid=17.
- Reij, C. and D. Steeds (2003). Success stories in Africa's drylands: supporting advocates and answering sceptics. A paper commissioned by the Global Mechanism of the Convention to Combat Desertification. CIS/Centre for International Cooperation, Vrije Universiteit Amsterdam, 32 pp.
- Rockström, J., J. Barron and P. Fox (2001). Rainwater management for increased productivity among small-holder farmers in drought-prone environments. Proceedings from the 2nd Waternet/Warfa Symposium on Integrated Water Resources Management, Theory, Practice, Cases, Cape Town, RSA, pp. 319–330.
- Rosegrant, M.W., X. Cai, S.A. Cline (2002). *World Water and Food to 2025. Dealing with scarcity*. IFPRI, IWMI, 322 pp.
- Sally, H. and C.L. Abernethy (eds.) (2002). Private irrigation in sub-Saharan Africa. Regional seminar on private sector participation and irrigation expansion in sub-Saharan Africa. IWMI, FAO, CTA, 307 pp.
- Scoones, I. and C. Toulmin (1999). Policies for soil fertility management in Africa. Report prepared for the Department for International Development. Brighton: IDS, IIED, Smaling, E.M.A. (2005). Inaugural address. International Institute for Geo-Information Science and Earth Observation, Enschede, the Netherlands. http://www.itc.nl/library/papers_2005/book_rev/smaling_har.pdf
- Sonou, M. (2002). Tendances et perspectives de l'irrigation en Afrique sub-saharienne. In Sally, H. and Abernethy, C.L. (eds.). *Private irrigation in sub-Saharan Africa. Regional seminar on private sector participation and irrigation expansion in sub-Saharan Africa*. IWMI, FAO, CTA, pp. 1–13.
- Stoorvogel, J. and E.M.A. Smaling (1990). *Assessment of soil nutrient depletion in sub-Saharan Africa*. Wageningen, the Netherlands: Winand Staring Centre.
- The World Bank (2006a). *World Development Indicators*. <http://devdata.worldbank.org/wdi2006/contents/index2.htm>
- The World Bank (2006b). *Enhancing agricultural innovation: How to go beyond the strengthening of research systems*. Washington, D.C.: The World Bank.
- Thornton, P.K., P.G. Jones, T.M. Owiyo, R.L. Kruska, M. Herrero, P. Kristjanson, A. Notenbaert, N. Bekele, A. Omolo, et al. (2006). *Mapping climate vulnerability and poverty in Africa: Report to the Department for International development*. Nairobi: ILRI.

- Tiffin, M. (2007). *Changing farming strategies with a closing farm frontier and urbanization in dryland Africa – are researchers aware?* <http://knowledge.cta.int/en/layout/set/print/content/view/full/4107>.
- Tilman, D., K.G. Cassman, P.A. Matson, R. Naylor, S. Polasky (2002). Agricultural sustainability and intensive production practices. *Nature* 418: pp. 671–677.
- Tittonell, P., B. Vanlauwe, N. De Ridder, K.E. Giller (2006). Heterogeneity of crop productivity and resource use efficiency within smallholder Kenyan farms: Soil fertility gradients or management intensity gradients? *Agricultural Systems* 94–(2007)2. pp. 376–390.
- Tittonell, P., B. Vanlauwe, P.A. Leffelaar, K.D. Shepherd, K.E. Giller (2005). Exploring diversity in soil fertility management of smallholder farms in western Kenya. II. Within-farm variability in resource allocation, nutrient flows and soil fertility status. *Agriculture, Ecosystems and Environment* 110 (3-4).- 2005. pp. 166–184.
- TSBF-CIAT (2007). *Conservation and sustainable management of below-ground biodiversity*. http://www.ciat.cgiar.org/tsbf_institute/csm_bgbd.htm
- United Nations (2006). *The millennium development goals report 2006*, pp. 28. <http://unstats.un.org/unsd/mdg/Resources/Static/Products/Progress2006/MDGReport2006.pdf>
- United Nations (2002). *Plan of Implementation of the World Summit on Sustainable Development*. http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf
- UNAIDS and WHO (2005). *AIDS Epidemic Update*. Joint United Nations Programme on HIV/AIDS and World Health Organization. Geneva. <http://www.unaids.org/Epi2005/doc/report.html>
- United Nations Environment Programme (UNEP) (2006). *Africa Environment Outlook 2. Our environment, our wealth*, pp. 576. http://www.unep.org/DEWA/Africa/AEO2_Launch/index.asp.
- United Nations Environment Programme (UNEP) (1999). *Global environment outlook 2000*. <http://www.grida.no/geo2000/english/0056.htm>
- Vanlauwe, B. and K.E. Giller (2006). Popular myths around soil fertility management in sub-Saharan Africa. *Agriculture, Ecosystems and Environment* 116 - (2006)1-2. pp. 34–46. <http://library.wur.nl/WebQuery/wurpubs/lang/366245>.
- Vanlauwe, B., Tittonell, P., Mukalama, J. (2005). Within-farm soil fertility gradients affect response of maize to fertiliser application in western Kenya. *Nutrient cycling in Agroecosystems*, Volume 76, Numbers 2-3/November 2006, Springer Netherlands. pp. 171–182.
- Vanlauwe, B., Diels, J., Sanginga, N., Merckx, R. (2002). *Integrated plant nutrient management in sub-Saharan Africa – from concept to practice*. CABI Publishing and IITA, 352 pp.
- Vanlauwe, B., J. Wendt, J. Diels (2001). Combined application of organic matter and fertilizer. In: *Sustaining Soil Fertility in West Africa*. Soil Science Society of America and American Society of Agronomy, SSSA Special Publication no. 58, pp. 247–279.
- Veena Jha (2006). *Environmental regulation and food safety. Studies in protection and protectionism*. Edward Elgar/ IDRC 2006 http://www.crdi.ca/mcp/ev-92817-201-1-DO_TOPIC.html. 250 pp.

- Wopereis, M.C.S., C. Donovan, B. Nebié, D. Guindo, M.K. N'Diaye (1999). Soil fertility management in irrigated rice systems in the Sahel and Savanna regions of West Africa. Part I. Agronomic analysis. *Field Crops Research* 61: pp. 125–145.
- Wopereis, M.C.S., A. Tamélokpo, D. Gnakpénou, G. Ezui, B. Fofana, H. Breman (2006). Mineral fertilizer management of maize on farmer fields differing in organic inputs in the West African savanna. *Field Crops Research* 88: pp. 39–56.
- Zougmore (2006). *Integrated water and nutrient management for sorghum production in semi-arid Burkina Faso*. PhD thesis. Wageningen, The Netherlands: Wageningen University and Research Centre.



Part 3

Principles and application of subsidiarity

1. The concept¹⁹

The principle of subsidiarity goes way back, *inter alia*, to the papal encyclicals *Rerum Novarum* (1891) and *Quadragesimo Anno* (1931). The principle holds that:

“... a community of higher order should not interfere in the internal life of a community of lower order, depriving the latter of its functions, but rather should support it in case of need and help to coordinate its activities with those of the rest of the society, always with a view to the common [public] good.”

A more common definition of the principle of subsidiarity, used mainly in the context of decentralisation policies, dictates that the “*operational responsibility and decision-making over public programs should be located at the lowest appropriate level of government that would be consistent with the operational competencies required, as well as with the efficient use of funds. Correspondingly, resources and budgetary allocations are assigned to each*

level in a manner consistent with the allocation of responsibilities.” The subsidiarity principle aims simultaneously at increasing stakeholder responsibility, improving efficiency and reducing financial cost by assigning tasks on the basis of comparative advantage. It is also a powerful design element to harness latent capacities, thus reducing programme costs.

The principle of subsidiarity balances two main precepts²⁰:

- a. On the one hand, responsibility for functions/tasks should be devolved as close to the people affected, as is consistent with effective management and delivery. This percept increases responsibilities and ownership at the lowest appropriate level (“anti-upward close”).
- b. On the other, where externalities²¹ or spill-overs exist, the function should be raised to that level or jurisdiction where these externalities can be integrated. Thus,

19. The subsidiarity principle states that matters ought to be handled by the smallest (or, the lowest) competent authority. The Oxford English Dictionary defines subsidiarity as the idea that a central authority should have a subsidiary function, performing only those tasks which cannot be performed effectively at a more immediate or local level.

20. Adapted from T. Courchren (<http://info.worldbank.org/etools/docs/library/238201/CourchrenEn.pdf>)

21. In economics, an externality is a cost or benefit from an economic transaction that parties “external” to the transaction receive. Externalities can be either positive, when an external benefit is generated, or negative, when an external cost is imposed upon others. It is a side-effect, though not necessarily an unintended consequence (Source Wikipedia).

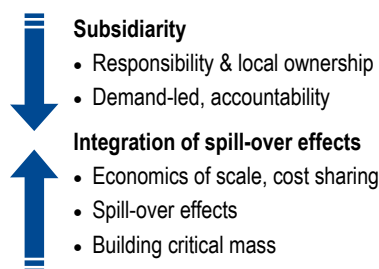
economically efficient delivery implies that the service should be controlled and financed at the scale/level where there are no significant spill-over effects. This reduces the extent of “free riding” and negative impacts on others outside the area of a particular domain or the potential for conflicts between equivalent levels.

Some authors²² also add the precept of **specialisation**, whereby limits are imposed on the domain/agenda within which an organisation has authority to assume responsibility for autonomous decision-making (i.e. specific agenda concerning the entire or selected parts of the domain). Finally, subsidiarity is also closely bound up with the principles of **proportionality and necessity**, which require that the involvement of regional institutions must be relative to the identified objectives and the operational actions required to achieve them (*the extent of the action must be in keeping with the aim pursued*).

1.1. A dynamic balance sometimes difficult to maintain

Within the overall requirements of social organisation, there is, strictly speaking, no contradiction but rather a succession of potential challenges and risks, which should be harnessed in the attempt to establish a dynamic equilibrium. Thus the application of the subsidiarity principle represents an oppor-

Figure 1. Balancing forces in the application of the subsidiarity principle



tunity to consider various, too often neglected, aspects of public action.

On one side, the definition of subsidiarity includes principles of democratisation (*downward accountability, empowerment, participation and ownership*) where established and well-functioning partnerships regulate each actor's roles and responsibilities to be complementary within a framework of institutional arrangements. Subsidiarity is to ensure that decisions are taken as closely as possible to the actors (*client-driven*). Each level will make decisions using the existing structure and state of operation based on the identified priorities, interests and capacities²⁴. More specifically, a higher organisational level should not take action except in the areas that fall within its exclusive competence, unless

The **subsidiarity**²³ principle is intended to ensure that decisions are taken as close as possible to the base (*the lowest practical level*) and that degrees of decision-making power, accountability/transparency and efficiency are maximised at the appropriate organisational level (*from the field to the national, sub-regional and regional levels*). Constant checks are to be made to determine whether actions are implemented at the most appropriate level, in the light of the opportunities at the lower levels and potential, significant spill-over effects. It is the transfer of power, decision making, resources and accountability to the most pertinent level that would provide more efficient, appropriate and localised, and ultimately more response-driven results, without significant spill-over effects on equivalent-level organisations.

22. K.C. Lai and V. Cistulli, *Agricultural Policy Support Service*, Policy Assistance Division, FAO-Rome, Italy, 2005.

23. Further details on the analysis of the principle and its 'balance' with other principles are discussed in Appendix 4.

24. Technical, financial and organisational capacities of local actors and all those implementing priority activities.

it is more effective than a directly lower level at integrating externalities. Each level should explore possibilities for synergies and building critical mass, based on comparative advantage of different partners/actors.

On the other hand, the “spill-over” precept suggests that the implementation and funding of a function should be raised to that level where the externalities can be integrated. Thus, economically efficient delivery implies that a service should be controlled and financed at that scale where there are no significant spill-over effects. In this framework, higher levels of organization could induce economies of scale and build critical mass to generate more efficient results responding to the common requirements of lower level members.

Hence, the principle of subsidiarity cannot be considered in isolation, and its relationship with other general principles of any institutional construction must also be taken into account. The idea of entrusting to the lowest level everything that cannot be done more efficiently by the level immediately above, must be balanced²⁵ against other requirements, such as:

- (i) **unity of action** – concerted actions of common interest, avoiding duplication and creating synergies;
- (ii) **efficient use of limited resources** – economies of scale and cost savings²⁶, comparative advantage and achieving a critical mass for efficient implementation;
- (iii) **unity of application** – favouring delegated functions managed at higher levels (*as opposed to local authority*); and
- (iv) **solidarity** – cooperation between organisation members aiming at balancing out resources among different levels according to relative needs. “Subsidiarity” must be reconciled with the need for an integrated approach: in this context, the watchwords

most often mentioned are “think integrated” and “act pragmatically”. Finally, effective application of the principle must take into account that the corresponding human and financial resources necessary to exercise related powers will not necessarily be available at the corresponding levels.

1.2. Subsidiarity and decentralisation

The terms “subsidiarity” and (more generally) “decentralisation”²⁷ have multiple interpretations, including their philosophical rather than legal meanings and the various ways these can be applied. Among the advantages of the subsidiarity concept, as opposed to a more formal and rigid definition of power sharing between regional and local authorities, is that it is iterative, allowing for continuous learning and development, and that it enables adaptation to different/evolutionary situations or existing methods of organisation. The main difficulty in defining subsidiarity relates to agreeing on the criteria to be applied to make it operational.

The principle has to be seen as a means of strengthening local responsibilities and ownership within a decentralised organisation. Thus responsibilities/functions may evolve as technical and/or management capacities build up. It is crucial, however, to avoid certain common risks related to decentralisation and subsidiarity, which is asymmetry, lack of coordination, and imbalance among decentralised units. A combined global/regional perspective is therefore essential to ensure coordination and coherence, with a localised, differentiated “regionalised” perspective that adequately responds to local demands.

The distribution of power between regional, national and local bodies could be based on three different types of competencies:

25. See further discussion of mentioned elements in Appendix 4.

26. Applying the principle of subsidiarity also cuts economic costs and improves transfer efficiency (Binswanger et al, 2003: 22)

27. Strengthening administrative and fiscal decentralisation: to advance administrative decentralisation, it is crucial to accelerate the process of deconcentration and decentralisation of line agencies to the lowest possible level of local government – what Binswanger refers to as the principle of subsidiarity. During the process of decentralisation, accountability mechanisms should be instated (Ibid.).

(i) concurrent or shared powers (the most common case); (ii) exclusive regional powers considered as *core regional functions*; and (iii) supporting powers or areas of supporting action, where the regional (*higher level*) main task is to advocate, encourage partnerships and coordinate actions implemented by its members.

2. Some implications for FARA, SROs and national organisations in agricultural research and development

At present, a large majority of the agricultural research and development activities in Sub-Saharan Africa are controlled and financed at the country/national level. Approximately US\$2.5 billion is spent annually for all African countries²⁸, while the expenditure on annual sub-regional and global-related activities is only about US\$ 25 million and 250 million respectively.

Subsidiarity governs the level of operational authority and share of responsibilities over AR4D services allocated between the regional forum (FARA), the SROs, national and local governments and farming communities. The application of the subsidiarity principle (including its different precepts) involves:

- a. Decentralisation of decision-making, fund allocation and activity implementation from the national to the most appropriate local level where operational competencies (decision-making and fund management) exist in the public, private or associative [farmers' organisation, civil society organisation (CSO)] sectors.
- b. Reallocation of decision-making and financing to higher levels of organisation, where common actions are more efficient, induce economies of scale and integrate significant spill-over effects.

Most technology development and diffusion activities should be carried out at the country level. According to the "subsidiarity principle", there is a strong need for decentralising national agricultural research and development activities towards appropriate local levels, for improved efficiency, accountability and ownership.²⁹ However, there are also critical activities that would clearly benefit from common sub-regional or regional approaches.³⁰ This is the case, among others, for agricultural research programmes of common interest, technical and economic information exchange services, regulatory frameworks such as definition and enforcement of common norms and standards, as well as higher-level technical education/training responding to common needs. For agricultural extension and education, while most activities need to be implemented and owned at the local level, there are also actions of common interest such as the development of methodologies and approaches that could benefit from economies of scale, critical expertise build-up at higher levels of the organisation, and integration of spill-over effects. Policies and actions that have trans-boundary advantages should be implemented at the sub-regional level and any policies and actions with cross-regional advantages drawn-up at the continental level. Creating larger, integrated markets will also make investments in technology development more attractive for private sector firms.

The National Agricultural Research and Extension Systems (NARES), SROs and FARA have interdependent governance bodies. Thus, there are opportunities for checks and balances in decision-making, programme implementation, and more efficient information flow and sharing, resulting in increased outcomes. Wide stakeholder consultation/

28. Source: FARA-SRO Retreat, February 2007.

29. There is basis to argue that decentralisation/devolution of responsibilities would enable strengthening of local solutions, indigenous, or innovative practices with promise for up-scaling: these would be based on good practices of farmer extension, such as client-driven, participatory, gender sensitive, location-specific and so on.

30. See further details summarised in Tables A and B of Appendix 1.

dialogue for planning and implementation will ensure that programme governance, responsibilities and management rules are clearly defined between stakeholders for efficient implementation and, equally importantly, that the ownership of implemented programmes is shared by all. The main objective is to achieve accountability in all decisions, policies and actions and to provide the required resources at the most appropriate lowest level in a timely manner, where capacities are appropriate for efficient decisions to be made and actions to take place.

Based on these principles, FARA should act and make decisions only if, and insofar as, the objectives of a proposed action cannot be sufficiently responded to by the SROs, but rather, by reasons of critical mass and scale of effects, are more efficiently achieved at the regional level. A similar approach should be applied between sub-regional and national-level organisations for sharing respective functions efficiently. The regional integration of research programmes would permit rationalising the use of available human and financial resources by promoting joint activities (research, capacity strengthening, etc.) on issues of common interest, avoiding wasteful duplication and creating the critical mass that is missing for most of the national programmes, while promoting local ownership and efficiency. Finally, effective information and communication systems are fundamental to generate appropriate agricultural innovations at different levels.

A decision-making framework³¹ could be developed to help balance subsidiarity and related principles to identify the most appropriate implementation level for generating public goods at different levels³². The following principles could be applied to determine

the most appropriate level for development of agricultural innovation systems:

1. Economic efficiency based on expected outcomes
2. Careful matching between comparative advantages of organisations and the functions they perform
3. Subsidiarity to the lowest possible level of government consistent with organisational competencies and efficient use of funds
4. Clear repartition of responsibilities and benefits among stakeholders
5. Careful assessment and optimal mixing of funding and delivery mechanisms, including pluralistic and participatory approaches to service delivery
6. Effective linkages and partnerships among all stakeholders (farmers, educators, researchers, extensionists, private sector, etc.)
7. Building human and social resources, and incentives for educating a new generation of farmers and service providers capable of empowering their rural clients
8. Sound monitoring and evaluation of goal achievement and programme outcomes

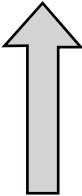
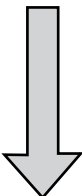
Activities funded at one level of the regional/sub-regional/national/local framework may include:

- Advocating for strengthening of lower-level organisations/institutions, to coordinate programmes of common interest and organise systematic knowledge sharing and human resource development.
- Forging articulations, strong partnerships and synergies between lower-level organisations and international agricultural research systems, or other centres of excellence and partners.
- Supporting investments in under-funded priority programmes by joint “specialised” implementing teams focusing on common/higher-level issues of common interest (balancing among actors).

31. See also CORAF/WE CARD *Strategic Plan review* (November 2006) and SADC-MAAP proposals (2007)

32. Further details on potential roles and functions are proposed in Appendix 3.

Table 1: Applying subsidiarity and related principles to respective regional and local functions.

| REGIONAL | Where regional interventions are most appropriate | |
|---|--|--|
|  | <i>Advocacy and partnership building</i> <i>Economies of scale/critical mass</i> | <ul style="list-style-type: none"> – Regional issues requiring regional solutions: issues or problems that are shared by multiple sub-regions and which require coordinated common solutions (<i>unity of action</i>) – Issues which, when aggregated at the regional level, create greater value addition and integrate spill-over effects, than at the sub-regional or national levels – Areas where sub-regional/national capacities are weak and regional knowledge resources are required to sustainably fill gaps through advocacy, trans-boundary cooperation and capacity strengthening (<i>solidarity</i>) – Exchange of information and learning systems |
|  | <i>Participatory service delivery</i> <i>Local decision-making</i> <i>Accountability and ownership</i> | <ul style="list-style-type: none"> – Issues or problems that may be common among multiple sub-regions/countries, but which require diverse/specific sub-regional national interventions (no or little spill-over effect) – Issues or problems that are unique to a sub-regional, national or local system and which require solutions to be built at the corresponding level – Areas where lower-level action creates greater impact than regional action (issues linked to local specificities) – Areas where national/local systems need to adapt, build, or deploy specific knowledge or capacity building – Areas where information and knowledge and local market integration is of primary importance |
| LOCAL | Where local interventions are most appropriate | |

- Supporting investments for core and programme activities of the lower-level organisations within the frame of comprehensive agricultural research and capacity building programmes of common relevance, including the building-up of selected research or training centres into partners of higher-level specialised centres of excellence networks.
- Promoting knowledge build-up and information sharing at all levels.

3. Elements for applying subsidiarity principle within FAAP

FAAP provides an African vision of policies, programmes and knowledge institutions needed to raise agricultural productivity and improve rural livelihoods. FAAP specifically calls for: (i) reform of agricultural institutions and services; (ii) increased investments in agriculture; and (iii) aligned and coordi-

nated financial support. Regional (FARA) and sub-regional research for development organisations (SROs) support effective implementation of CAADP Pillar IV requirements and FAAP within the African continent and its sub-regions respectively. Within this framework, the mandate and related strategies of regional and SROs needs to be broadened beyond agricultural research (AR4D) to also encompass the empowerment of producers and their organisations, agricultural advisory services, as well as agricultural training and education.

Building on existing programmes, support programmes³³ are being elaborated to align ongoing work programmes with the FAAP requirements for improving African agricultural productivity. Overall programmes are organised according to FAAP's main components:

- (i) farmer empowerment and organisation strengthening,

- (ii) agricultural advisory services and innovation sharing,
- (iii) agricultural research and knowledge build-up, and
- (iv) education, training and learning systems.

The principle of subsidiarity will ensure efficient programme implementation, client ownership, and that the involvement of the sub-regional and regional institutions is limited to what is necessary to most efficiently achieve the objectives, given their respective mandates. Based on the discussion of the subsidiarity principle and its related precepts and after considering core and support functions, the specific functions of regional and sub-regional AR4D organisations have been outlined in detail³⁴ for each FAAP component and cross-cutting issues in Appendix 2. Specific results and activities need to be fine-tuned by stakeholders at specific strategic and Operation Plan levels.

33. See graphical representation of respective on-going and complementary programmes for FAAP alignment in Appendix 3a (FARA) and 3b (ASARECA).

34. See also summary in Appendix 1 Tables A and B.

Appendix 1

Table A: Roles and functions at regional, sub-regional and national levels for FAAP within subsidiarity (draft summary)

| Goal: Increased economic growth, reduced poverty and improved livelihoods in rural Africa, based on sustainable use of natural resources | | | |
|--|--|--|---|
| Purpose: Enhanced agricultural productivity, value added and competitiveness of regional agricultural production systems | | | |
| Level | Regional | Sub-regional | National/Local |
| Main functions | <ul style="list-style-type: none"> - Advocacy for FAAP - Regional alliances (technologies, markets...) - Innovation methodologies/approaches - Agricultural information exchange platform - Policy and innovation strategy analysis - Enabling M&E strategies & capacities | <ul style="list-style-type: none"> - Transboundary advocacy for FAAP - Coordinate partnerships, AR4D networking - Capacity building and information sharing - Pluralistic sub-regional strategies and policies - Framework for experience exchange and TA | <ul style="list-style-type: none"> - National stakeholder platform for FAAP - Promote local partnerships (public-associative-private sector) - Implement participative AR4D, advisory and market access services - Farmer empowerment, education/learning |
| 1. Farmer empowerment and organisation strengthening | <i>Core</i> | <ul style="list-style-type: none"> - Advocate support for farmer empowerment and catalyse institutional innovations and practices - Promote regional and global partnerships for experience exchange on farmer empowerment and organisation strengthening - Foster supportive institutional environment | <ul style="list-style-type: none"> - Support rural education and learning access, adult education programmes - Support/implement farmer specialised training - Promote grass-roots farmer organisations, cooperatives, etc. - Support farmer organisation federations and their involvement in national development platforms as well as in service provision to their members and partners |
| | <i>Support</i> | <ul style="list-style-type: none"> - Strengthening of regional farmer organisations - Promote innovative approaches and best practices [farmers' field school (FFS) etc.] | <ul style="list-style-type: none"> - Strengthening sub-regional farmer organisations - Support trans-boundary exchange of experience, best practices, farmer empowerment partnerships |

| | | | | |
|---|----------------|--|--|--|
| 2. Farmer advisory services and innovation sharing | <i>Core</i> | <ul style="list-style-type: none"> - Advocate investments for participatory advisory services and promote experience exchange on best practices and methodologies - Regional agricultural knowledge platform/portal, connected to international portals (adapted to different needs/users) | <ul style="list-style-type: none"> - Exchange of sub-regional experiences, approaches/methodologies and best practices - Sub-regional knowledge platform and information share agro-ecological zone (AEZ), common markets, etc. - Coordinate pilot innovations for AR4D | <ul style="list-style-type: none"> - Implement efficient participative advisory services at national level - Improved access to markets - Exchange local experience/knowledge - Promote private sector partnership - Strengthen national stakeholder platform |
| | <i>Support</i> | <ul style="list-style-type: none"> - Promote innovative agricultural knowledge dissemination, regulatory framework, training and advisory services as appropriate | <ul style="list-style-type: none"> - Support the implementation of innovative advisory service provision and knowledge sharing at national level | <ul style="list-style-type: none"> - Improve local information access and exchange (ICT) - Strengthen market information systems |
| 3. Agricultural research and knowledge build-up | <i>Core</i> | <ul style="list-style-type: none"> - Advocate increased investments in AR4D - Foster partnerships with international research institutions and knowledge organisations | <ul style="list-style-type: none"> - Support centres of excellence/specialisation for research activities and capacity build-up at sub-regional level - Implementation of common interest technology generation within AEZ | <ul style="list-style-type: none"> - Prioritise national issues and opportunities for AR4D - Adapt knowledge available at sub-regional and regional levels - Address national agricultural research specificities - Strengthen national institutional framework for AR4D |
| | <i>Support</i> | <ul style="list-style-type: none"> - Promote priority demand-driven and "push" research, including global initiatives meeting high-level standards | <ul style="list-style-type: none"> - Support national AR4D management and implementation capacities | |
| 4. Education training and learning systems | <i>Core</i> | <ul style="list-style-type: none"> - Foster innovative learning systems/strategies - Promote/strengthen alliances for international partnerships for higher agricultural education - Advocate agricultural science and technology integration in education curricula | <ul style="list-style-type: none"> - Support joint specialised regional training centres - Develop innovative sub-regional learning systems | <ul style="list-style-type: none"> - Promote NARS/University platforms - Strengthen technical & professional education - Adapt rural primary/permanent education curricula, access to distance learning |
| | <i>Support</i> | <ul style="list-style-type: none"> - Specialised capacity strengthening/education at regional level, including using ICT | <ul style="list-style-type: none"> - Organise regional common interest training programmes, including for national government staff at all levels | <ul style="list-style-type: none"> - Develop centre of excellence for specialised training - Encourage public-private partnerships for capacity strengthening |
| Cross-cutting issues | | <i>Mainstreaming gender, sustainable natural resource management and other cross-cutting issues</i> <i>Use of modern ICT to boost human and social resource build-up</i> | | |
| Policy support and institutional strengthening | | <ul style="list-style-type: none"> - Develop agricultural policy analysis, strategy - Advocate increased harmonised investments for agricultural productivity development | <ul style="list-style-type: none"> - Facilitate the implementation of agricultural development action plans, support institutional changes - Advocate increased harmonised investments | <ul style="list-style-type: none"> - Implement adapted policy and institutional reforms |

Appendix 1

Table B: General functions of regional and sub-regional levels within FAAP (summary)

| | | | | |
|---|--|--|---|---|
| <u>Overall Goal: Increased economic growth, reduced poverty and improved livelihoods in rural Africa, based on sustainable use of natural resources</u> | | | | |
| <u>Specific objective/purpose: Enhanced agricultural productivity, value added and competitiveness of regional agricultural production systems</u> | | | | |
| <i>Thematic areas</i> | <i>Farmer empowerment and organisation strengthening</i> | <i>Farmer advisory services and innovation sharing</i> | <i>Agricultural research and knowledge build-up</i> | <i>Education, training and learning systems</i> |
| Outcomes and impacts | Farmer empowerment and enabling environments that allow farmer organisations to emerge, grow and link to key services and markets | Farmer-driven, demand-led and market-oriented advisory services and innovation systems, to provide appropriate knowledge and technology options to farmers | Research and participatory technology generation systems able to generate appropriate technologies that respond to priority farmer and market needs | Institutional capacity for agricultural education and learning systems effective in supporting human capacity building for improved rural livelihoods |
| <i>Capacity building</i> | <i>Permanent education, strengthening of technical and management capacities at all levels (human resource build-up at farmer, advisory services, research and training institution levels)</i> | | | |
| <i>Information and communication</i> | <i>Both traditional media and new digital-based ICTs that provide content supporting farmer-centred innovation systems and empowerment</i> | | | |
| Roles for regional institutions | <u>Implementing regional core programmes</u> <ul style="list-style-type: none"> Developing and supporting specific regional activities related to advocacy, strengthening partnerships for regional technology generation, farmer empowerment, education, training, and information management Facilitating exchange of knowledge and experience between the region and globally, and SROs and national systems (regional platform) Promoting human capacity strengthening of regional interest <u>Providing support to sub-regional and multi-national systems</u> <ul style="list-style-type: none"> Providing technical assistance to assist SRO systems in designing or implementing specific strategies, reforms, or programmes to make research, advisory services, education and information systems more responsive to farmers | | | |

| | |
|--|--|
| Roles for sub-regional institutions | <p><u>Implementing sub-regional core programmes</u></p> <ul style="list-style-type: none"> • Developing and supporting specific sub-regional activities, networks and partnerships for joint sub-regional technology generation, farmer empowerment, advisory services, education, training, and information management: <ul style="list-style-type: none"> - Development of joint training programmes on shared priorities - Research/technology generation on shared sub-regional or trans-boundary priorities - Support for development of sub-regional information platforms • Facilitating exchange within the sub-region of knowledge and experience on farmer empowerment and farmer organisations, technology generation, advisory services, education and training and knowledge and information with a focus on information sharing on good practice and lessons learned • Promoting human capacity strengthening of sub-regional interest <p><u>Providing support to national systems</u></p> <ul style="list-style-type: none"> • Providing technical assistance to assist national systems in designing or implementing specific strategies, reforms, or programmes to make research, advisory services, education and information systems more responsive to farmers |
| National role | <p><i>Implementing national programmes (application of subsidiarity principle in sharing activities between national and local levels)</i></p> |

Source: Adapted from SADC-MAAP.

Appendix 2

FAAP-based implementation functions: objectives, components and main “possible” activities at regional and sub-regional levels

| Goal: Increased economic growth, reduced poverty and improved livelihoods in rural Africa, based on sustainable use of natural resources (6% growth of Agricultural GDP per annum by 2015). | | |
|---|---|--|
| Purpose: Enhanced agricultural productivity, value added and competitiveness of regional agricultural production systems through improved agricultural institutions and services and increased harmonised investments. | | |
| Specific objectives per component | | |
| Component | Regional level (FARA) | Sub-regional level (SRO) |
| 1. Farmer empowerment and organisation strengthening | Advocate and promote innovative approaches/methodologies for empowerment of farmers and strengthening of their organisations (social capital) | Facilitate the implementation of innovative farmer empowerment programmes and support strengthening of their organisations (social capital) |
| 2. Advisory services and innovation sharing | Promote opportunities for innovative agricultural knowledge dissemination and information sharing across the region | Support the implementation of agricultural knowledge sharing, including farmer advisory services and improved access to IC technologies, across member countries |
| 3. Agricultural research and knowledge build-up | Foster partnerships between sub-regional, regional and international AR4D programmes/networks and knowledge build-up systems | Coordinate integrated sub-regional AR4D programmes/networks and knowledge build-up systems, through efficient trans-boundary partnerships |
| 4. Education, training and learning systems | Advocate investments and facilitate partnerships for human capacity strengthening of African agricultural technology systems at all levels of the knowledge chain (institutional strengthening for education, training and learning systems) | Coordinate trans-boundary human capacity strengthening programmes of sub-regional agricultural technology systems at all levels of the knowledge chain (institutional strengthening for education, training and learning systems) |
| 5. Coordination and management | Coordination, management and follow-up of FARA activities | Coordination, management and follow-up of SRO activities |

| | | |
|---|--|--|
| Cross-cutting: policy support for sustainable agricul- tural development | <p>Foster appropriate regional agricultural development policies, support institutional changes and advocate increased harmonised investments for:</p> <ul style="list-style-type: none"> • Sustainable agricultural productivity • Use of traditional and modern ICT • Capacity building at all levels • Gender mainstreaming. | <p>Facilitate the implementation of appropriate sub-regional agricultural development action plans, support institutional changes and foster government investments for:</p> <ul style="list-style-type: none"> • Sustainable agricultural productivity • Use of traditional and modern ICT • Capacity building at all levels • Gender mainstreaming |
| Clients | AU, SROs and RECs' regional farmer organisations, CSOs and private sector organisations | Member countries, RECs Sub-regional farmer organisations, CSOs, private sector organisations |
| Implementation roles | <ul style="list-style-type: none"> - Advocate and promote partnerships/alliances at regional level - Develop regional alliances - Foster innovation strategies and methodologies – best practices for agricultural research and development (including M&E) - Global agricultural innovation knowledge sharing - Develop specialised studies and action plans and support resource mobilization on strategic regional agricultural development issues | <ul style="list-style-type: none"> - Advocate and strengthen functional partnerships at sub-regional level - Promote regional partnerships and coordinate networking - Coordinate implementation (from planning to M&E) of priority trans-boundary AR4D innovation and capacity strengthening programmes - Coordinate appropriate sub-regional knowledge sharing systems |

Detailed roles and functions within FAAP framework (core and support functions)

| | | <i>Main FARA functions</i> | <i>Corresponding SRO functions</i> |
|--|-------------------|--|--|
| 1. | | <i>Advocate and promote innovative approaches/ methodologies for farmer empowerment and strengthening of their organisations at regional level (social capital)</i> | <i>Facilitate the implementation of innovative farmer empowerment programmes and support strengthening of their organisations at sub-regional level (social capital).</i> |
| 1. Farmer empowerment and organisation strengthening | Core functions | <p>Advocate to put farmer's interests upfront, bring farmer empowerment to the centre of the innovation systems approach (FFS etc.) and promote the federation of farmer organisations at regional level</p> <p>Assist in integrating regional farmer organisations as full partners of policy making, agricultural research and development, agri-business and marketing networking/platforms</p> <p>Promote partnerships and experience exchange between regional/international farmer organisations and other stakeholders on service provision for agricultural innovations, knowledge and market access, etc.</p> <p>Promote good practices and capacity building for farmer empowerment, including strengthened agribusiness linkages and farm enterprise development</p> <p>Stimulate review of current legal and regulatory frameworks to create a more supportive institutional environment for farmer organisations within the region</p> | <p>Promote partnerships and inter-country experience exchange between sub-regional farmer organisations and other stakeholders on empowering farmers, agricultural innovations, market access, etc.</p> <p>Develop initiatives/pilot activities to support farmer empowerment and scaling-out of successful approaches and learning systems</p> <p>Promote and facilitate innovative information exchange and learning systems (i.e. FFS etc.) for empowering local farmer groups/associations</p> <p>Integrate sub-regional farmer organisations as full partners of agricultural research and development networking/platforms, etc.</p> <p>Link sub-regional farmer organisations to the private sector for the development of sub-regional markets</p> |
| | Support functions | <p>Catalyse regional partnerships, experience exchange and learning systems in empowering farmers</p> <p>Catalyse support for strengthening technical and management capacities of regional farmer organisations</p> <p>Promote research on strategies and policies and facilitate institutional innovation for farmer empowerment and strengthening farmer organisations</p> <p>Provide specialised common interest expertise in social and organisational sciences, farmer capacity strengthening, etc.</p> <p>Advocate and support development of new technologies (ITC) for farmer empowerment and organisational strengthening (e-learning, information access)</p> | <p>Promote and support the federation of farmer organisations at sub-regional level</p> <p>Support strengthening of technical and management capacities of sub-regional farmer organisations, including service provision to their members</p> <p>Develop/Adapt primary education level curricula to suit the needs of the farmers of the future</p> <p>Provide specialised technical assistance to NARES and stakeholders</p> <p>Support the development of new technologies (ITC) for farmer empowerment and organisational strengthening (e-learning, information access)</p> |

| | | <i>Main FARA functions</i> | <i>Corresponding SRO functions</i> |
|--|-------------------|---|---|
| 2. | | <i>Promote opportunities for innovative agricultural knowledge dissemination (best practice) and information sharing across the region</i> | <i>Support the implementation of agricultural knowledge sharing, including farmer advisory services and improved access to ICT across member countries</i> |
| 2. Agricultural advisory services and innovation sharing | Core functions | <p>Advocate for investment by governments, economic communities and development partners in innovative technology dissemination approaches (FFS, etc) and farmer-support services;</p> <p>Establish/strengthen regional partnerships/networks aimed at sharing and scaling out methodologies and good practices [Dissemination of New Agricultural Technologies (DONATA)] for agricultural advisory services and knowledge sharing through the regional agricultural information and learning systems (RAILS).</p> <p>Facilitate synergies and create partnerships and promote value-added and information/knowledge sharing through regional agricultural information and learning systems (RAILS)</p> <p>Explore strategies and policies for institutional innovations to improve research-advisory services and farmer-market linkages</p> <p>Set-up/Strengthen the African platform for access to global agricultural knowledge management and learning systems, using modern learning tools best suited to specific client needs (university, colleges, farmers-IK)</p> <p>Provide specialised expertise for common interest studies on methodologies/approaches and best practices in dissemination of innovations</p> <p>Advocate greater resources and investments for ICT-enabled agricultural information/knowledge sharing and learning systems in Africa</p> | <p>Build-up a portfolio of successful technologies and promote their dissemination for rapid scaling-out within similar AEZ</p> <p>Promote the exchange of best/innovative practices in delivery of farm advisory services and farmer empowerment</p> <p>Identify common priority capacity development needs for improved technology transfer and build (sub)-regional training programmes</p> <p>Promote and coordinate pilot programmes for innovative financing and management of farmers support services, input supplies and marketing, controlled by farmer organisations</p> <p>Advocate greater investments for ICT-enabled information sharing and using of modern learning tools best suited to specific local needs</p> <p>Develop an integrated sub-regional knowledge/ information portal for cross-border information/knowledge exchange services (markets, early warning systems, etc.),</p> |
| | Support functions | <p>Promote the development of and access to regional information services (markets, early warning systems, trade flows, standards and regulations)</p> <p>Facilitate institutional changes at sub-regional level and pilot reform activities</p> <p>Facilitate required skill development and institutional changes as required by stakeholders</p> <p>Provide specialised expertise in ICT development for adapted information sharing and learning systems</p> | <p>Provide support to piloting and innovative use of ICT for farmer organisations and local commercial service providers to develop, own and maintain information that is relevant for local farmers</p> <p>Implement studies on methodologies/approaches and best practices at sub-regional level</p> <p>Establish a technology dissemination innovation fund to facilitate institutional changes at national level and pilot reform activities</p> <p>Development of sub-regional information management capacity for integrated information/knowledge platform at sub-regional level</p> <p>Implement common interest studies on methodologies/approaches and best practices and provide technical assistance at sub-regional level</p> |

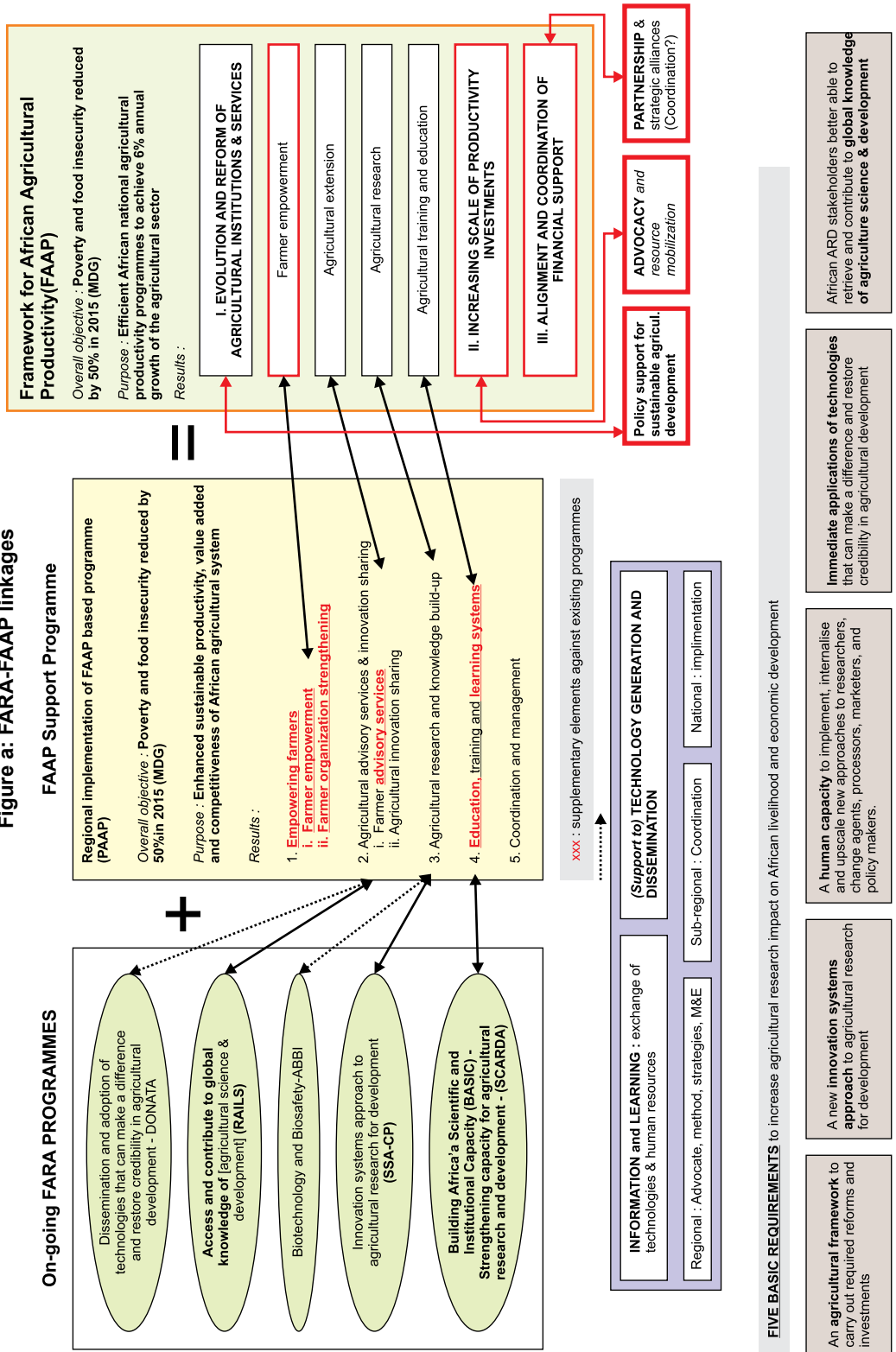
| | | Main FARA functions | Corresponding SRO functions |
|---|-------------------|---|---|
| 3. | | <i>Foster partnerships between sub-regional, regional and international AR4D programmes/networks and innovative knowledge build-up systems</i> | <i>Coordinate integrated sub-regional AR4D programmes/networks and knowledge build-up systems, through efficient trans-boundary partnerships</i> |
| 3. Agricultural research and knowledge build-up | Core functions | <p>Advocate AR4D from AU, donor communities to promote IAR4D-oriented to farmer priority needs</p> <p>Promote partnerships for dynamic agricultural knowledge and innovation systems at regional and international research levels (research institutes, universities, private sector, etc.)</p> <p>Support demand-driven priority agricultural research that has regional relevance</p> <p>Address regional “push-driven” research strategies and programmes</p> <p>Facilitate and catalyse progressive institutional changes in African agricultural innovation systems, including research–university linkages, inter sub-regional cooperation, etc.</p> <p>Advocate and support harmonisation of the regulatory framework for technology development (seeds, insecticides, pesticides, veterinary products, and also biotechnology) – [African Biotechnology and Biosafety Initiative (ABBI)] and food safety standards</p> <p>Foster inter-regional and international partnerships (scientific, financial support, etc.) including Global Forum on Agricultural Research (GFAR), CG Centers, etc. and coordinate contracted Africa-wide CGIAR/other international research programmes</p> | <p>Advocate agricultural research support from sub-regional economic communities, donors, member countries</p> <p>Promote partnerships for dynamic agricultural knowledge and innovation systems at sub-regional levels</p> <p>Coordinate sub-regional common “needs” research programmes on joint issues, contracted to national centres of excellence/specialisation</p> <p>Promote and coordinate IAR4D-oriented actions/programmes on specific farmer and market needs</p> <p>Facilitate and catalyse progressive institutional changes in sub-regional agricultural innovation systems,</p> <p>Support and coordinate sub-regional research programmes for NARS, through competitive mechanism open to all qualified research institutions</p> |
| | Support functions | <p>Support innovative research for development systems and their application mechanisms in improving rural livelihoods</p> <p>Provide assistance and specialised expertise for specific regional priority reviews and studies</p> <p>Support targeted on-demand institutional capacity building of SRO and regional agricultural development institutions</p> <p>Establish a comprehensive regional information system that will capture and promote the exchange of African contributions to agricultural technology, science and policy knowledge</p> <p>Support high level (research and universities) capacity strengthening</p> | <p>Provide assistance and specialised expertise for specific sub-regional and national priority reviews and studies</p> <p>Strengthen the financial and management autonomy and governance body (all stakeholders) of public research institutions</p> <p>Harmonise the regulatory framework for technology development (seeds, insecticides, pesticides, veterinary products, and also biotechnology) and food safety standards</p> |

| | | Main FARA functions | Corresponding SRO functions |
|--|-------------------|---|--|
| 4. | | Advocate investments and facilitate partnerships for capacity strengthening of African agricultural technology systems at all levels of the knowledge chain (<i>institutional strengthening for education, training and learning systems</i>) | Coordinate trans-boundary capacity strengthening programmes of sub-regional agricultural technology systems at all levels of the knowledge chain (<i>institutional strengthening for education, training and learning systems</i>). |
| 4. Agricultural education, training and learning systems | Core functions | <p>Advocate political support and increased investment in agricultural education (AET) in Africa</p> <p>Support advocacy and sharing of successful experiences in institutional reforms related to lifelong learning approaches and improved gender balance</p> <p>Promote/Strengthen partnerships amongst African agricultural universities and with specialised universities in Europe, USA, etc., (adapted curricula, distance learning, etc.)</p> <p>Promote building of a human resource base for research and training institutions, through relevant training network programmes based on the common specialised training needs</p> <p>Promote regional partnerships linking AET to research institutions, advisory services systems and farmer organisations for innovation</p> <p>Promote interaction between capacity building networks [Regional Universities Forum (RUFORUM), Strengthening Capacity for Agricultural Research in Africa (SCARDA), etc.] for mutual reinforcement and eliminating duplication</p> <p>Develop methodologies and frameworks for continuous training and learning (using ICT) for agricultural practitioners</p> <p>Promote research on appropriate ICT, e-learning and distance learning systems/techniques at regional level</p> <p>Promote capacity to build capacity [Building African Scientific and Institutional Capacity (BASIC)]</p> | <p>Advocate political support and increased investment in agricultural education and training (AET) and information systems in the sub-region</p> <p>Support advocacy and sharing of successful experiences in institutional reforms related to lifelong learning approaches and improved gender balance</p> <p>Identify common/cross-boundary capacity building needs for technology development and dissemination and promote opportunities within the sub-region</p> <p>Promote building of a human resource base for research and training institutions, through relevant training network programmes based on the common specialised training needs,</p> <p>Support the implementation of common specialised training needs (inter-country)</p> <p>Coordinate agreed-upon common capacity-building programmes for NARES, universities and colleges</p> <p>Support sub-regional specialised training centres and rationalise the use of existing training capacities and strengthen partnerships among sub-regional universities and training institutions</p> <p>Facilitate building of networks and partnerships for more innovative and responsive education and training systems at sub-regional level</p> |
| | Support functions | <p>Advance the cause of education initiatives at primary ('farmers of the future'), secondary level education (professional and technical) and postgraduate levels (RUFORUM, SCARDA)</p> <p>Identify and disseminate good practice in non-formal and formal education, curriculum development, and pedagogy</p> <p>Build networks and partnerships for more innovative and responsive education and training systems</p> <p>Identify opportunities for using mass media and ICT for partnerships for distance and e-learning</p> <p>Facilitate coordinated access to regional scholarship programmes</p> <p>Identify opportunities for development of programmes that allow schools (primary and secondary) to improve access to technology and participate in technology development and use</p> <p>Improve the curricula and strengthen Africa's capacity to build capacity, especially for medium and higher-level agricultural training</p> | <p>Provide capacity building and training for national systems to introduce new methodologies and update education and learning systems</p> <p>Identify and disseminate good practice in non-formal and formal education, curriculum development, and pedagogy</p> <p>Promote using appropriate mass media, ICT and distance learning techniques at sub-regional level</p> <p>Identify opportunities for development of programmes that allow schools (secondary and below) to improve access to technology and participate in technology development and use</p> <p>Facilitate the exchange of "best practices" in teaching agriculture and natural resource management</p> <p>Improve the curricula and strengthen sub-regional capacity to build capacity, especially for medium and higher-level agricultural training</p> |

| | | Main FARA functions | Corresponding SRO functions |
|---|-------------------|---|---|
| 5. | | Coordination, management and follow-up of FARA activities | Coordination, management and follow-up of SRO activities |
| 5. Coordination and management | Core functions | Build and promote Regional Information Management (platform) providing knowledge resources to support FARA action priorities Financially manage FARA-commissioned Innovation Agricultural Research and Development Fund Provide core institutional support for FARA and SRO strengthening | Build and promote sub-regional information management (platform) providing knowledge resources to support ASARECA action priorities Develop adapted methodologies for M&E to strengthen capacities and implement M&E of ASARECA activities Financially manage ASARECA-commissioned Innovation Agricultural Research and Development Fund Provide core institutional support for ASARECA and strengthen national platform |
| | Support functions | Foster institutional development and partnership building and 'management change' assistance Develop adapted methodologies for monitoring and evaluation , strengthen capacities and implement M&E of FARA activities | Foster institutional development and partnership building and 'management change' assistance |
| Cross-cutting issues | | <i>Foster appropriate regional agricultural development policies; support institutional changes; and advocate increased harmonised investments for sustainable agricultural productivity</i> | Facilitate the implementation of appropriate sub-regional agricultural development action plans; support institutional changes; and foster governments investment for sustainable agricultural productivity |
| Policy support for sustainable agricultural development | Core functions | Build regional and international commitments for agricultural (productivity) development, food security and sustainable natural resource management in Africa Promote increased investment (donors and governments) in efficient technology generation and dissemination and capacity strengthening at regional level | Promote increased investment from sub-regional economic bodies and governments in IAR4D, agricultural education, information exchange, etc. Support the development of regional networks for producers, processors, technology developers (input suppliers), etc. Establish, monitor and enforce mechanisms for sub-regional and national policies/regulations |
| | Support functions | Support improvement of policy, strategies and institutional environment to enhance agricultural productivity development and to deepen the regional markets and access global markets Support the development of methodologies and capacities to strengthen regional M&E capacities Facilitate the establishment of regional quality/safety standards and regional monitoring/enforcement mechanisms, including strengthened stakeholder consultation/platforms Facilitate institutional changes and instruments to promote public-private farmer partnerships and investments Strengthen natural disaster coping mechanisms to trigger timely responses (including early warning mechanisms) | Contribute to the institutional framework for tackling issues with clear cross-border externalities such as the rational exploitation of common natural resources, pest/diseases, pollution, migration, etc. Facilitate institutional changes to strengthen public-private-farmer partnerships at sub-regional level Promote private sector investments in technology development Contribute to the establishment of efficient national-regional linkages and incentive mechanisms (harmonise investment incentives) Strengthen trans-boundary partnerships for knowledge/experience exchange, open markets, etc. |
| Other | | Mainstream gender, sustainable natural resource management and other cross-cutting issues. | Mainstream gender, sustainable natural resource management and other cross-cutting issues |

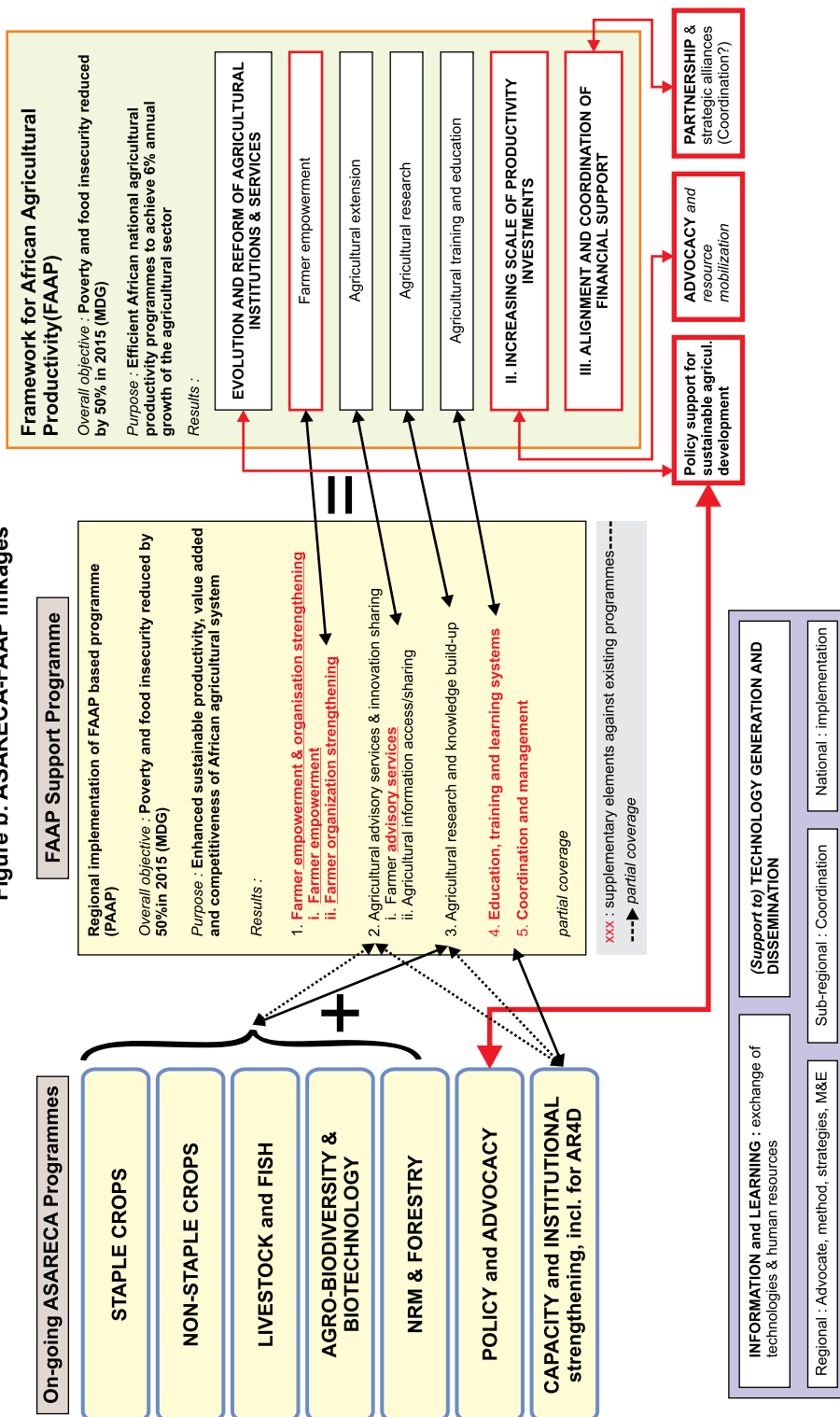
Appendix 3

Figure a: FARA-FAAP linkages



Appendix 3

Figure b: ASARECA-FAAP linkages



Appendix 4: Subsidiarity and related principles³⁵

The difficulty of defining the exact (legal) scope of subsidiarity is related to: (i) the complexity of modern societies, where a great majority of the powers are shared powers; (ii) the dynamic of the principle capable of accentuating a given trend; (iii) the fact that all territorial authorities, even those at the same level, do not necessarily enjoy the same capacity to exercise their powers; (iv) the assumption that the corresponding financial and human resources necessary to exercise the powers will be made available at corresponding levels (which is necessary for effective application); and (iv) the need to entrust an authority to supervise and safeguard the application of the principle.

The principle has to be seen as a means of strengthening local democracy. However, the principle of subsidiarity cannot be considered in isolation and its relationship with other general principles of any institutional construction, must also be taken into account. The idea of entrusting to the lowest level everything that cannot be more efficiently done by the level immediately above must be balanced against other principles such as unity of action, efficiency, unity of application, and solidarity.

Subsidiarity and unity of action. Concerted actions are more difficult to achieve when there are increased number of authorities or levels involved. Subsidiarity can therefore be invoked to justify compromises between bringing decision-making closer to the base and the creation of new structures designed to prepare and carry out the required decisions³⁶. This presupposes a system of representation

in which the lower-level authorities are able to participate in the definition (and control) of what constitutes the desirable intervention of the higher-level organisation. Within a 'fair balance', the principle of subsidiarity could at least be regarded as a permanent 'anti-upward' clause that could only be transgressed for clearly established reasons.

Subsidiarity and efficiency. The economic theory of federalism is essentially based on an analysis of proximity, the effects of excesses (more benefits to a larger interest community) and economies of scale (for reduced costs). In institutional and political affairs, efficiency can only be a relative concept, and excessive concentration on criteria purely in terms of economic or financial viability should be avoided. As long as the principle of subsidiarity is not interpreted as systematic localism, it does not conflict with the notion of efficiency, but leads to the consideration of other more qualitative criteria, such as human factors and well-being/improved livelihoods. By virtue of the mobilization of individual and collective responsibilities which it can bring about, the principle of subsidiarity can contribute to greater efficiency.

Subsidiarity and unity of application. The principle of subsidiarity encourages diversity both in structures and in policies for the promotion of a better balance in citizens' livelihoods, with the aim of equality. While allowing for a certain degree of organisational freedom at the local level, institutions should be better able to take account of local situations and to pursue more suitable policies (at each respective level). Particularly, the principle of subsidiarity consists more in advocating a method of action than in introducing a competitive element. It seems to militate for a restricted use of "delegated functions" in favour of "local authority powers". There is no reason why, instead of being regarded simply as implementing agents, local-level organisations should not be

35. Adapted from: (i) *Definition and limits of the principle of subsidiarity* (Report no. 55 prepared for the Steering Committee on Local and Regional Authorities (CDLR)), (ii) *Pro and Cons of subsidiarity* (B. Møller).

36. In accordance with the idea of proportionality embodied in the principle of subsidiarity, in so far as it is necessary and in those fields where it is naturally called for.

entrusted with the implementation of various functions, thereby reducing the possible rigidity and poor adaptability that unity of application can involve. This could also pave the way for initiatives or innovation.

Subsidiarity and solidarity may appear at first sight to be contradictory, in that solidarity seems to be easier to achieve in a centralised context. However, the idea of subsidiarity also implies the idea of aid³⁷, with a view to a fuller assumption of responsibility. Subsidiarity is

therefore not opposed to the idea of balancing out resources among different levels. It introduces the idea that equalisation (or aid) has no meaning unless it leads to equal capacity for action and is accompanied by acceptance of responsibility. In order to achieve a balance between solidarity and subsidiarity, the organisation of solidarity (the same applies to co-operation) presupposes that the responsibilities assigned to local authorities should be as clearly identified as possible.

37. In this context, subsidiarity may be contrasted with "assistance".



Part 4

HIV/AIDS mainstreaming

1. Introduction

AIDS was first recognised as a disease in the early 1980s. Since then it has spread throughout the world. By 1999 it was rated the fourth most important cause of death globally and, in Africa, it was responsible for one in five deaths³⁸. The joint UNAIDS and WHO update³⁹, which compared the global HIV and AIDS pandemic data in 2006 with that of 2004 reckons that Sub-Saharan Africa accounted for 63% of all persons living with HIV globally and 72% of all global AIDS deaths – about 6.5% more than the 2004 levels. Females, characteristically, are four times more vulnerable to HIV infection than their male counterparts⁴⁰.

AIDS is a terminal disease condition caused by the Human Immuno-deficiency Virus. The virus is transmitted via exchange of body fluids through unsafe sex practices and through infected hypodermic needle use. HIV/AIDS needs immediate attention because of its ability to decimate development within and

across every segment of society. It is a threat to humanity and every human endeavour.

HIV infection is asymptomatic and it takes 8–10 years for any clinical symptoms to manifest, by which time the immune system of the infected person is severely compromised and therefore susceptible to all kinds of opportunistic infections. The disease, characteristically, is a “long wave” event, i.e., by the time the clinical symptoms become manifest in infected persons, many more are already infected⁴¹ across successive age groups. Unlike other pandemics, no cure has been found for HIV or AIDS. Anti-retrovirals (ARV) only retard the progression from HIV to AIDS. ARV drugs are prohibitively priced, and treatment of the disease often leads to the depletion of individual and/or family resources, leading to poverty.

Individuals most susceptible to HIV infection are those within the 15–49 years age group. There are, however, records of infections below and above this range. Persons in this age group are economically active. Skilled or unskilled, they engage in productive activities,

38. *WHO Annual World Health Report*, 1999. www.who.org/annualworldhealthreport1999.

39. *AIDS Epidemic Update: A Special Report HIV/AIDS*, December 2006. www.unaids.org; unaids@unaids.org.

40. Ibid

41. AIDS Research Division of Metropolitan Life, Cape Town, South Africa.

develop and/or manage enterprises, or provide the requisite labour that adds economic value to resources. This age group also constitutes the reproductive class that replenishes society. The 15–49 age group is thus of immense importance to society. The scourge of AIDS significantly reduces the number of persons in this group through mortality. AIDS morbidity also compromises the ability of the survivors in this age group to reproduce and engage in efficient and effective socio-economic activities. In addition to fewer children being born, there are also many orphaned children as a result of their parents succumbing to AIDS. HIV/AIDS thus alter the demographic structure of society, which occurs through changes in the dependency and sex ratios.

The “dependency ratio” is a quotient of the ratio of the dependent population (those aged below 15 years and 50 years and above) (numerator) to the 15–49 years age group (denominator). The quotient is indicative of how much effort an individual must make in order to provide for himself/herself and one dependant. A quotient less than one (a fraction) implies that an individual needs only to increase productivity by that fraction to provide for a dependant and himself/herself. But when the quotient is one or greater than one, then the individual must increase productivity that many number of times to care for himself/herself and another person. The quotient is thus indicative of the potential of a society to invest in developing itself. Societies with dependency ratios greater than one have more difficulty investing in the development of their societies, e.g. developing countries, than industrialised economies with dependency ratios of less than one⁴². The inability of a society to invest adequately in the development of its citizens in time and space results in poverty. Individuals in these societies, under the pressure of poverty, often devise means

of coping, including indulging in unsafe sex practices identified as one of the main reason for HIV. Once there is HIV infection, the cycle repeats itself. HIV/AIDS is thus not caused by poverty. The susceptibility increases in conditions of poverty because poverty increases vulnerability to infection, and once infected poor people have fewer resources to cope with the burden of ill health⁴³.

The “sex ratio” is the ratio of males to females expressed as males per 100 females⁴⁴. In patriarchal societies, where access to resources (e.g. education) is socially constructed more in favour of males, female social capital is poorly developed and limits the effectiveness of women in societal development. HIV/AIDS morbidity and mortality among the male populace of the society impacts the sex ratio and adversely affect the social capital and thereby the ability to engage effectively with external partners in developing the society.

The impact of HIV/AIDS in a society therefore goes beyond the infected individuals and affected families. An entire society is incapacitated and cannot participate meaningfully in investing in its own development or partnering with others to do so for the lack of requisite social capital.

Susceptibility to HIV infection at the individual level has been found to be largely a result of lack of knowledge, inadequate information and/or the unwillingness to change in response to information about preventing the disease among others. The vulnerability of the individual to HIV also increases depending on the governing systems, whether they are cultural, religious, socio-economic or political. In recognition of this, there have been various programmes to mitigate the impact of AIDS and prevent the spread of HIV through its mainstreaming.

42. International Union for the Scientific Study of Population, *Multilingual Demographic Dictionary*, English Section

43. Charles Gills (1998)

44. International Union for the Scientific Study of Population, *Multilingual Demographic Dictionary*, English Section

2. HIV/AIDS mainstreaming

The objective of mainstreaming HIV/AIDS issues into the core functions of any organisation is to ensure that:

- The effective and efficient achievement of the objectives are not adversely impacted by HIV/AIDS.
- The processes of implementation of the core functions of the organisation do not inadvertently increase the susceptibility of individuals and/or the vulnerability of society as well as other partner organisations (clients) to HIV infection.
- The impact of HIV/AIDS on clients so infected is mitigated through the implementation of the core functions.

2.1 The Concept

Integration and mainstreaming are often used synonymously with respect to HIV/AIDS. It is however, important to establish a distinction between the two in order to fashion clear operational principles for addressing the issues within the activities of institutions.

Integration occurs when HIV/AIDS-related issues and interventions are introduced into a project, programme or policy context as a component or a content area, without interfering much with the specific core business of the institution or the main purpose of its policy instrument. HIV/AIDS activities may be executed, but they are maintained as separate activities rather than being incorporated into, and interfering with other activities.

Mainstreaming recognises that the processes of implementing the functions of an organisation have the potential to increase the vulnerabilities of its clients to HIV infection. It also recognises that the impact of HIV/AIDS among the clients of the programme activities can undermine the effectiveness and efficiency with which objectives of the functions are achieved, if they can be achieved at all. Thus, in mainstreaming HIV/AIDS, the core functions/activities of the organisation and the

targets of planned activities are sufficiently informed by the dynamics of the contextual impact (real and/or potential) of the pandemic on clients, while at the same time ensuring that the processes of implementation of the programme/project activities do not by any means become vehicles for the spread of the pandemic.

Mainstreaming therefore starts with the analysis of the mandate or purpose and the routine functions of an institution, sector or instrument, and moves beyond integration by:

- Identifying the specific areas of responsibility related to HIV/AIDS relevant to the institution
- Outlining context-specific actions underpinned by adequate financial commitments addressing each of these areas in its relationship with the core mandate and activities of the institution

Through mainstreaming, HIV/AIDS become aligned with, and, in turn, influence, the core functions of an institution, thus becoming more than a mere “add-on”.

2.2 Issues for HIV/AIDS mainstreaming

HIV infection occurs at the individual level but the impact and effects extend beyond the individuals to families, communities and societies. The objectives of policies, programmes or development interventions are also vulnerable to the impact of HIV/AIDS. Issues for consideration in mainstreaming should include:

- Individual susceptibility reduction and impact mitigation.
- Societal vulnerability reduction and impact mitigation.
- Policy, programme or project objective vulnerability reduction and impact mitigation.

Individual susceptibility reduction and impact mitigation

HIV is essentially a blood-borne disease that is transmitted mainly through body fluid ex-

change during unprotected sex with infected individuals, and exchange of contaminated needles among injection drug users. Having unsafe sex and/or using objects/gadgets which results in exchange of blood fluids constitute high-risk behaviour. High-risk behaviour is dependent on the individual's perception of risk in unsafe sex and/or sharing objects/gadgets that promote exchange of HIV-contaminated blood or body fluids. Risk perception is influenced by the individual's level of knowledge about the disease, attitude towards this information and hence willingness to change behaviour and practices that increase the risk of HIV infection. Susceptibility reduction at the individual level thus involves conveying the value proposition in behavioural change to safer sex practices through:

- Continuously reinforced culturally relevant information, education and communication (IEC) on the disease, the modes of transmission, etc.
- Counselling and voluntary testing to know one's status in order to encourage uninfected persons to remain uninfected, while the infected are assisted to live positively without infecting others.
- Abstinence among the unmarried.
- Faithfulness among the married.
- Condom use with non-regular partners among the sexually active.

Confirmed or suspected HIV and/or AIDS status of an individual stigmatises him/her. This often results in rejection, ostracism, discrimination and even abuse of the infected individual's rights by his/her own family and the society. An HIV/AIDS infected person is also vulnerable to opportunistic infections that increase morbidity. This type of morbidity is accentuated by poor nutrition. The impact can be reduced through:

- Counselling affected families against rejecting and/or discriminating against affected individuals because of the associated stigma of HIV/AIDS.

- Facilitation of access to treatment of opportunistic infection and ARV drugs to suppress early progression from the HIV to the AIDS stage.
- Providing nutritional support to infected individuals and/or the affected families to make treatment effective.
- Educating infected individuals on how to lead positive lives.

Societal vulnerability reduction and impact mitigation

Susceptibility to HIV infection at the individual level is a consequence of choices made based on the knowledge about preventing the disease, the attitude of the individual towards this information and the willingness to change behaviour practice based on the value proposition of the information available.

Individuals live in societies and are socialised by worldviews promoted by the prevailing systems of governance, which have a strong influence on their attitudes and behaviour. These include the civic, cultural, social, religious, political and economic systems and/or various types and levels of combination of these systems. Advocates of societal vulnerability reduction posit that certain aspects of these systems promote worldviews that do not sufficiently motivate individuals to adopt attitudes that lead to changes in behaviour practices in response to the value propositions in the knowledge about HIV infection prevention⁴⁵. Thus the susceptibility of individuals to HIV infection is increased, thereby rendering the entire society vulnerable to the impact of AIDS, which includes reduction in societal social capital among other effects.

Societal vulnerability reductionists therefore propose altering the aspects of societal governance systems that increase an individual's susceptibility to HIV infection by investing in understanding the dynamics of these systems

45. Sofia Gruskin and Daniel Tarantola as quoted in Lamptey et al, *Facing the HIV/AIDS Problem*, www.prb.org English Bulletin 57.3.

so that the right processes could be adopted to alter them without compromising the inherent good values. This involves profiling of specific community governing systems as co-factors in increasing the susceptibility of individuals to HIV infection. They also posit that reducing societal vulnerability to the impact of AIDS will be more effective and efficient if the value propositions in behaviour change communication aimed at individual susceptibility reduction are appropriately informed by the prevailing societal worldview of these systems.

The ability of a society to invest in developing itself or partnering others to do the same depends on the quantity and quality of the social capital available in the requisite forms in time and space. Social capital is the backbone of socio-economic activity. The impact of HIV/AIDS reduces the social capital of a society by distorting the demographic structure (age and sex ratios) through mortality and by incapacitating the remaining social capital through morbidity.

When developing measures to mitigate the impact of HIV/AIDS, they need to be contextualised with respect to how the disease manifests itself in various sectors of the society.

Reduction of the vulnerability of objectives of core functions

The efficiency with which the objectives of core functions of an organisation are met depends on the effectiveness of the types and levels of engagement between the implementers and the beneficiaries. The effectiveness of this engagement is dependent on the types (quality and quantity) of social capital and levels of consultation between partners in determining the targets of objectives and the process(es) of implementation, and during the implementation process.

It requires an innovative approach which constantly and openly engages partners in determining the targets of the objectives, selecting implementation process(es) as well as in implementation itself. This essentially in-

volves enabling all partners to contribute to the planning and implementation of activities such that the targets reflect the impact of HIV/AIDS on the society as well as the capacities of the partners to effectively engage each other in achieving these targets.

It is important to distinguish this approach from the traditional pipeline approach, where a lead partner organisation sets the targets and determines the implementation process(es), expecting other partners to collaborate with it in achieving the goals. This approach, many a time, does not fully utilise essential (but often latent) information that can reduce the vulnerability of the targets of the objectives of the organisation to the impact of HIV/AIDS.

2.3 The principles of HIV/AIDS mainstreaming

Based on current experience aimed at guiding mainstreaming HIV/AIDS at different levels, five simple principles⁴⁶ have emerged that provide a comprehensive framework within which to conceptualise and implement HIV/AIDS mainstreaming in order to reduce susceptibility at the individual level and reduce societal as well as policy/programme/project objective vulnerabilities:

- Develop and define entry points or themes for mainstreaming HIV/AIDS clearly in order to maintain the critical focus necessary to make an impact.
- Determine and distinguish between internal (implementers) and external (beneficiaries) clients of the policy/programme/project to be mainstreamed in order to focus on reducing their respective vulnerabilities.
- Determine priority interventions areas of the vulnerability reduction programme, e.g. prevention of HIV infection, provision of treatment, care and support.
- Develop strategic partnerships based upon comparative advantage, cost effec-

46. UNAIDS/GTZ: *Mainstreaming HIV/AIDS*, June 2002

tiveness and collaboration, which result in effective and efficient implementation of the vulnerability reduction programme.

- Develop advocacy, sensitisation and capacity building plans to back the vulnerability reduction plan.

3. Agriculture in Africa

3.1. The HIV and AIDS pandemic in Africa

Agriculture in Africa is dominated by small subsistence enterprises. It employs about 80% of the populace, who directly or indirectly depend on it for their livelihood. Predominantly women and children constitute the primary labour (65%) that tills the land; the remaining 25% of the work is done by draught animals and 10% by engines. The agricultural sector contributes to a third of the total GDP and 40% of the total export earnings, and yet the region is not self-sufficient in food production and has difficulty feeding the populace. It is estimated that 33% of the Sub-Saharan African population remains undernourished and the majority suffer hunger and poverty⁴⁷. While agricultural development is constrained by civil conflicts, which make investment in agriculture in the affected areas difficult, the government's prioritisation also leaves much to be desired.

This crisis is aggravated by weak, fragmented, under-resourced and overtaxed agricultural education and research systems. Farmers and agricultural entrepreneurs lack access to the information, infrastructure and resources required to be commercially successful. There is also a chronic lack of capacity⁴⁸ for generating innovations to increase the productivity and sustainability of agriculture, to ensure food security, and to contribute to wealth generation. The result is that hunger and poverty is an unfortunate characteristic

of the continent. This is exacerbated by the impact of the HIV/AIDS epidemic.

3.2. The HIV/AIDS pandemic in Africa

The December 2006 Epidemic Update⁴⁹ published by UNAIDS and WHO indicated that 63% of all global HIV infections and 72% of the AIDS deaths occur in Sub-Saharan Africa. It further indicated that women bear a disproportionate burden of the impact of the epidemic and are more likely to be infected than their male counterparts and, that they ultimately become the caregivers for people infected with HIV as well as the AIDS patients.

The report provided some evidence that the epidemic is stabilising in most African countries, i.e. the number of newly infected people with HIV roughly equals the number dying of AIDS. This is possibly a result of the respective National HIV/AIDS Response Programmes. However, it cautioned that the programmes reach only about one quarter (23%) of the people infected with and/or affected by HIV/AIDS who need to be reached.

In the sub-regional context, southern Africa is reported as 'remaining the epicentre of the global epidemic'. It has 32% of the globally HIV infected persons as well as 34% of all global AIDS deaths. Though there was a decline in the national HIV prevalence rate in Zimbabwe, in the other countries in the sub-region the prevalence rates continue to increase.

In East Africa, the report indicated a continuation of the general trend of stabilising HIV prevalence, but warned that the results of a recent research study points to an increasing trend in HIV prevalence in rural Uganda. This implies a possible erosion of the gains made against AIDS in Uganda in the 1990s.

In West Africa, the national HIV prevalence rate is lower than in other parts of sub-Saharan

47. Lori Hunter in *Understanding how HIV and AIDS and Agriculture are Linked*, www.prb.org

48. The new FARA Strategic Plan (2007-2017)

49. *AIDS Epidemic Update: Special Report on HIV/AIDS*, December 2006. www.unaids.org

Africa, surpassing 4% prevalence rate only in Cote d'Ivoire. There are signs of declining HIV prevalence in the urban areas of Burkina, Cote d'Ivoire and Ghana, but Mali's epidemic appears to be growing.

In Central Africa, incomplete data make it difficult to detect any clear trend for the countries in the sub-region. It is however known that HIV prevalence rates may still be 5% and above. E.g. HIV prevalence rates in the Central African Republic and Cameroon are 11% and 5% respectively.

Thus the HIV/AIDS epidemic in sub-Saharan Africa does not display a uniform trend. While some sub-regions appear to be stabilising, there is evidence of a growing epidemic in others. Countries within the sub-regions also show divergent trends. Any visible improvement is largely an urban phenomenon. Little change, if any at all, seems to be happening in the rural areas. Where there have been gains there are signs of possible reversals.

3.3. The link between HIV/AIDS and African agricultural systems

In the early years of the pandemic, HIV/AIDS was primarily considered an urban issue. It has, however, now been proven that many rural regions of sub-Saharan Africa also have high HIV prevalence. Since rural residents typically have less access to health care, testing, and counselling, the HIV/AIDS pandemic is more difficult to combat in these regions.

Africa is predominantly rural, and the agricultural systems are dominated by rural and subsistence enterprises. Agricultural production largely depends on human labour. Inadequate infrastructure and lack of access to agricultural market information seriously undermine the productivity of rural enterprises. This results in inadequate food production and food deficits, which, in turn, result in hunger and poverty.

In these settings, HIV/AIDS pose a serious threat to agricultural production and food security, in several ways. It puts pressures on

agriculture systems related to, e.g., the loss of labour and household assets⁵⁰.

Reducing the labour available for agricultural production is the HIV/AIDS pandemic's most obvious impact on agriculture. Clearly, the disease affects the labour provided by the infected individual. It also influences the availability of the labour of other household members, who have to take care of the sick individuals. Culturally mandated mourning periods further reduce labour available for agricultural activities. A mourning period often requires special clothing and the restriction of work activities, including tending the fields⁵¹.

Reductions in available human labour influence household agricultural production and related food security in several ways. Previously tended land may be left fallow, resulting in less food production. Important tasks such as weeding may be postponed, resulting in reduced yields. The labour shortages can cause changes in what crops are planted to favour less labour-intensive production systems.

Adult mortality influences cropping patterns depending on the role of the deceased in household ventures. In many cultures, men are more likely to engage in the cultivation of cash crops such as coffee, tea, sugar and cocoa, and the death of adult males often lowers production of these crops. In contrast, grain crops suffer shortfalls following the death of adult females. In both situations, HIV/AIDS mortality shapes food security and hunger through reduced income from the market in the case of foregone "cash crops", or through direct consumption in the case of grain crops⁵².

HIV/AIDS-related changes in crop production may also threaten access to agricultural land. In regions where land tenure is not secure, households may lose rights to land not regularly

50. Lori Hunter in *Understanding how HIV and AIDS and Agriculture are Linked*, www.prb.org

51. Ibid

52. Ibid

used. This is of particular concern for widows and child-headed households in cultures with patriarchal land rights, since widows may lose access to assets, including to land in favour of the deceased spouse's relatives.

HIV/AIDS has exacerbated poverty, but is not the outcome of poverty. They however, flourish in conditions of poverty because poverty increases vulnerability to infection; and, once infected, poor people have fewer resources to cope with the burden of ill health⁵³. This is true particularly if the infected individual had been a wage-earner. In addition to lost wages, HIV/AIDS-affected households incur new expenses related to healthcare and the expense on funerals in the event of death. These expenses seriously drain the already stressed finances of the families, which in most cases resort to borrowing, pawning and/or selling personal effects, including draught animals and machinery, to offset these expenses.

Reduced financial resources may also mean lower levels of purchased agricultural inputs such as fertilisers, leading to lower yields. Reduced food security leads to hunger, which affects the immune system of individuals, reducing their ability to resist infections. This situation often predisposes family members to high-risk activities as a means of augmenting their incomes and the cycle continues.

The loss of agricultural knowledge is another way in which HIV/AIDS threatens food security because AIDS mortality is highest among prime-age adults, and important agricultural knowledge is lost when they die. Research in Mozambique, e.g., illustrated the importance of the intergenerational transfer of knowledge about seeds for maintaining agricultural systems. Surveys and interviews with farmers in the Chókwè district of Mozambique revealed that HIV/AIDS-affected households also had less access to seed and seed information⁵⁴. Respondents most often noted that their

parents were key the sources of information on seeds.

4. The FARA Strategic Plan

4.1. *The objective of the Strategic Plan*

The FARA Strategic Plan is influenced by the AU-NEPAD response to the agricultural crisis on the continent – CAADP. CAADP aims at achieving a 6% annual growth in agricultural production by 2015 through a smallholder-led growth strategy. It is built on four 'pillars':

1. Extending the area under sustainable land management and reliable control systems.
2. Improving rural infrastructure and trade-related capacities for better market access.
3. Increasing food supply and reducing hunger.
4. Agricultural research and technology dissemination and adoption.

The FARA Strategic Plan is designed to support the Pillar IV agenda of the AU-NEPAD CAADP and provide sustainable solutions to the agricultural crisis in Africa. The main objective of the FARA Strategic Plan (2007–2016) is to reduce food insecurity and poverty in Africa in an environmentally responsible manner by establishing broad-based agricultural growth through sustainable improvements in agricultural productivity, competitiveness and markets⁵⁵. This objective reflects FARA's comparative advantage, and is designed to complement and add value to the strategies and programmes of partners through the provision of networking support which include:

- A&RM
- Access to knowledge and technologies
- Regional policies and markets
- Capacity strengthening
- Partnerships and strategic alliances

53. Charles Gills (1998),

54. *AIDS Epidemic Update: Special Report on HIV/AIDS*: December 2006. www.unaids.org

55. FARA Medium Term Operation Plan: 2007-2011

4.2. Mainstreaming HIV in the FARA Strategic Plan

The objective

Given the nature and dimensions of the impact of HIV/AIDS, the objective for mainstreaming the FARA Strategic Plan therefore should be to ensure that:

- The effectiveness and efficiency of technology research, dissemination and adoption and increasing agricultural productivity, competitiveness and markets is not adversely impacted by the HIV/AIDS pandemic.
- The processes of implementing the networking support functions do not inadvertently increase the susceptibility/vulnerability of the clients of this Strategic Plan to HIV infection.
- The mitigation of the impact of HIV/AIDS on clients so infected and those already infected through the implementation of the networking support functions.

These objectives are to be achieved at every level of the FARA structure.

The entry points

The three-layered structure of FARA, consisting of the FARA Secretariat, SROs, and NARS, provide entry points for mainstreaming the Plan at the regional, sub-regional and country level. Adhering to the principle of subsidiarity, each level should identify and implement activities relevant to its environment within the limit of the Strategic Plan without any interference from a higher level. The higher levels, however, are expected to add value to the activities of the lower levels. That is, the SROs should add value to the activities of NARS by providing networking support for their activities in the sub-regional context, while the FARA Secretariat and the forum provide networking support with a regional perspective to the SROs.

The structure thus effectively leaves the agriculture research systems (institutions) in each country to identify issues of research,

technology dissemination and adoption relevant to increasing agricultural productivity in each country. This provides a framework which facilitates clear definition of clients at each level vis-à-vis their susceptibility or vulnerability to HIV/AIDS impact, so that specific intervention measures that promote the effective and efficient achievement of the Strategic Plan's objectives at each level could be developed.

External and internal clients

In HIV/AIDS mainstreaming, everyone, be it an individual, an institution or society, related to the plan being mainstreamed is referred to as a client. The clients are further categorised as internal clients when they are the implementers of the plan and external clients when they are recipients/beneficiaries of the outputs of the plan. It is important to make this distinction because the factors of susceptibility and vulnerability to the impact of HIV/AIDS for these two categories are different depending on the individual and societal worldviews they subscribe to vis-à-vis information on HIV/AIDS. Drawing this distinction is thus important for developing a relevant HIV/AIDS susceptibility/vulnerability reduction plan for each group.

Clients can be identified at each of the three levels of the FARA system because the Strategic Plan is implemented across these levels as shown in Table 1.

Intervention areas

Intervention areas may be classified into two broad categories:

- (1) susceptibility/vulnerability reduction, and
- (2) impact mitigation

Susceptibility/Vulnerability reduction intervention areas

Individuals may be said to be susceptible to HIV infection while society is vulnerable to the larger impacts of the infection. Susceptibility of individuals to HIV infection is dependent on their level of knowledge about the disease, their attitude to the information, and their willingness

to change the behavioural practices based on this information. To engender the appropriate behavioural changes to reduce HIV infection, it is important to conduct knowledge, attitude and behavioural practice surveys among the individuals to determine the relevant activities that need to be initiated.

Individuals live and grow in societies and their attitudes and behavioural practices are influenced by the worldviews prevailing in their society. Since these worldviews often emanate from the governance systems in the society, it is important to profile these systems in order to identify the aspect(s) of the system(s) which reinforce attitudes and behavioural practices that increase the vulnerability of the individual.

The outcomes of these studies will indicate the issues that must be tackled in reducing susceptibility/vulnerability to HIV infection for each type of client in the form of prevention activities.

Impact mitigation

HIV/AIDS impact agricultural productivity in Africa through:

- Loss of agricultural labour resulting in reduction of the effective area per head under cultivation.
- Loss of indigenous knowledge about local agricultural practices, e.g. seed technology, environmental practices necessary to increase productivity.
- Changes in cropping patterns.

This impact is exacerbated by prevailing societal governance systems which promote:

- Extended mourning periods in the event of the loss of loved ones, during which period important agricultural tasks are postponed.
- Elaborate and expensive funerals which lead to the sale of farm machinery and draught animal to offset debts incurred.
- Land tenure practices that discriminate against the female sex, thereby restricting them to the production of specific crops.
- The right of access of males to education over the right of access of females.
- The taboo of the production, processing and consumption of certain foods with even higher nutritional values based on sex or age, which compromises this group's resistance to disease particularly HIV among others.

To mitigate the impact, therefore, agricultural research would need to invest in:

- Agricultural labour-saving technologies (production and processing) requiring minimal human intervention.
- High yield animal/crop varieties suited to various environments.
- Nutritionally fortified foods for the very weak in society.
- Farming systems (agro-forestry) that provide individuals and families a good mix

Table 1. The FARA structure and clients.

| Level | Clients | |
|--|---|---|
| | Internal | External |
| The Forum | Staff of Secretariat | Staff of SROs and National Research Institutions, private individuals from the NARS levels |
| Sub-regional organisations (SROs) | Staff of Secretariats | National Research Institutions, private individuals from the NARS levels |
| National Agriculture Research Systems (NARS) | Staff of National Agricultural Research Institutions (NARIs) e.g. extension officers, researchers, etc. | Private individuals, local communities collaborating in agricultural research and technology dissemination and adoption |

of food sources to improve their nutritional levels and thereby resistance to infection.

- Mechanisms for indigenous agricultural knowledge preservation (documentation) and transmission.

These efforts would need to be coupled with research into societal governing systems with a view to altering aspects that do not lend themselves to adoption of new technologies and good (balanced) nutritional values as well as aspects that increase (directly or indirectly) the vulnerability of individuals in the society to HIV infection. Alternatively, research could also focus on developing the appropriate means and methods of communicating the value propositions in the developed technologies to engender the requisite societal change for its acceptance.

HIV/AIDS mainstreaming and FARA's networking support functions

Raising awareness and advocating appropriate responses to HIV/AIDS is an important element of all FARA activities, which is threaded through the activities of FARA's five networking-support functions (NSF).

NSF 1: Advocacy and resource mobilization. FARA will be constantly seeking more information and evidence-based policy recommendations for inclusion in its advocacy activities.

NSF 2: Dissemination of knowledge and technology. RAILS will be an important means of raising awareness, disseminating information and enabling learning about HIV/AIDS among stakeholders on all aspects of African agriculture.

The dissemination of new technologies through DONATA will have to be appropriate to the HIV prevalence in the targeted communities so that application is possible in the face of reduced and weekend labour resources. It is obviously important that FARA's products from

NSF 3: Research on policies and markets, produces recommendations that are sensitive

to HIV/AIDS issues. Access to fair markets for households headed by women caregivers and for child-headed households are among the topics that have not received sufficient attention.

NSF 4: Capacity building, FARA's SCARDA and BASIC projects are very much concerned with the effects of AIDS because it seriously aggravates the capacity shortages, which have to be compensated for in the numbers trained and in succession planning.

NSF 5: The innovation platforms promoted under NSF 5 will also be negatively affected by HIV/AIDS, which severely erodes the financial and social capital and the capacity to take risks that individuals and communities need to engage in innovation.

Strategic partnerships

HIV vulnerability reduction and AIDS impact mitigation requires broad-based knowledge and learning across societies, resource mobilization, and capacity strengthening at the national, sub-regional, or regional and even the international level. Synergy from partnerships within and across these levels is necessary for efficiency and effectiveness in programme delivery. This is crucial to take advantage of the networking-support functions executed at the higher levels.

Advocacy, sensitisation, capacity building plans

The vulnerability reduction and impact mitigation activities will be implemented over a period of time and would involve the participation and support of different partners at different times. It is important to develop advocacy, sensitisation and capacity plans to sustain the programmes by keeping partners regularly informed, building their capacities to enable them to achieve the objectives, processes of implementation and expected outputs and outcomes. This would encourage collective ownership and responsibility for realisation of the programme objectives.

Additional resources

The following additional documents are available on the Internet, and may be useful to readers seeking additional information on the links between HIV/AIDS and agriculture, and interventions that contribute to alleviating the risks and impacts of the disease on agricultural productivity:

- ActionAid International (August 2005). Food Security and HIV and AIDS in Southern Africa: Case Studies and Implications for Future Policy, SAPP (Southern Africa Partnership Programme), 76 pages, [http://www.reliefweb.int/rw/lib.nsf/db900SID/EK0I-6J89AN/\\$FILE/food%20security%20HIVAIDS.pdf?OpenElement](http://www.reliefweb.int/rw/lib.nsf/db900SID/EK0I-6J89AN/$FILE/food%20security%20HIVAIDS.pdf?OpenElement).
- Barnett, Tony (April 2005). HIV/AIDS, Nutrition and Food Security: Looking to Future Challenges, PowerPoint presentation, London School of Economics, LSE/AIDS, http://www.sarpn.org.za/documents/d0001214/Barnett_LSE_HIV.pdf.
- Barnett, Tony (2002). The Challenge of HIV/AIDS for Food Security and Nutrition, Norwich, UK: School of Development Studies, UEA. <http://www.lse.ac.uk/collections/DESTIN/publink/barnett/asb02e.htm>; See also Tony Barnett's publications page: <http://www.lse.ac.uk/collections/DESTIN/publink/barnett/asbpub.htm>.
- Barnett, Tony & Rachel Grellier (July 2003). Mitigation of the Impact of HIV/AIDS on Rural Livelihoods through Low-Labour Input Agriculture and Related Activities, Report submitted to DFID-UK by the Overseas Development Group, UEA Norwich, 93 pages, http://www.passlivelihoods.org.uk/site_files%5Cfiles%5Creports%5Cproject_id_53%5CMitigation%20of%20the%20Impact%20of%20HIVAIDS%20on%20Rural%20Livelihoods%20Report_HA0036.pdf.
- deWaal, Alex & Joseph Tumushabe (February 2003). HIV/AIDS and Food Security in Africa, Report for DFID, 22 pages, http://www.sarpn.org.za/documents/d0000235/P227_AIDS_Food_Security.pdf.
- Economic Commission for Africa (October 2005). Report of the Workshop on Interventions to Mitigate the Impact of HIV/AIDS on Smallholder Agriculture, Food Security and Rural Livelihoods in Southern Africa, 45 pp, <http://www.uneca.org/srdc/sa/Documents/AIDSWORKSHOPREPORTOCTOBER2005.pdf>.
- Economic Commission for Africa 2006. Mitigating the impact of HIV/AIDS on smallholder agriculture, food security and rural livelihoods in Southern Africa: Challenges and action plan, Addis Ababa: ECA, 49 pp., <http://www.uneca.org/srdc/sa/publications/HIV-AIDSandAgriculture.pdf>.
- Eibl, Marita & Valerie Foster (n.d.). Annotated Bibliography on Gender and HIV/AIDS, (includes sections on water and land rights, and agriculture, food security and nutrition), East Lansing, MI: Michigan State University Women in International Development Program <http://www.wid.msu.edu/resources/biblios/Gender%20and%20HIV-AIDS.htm>.
- FAO. A search of their website shows 24 documents available. See http://www.fao.org/google_result_en.htm?cx=018170620143701104933%3Aqq82jsfba7w&q=AIDS&x=26&y=11&cof=FORID%3A9#526.
- Gillespie, Stuart & Sumeetha Kadiyala (2005). HIV/AIDS and Food and Nutrition Security: From Evidence to Action, IFPRI Food Policy Review 7, Washington DC: International Food Policy Research Institute, 184 pages, <http://www.ifpri.org/pubs/fpreview/pv07/pv07.pdf>.

- Gillespie, Stuart (ed.) (2006). *AIDS, Poverty, and Hunger: Challenges and Responses, Highlights of the International Conference on HIV/AIDS and Food and Nutrition Security*, Durban, South Africa, April 14–16, 2005, Washington DC: International Food Policy Research Institute, 375 pages, <http://www.ifpri.org/pubs/books/oc50.asp#dl>.
- GTZ & UNAIDS (June 2002). *Mainstreaming HIV/AIDS: A Conceptual Framework and Implementing Principles*, Accra, Ghana, 19 pages, http://hivaidsclearinghouse.unesco.org/ev_en.php?ID=1985_201&ID2=DO_TOPIC.
- GTZ, Oxfam, FAO, HSRC, UNDP & Save the Children (2003). *Mitigation of HIV/AIDS-Impacts through Agricultural and Rural Development – Success Stories and Future Actions*, Workshop Report, May 27–29, 2003, Pretoria, South Africa.
- ICASO, AfriCASO, International HIV/AIDS Alliance (2007). *Coordinating with Communities, Part A: Background to Involving Communities. Guidelines on the Involvement of the Community Sector in the Coordination of National AIDS Responses*, 24 pages, http://www.aidsalliance.org/graphics/secretariat/publications/Coordinating_communities_part_A_english.pdf.
- Middleton-Lee, S. (2007). *Coordinating with Communities, Part B: Taking Action to Involve Communities. Guidelines on the Involvement of the Community Sector in the Coordination of National AIDS Responses*, 16 pages, http://www.aidsalliance.org/graphics/secretariat/publications/Coordinating_communities_part_B_english.pdf.
- IFAD (October 2001). *Strategy Paper on HIV/AIDS for East and Southern Africa*, Rome: International Fund for Agricultural Development, 71 pages, <http://www.ifad.org/operations/regional/pf/aids.pdf>.
- IFPRI (2006). *RENEWAL: The Regional Network on AIDS, Livelihoods and Food Security, Project Concept Note*, Washington DC: International Food Policy Research Institute, 4 pages, <http://www.ifpri.org/renewal/index.htm>.
- IFPRI (2007). *RENEWAL: 3rd Regional Workshop*, March 12–14, 2007, Heia Safari Lodge, South Africa.
- Jayne, T.S., Marcela Villarreal, Prabhu Pingali & Günter Hemrich (2005). *HIV/AIDS and the Agricultural Sector in Eastern and Southern Africa: Anticipating the Consequences*. Food and Agriculture Organization of the United Nations, Rome, Italy.
- Kormawa, Annmarie J. (2005). *Impact of HIV/AIDS on African Agriculture and the role of the Consultative Group on Agricultural Research*, Cotonou: Africa Rice Center (WARDA), 13 pages, <http://www.warda.org/swiha/DublinPaper.pdf>.
- Kormawa, Annmarie J., B. Beks & A.R. Agboh Noameshie (eds.) (2005). *HIV/AIDS & Agriculture: Implications for Food Security in West and Central Africa*, Africa Rice Center (WARDA)/Systemwide Initiative on HIV/AIDS and Agriculture (SWIHA), 320 pages, <http://www.warda.org/publications/swihaproc/index.html>.
- Lessons learned in mainstreaming HIV/AIDS (2002). *Flyer 1: Overview of HIV/AIDS Mainstreaming*. OXFAM GB, Southern Africa.
- Lessons learned in mainstreaming HIV/AIDS (2001). *Flyer 2: Practical outcomes of HIV/AIDS mainstreaming*. OXFAM GB, Southern Africa. 2 pp.

- Lessons learned in mainstreaming HIV/AIDS (2001). Flyer 3: HIV/AIDS awareness among staff. OXFAM GB, Southern Africa. 2 pp.
- Lessons learned in mainstreaming HIV/AIDS (2001). Flyer 4: Workplace policy on HIV/AIDS. OXFAM GB, Southern Africa. 2 pp.
- Lessons learned in mainstreaming HIV/AIDS (2001). Flyer 6: Findings of local research on HIV/AIDS. OXFAM GB, Southern Africa. 2 pp.
- Mutangadura, Gladys B. (2005). Gender, HIV/AIDS and Rural Livelihoods in Southern Africa: Addressing the Challenges, JENDA: A Journal of Culture and African Women Studies, Issue 7.
- Nankam, Claude (2003). HIV/AIDS and Agriculture Systems Initiatives, manuscript, World Vision, 17 pages, <http://aiard.org/communications/HAASI.pdf>.
- Mullins, Dan (2002). Mainstreaming HIV/AIDS into development: what it can look like. OXFAM GB, Southern Africa. 6 pp.
- (2005) Prowling lions and sleeping dogs: the challenge of mainstreaming HIV/AIDS in Organisations. 4 pp. http://www.sarpn.org.2a/documents/d0001774/HIV_organisations_2005.pdf.
- VetAid (November 2003). Mitigating the Effects of HIV/AIDS on Food Security and Agriculture in Eastern and Southern Africa, Workshop Summary Report, Maputo, 10 pages, http://www.sarpn.org/documents/d0000855/P974-VETAID_Report_Nov2003.pdf

Acronyms and abbreviations

| | |
|--------------|--|
| A&RM | Advocacy and Resource Mobilization |
| AARINENA | Association of Agricultural Research Institutions in the Near East and North Africa |
| AATF | African Agricultural Technology Foundation |
| ABBI | African Biotechnology and Biosafety Initiative |
| AEZ | agro-ecological zone |
| ARV | Anti-retrovirals |
| AR4D | Agricultural Research for Development |
| ASARECA | Association for Strengthening Agricultural Research in Eastern and Central Africa |
| AU | African Union |
| AU-NEPAD | African Union's New Partnership for Africa's Development |
| BASIC | Building African Scientific and Institutional Capacity |
| CAADP | Comprehensive Africa Agriculture Development Programme |
| CEEAC | Communauté Économique des États de l'Afrique Centrale |
| CEMAC | Communauté Économique et Monétaire de l'Afrique Centrale |
| COMESA | Common Market for Eastern and Southern Africa |
| CORAF/WECARD | Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricole / West and Central African Council for Agricultural Research and Development |
| CSO | civil society organization |
| ECAPAPA | East and Central Africa Programme for Agricultural Policy Analysis |
| ECOWAP | ECOWAS Agricultural Policy |
| ECOWAS | Economic Community of West African States |
| EDF | European Development Funds |
| FAAP | Framework for African Agricultural Productivity |
| FARA | Forum for Agricultural Research in Africa |
| FFS | farmers' field school |
| GDP | gross domestic product |
| GFAR | Global Forum on Agricultural Research |
| IAR4D | Integrated Agricultural Research for Development |
| ICT | Information and Communications Technology |
| ICU | Information and Communications Unit |
| IPM | Integrated Pest management |
| IP | Intellectual Property |
| JEE | Joint External Evaluation |
| M&E | Monitoring and Evaluation |

| | |
|-----------|---|
| MDG | Millennium Development Goal |
| MOU | Memorandum of Understanding |
| NARES | National Agricultural Research and Extension Systems |
| NARIs | National Agricultural Research Institutions |
| NARS | National Agricultural Research System |
| NEPAD | New Economic Partnership for Africa's Development |
| NRM | Natural Resource Management |
| NSF | networking support functions |
| OP | operational plan |
| R&D | Research and development |
| REC | Regional Economic Commission |
| RP | rock phosphate |
| RUFORUM | Regional Universities Forum |
| SADC-FANR | Southern Africa Development Community – Food Agriculture and Natural Resource Directorate |
| SCARDA | Strengthening Capacity for Agricultural Research in Africa |
| SOM | soil organic matter |
| SPMS | Sanitary and Phytosanitary Measures |
| SRO | Sub-Regional Organization |
| STRC | Scientific, Technical and Research Commission |
| TRIPS | Trade-Related Aspects of International Property Rights |
| UEMOA | Union Économique et Monétaire Ouest Africaine |
| WEMU | West African Economic and. Monetary Union |
| WTO | World Trade Organization |

About FARA

FARA is the Forum for Agricultural Research in Africa, the apex organization bringing together and forming coalitions of major stakeholders in agricultural research and development in Africa.

FARA is the technical arm of the African Union Commission (AUC) on rural economy and agricultural development and the lead agency of the AU's New Partnership for Africa's Development (NEPAD) to implement the fourth pillar of Comprehensive African Agricultural Development Programme (CAADP), involving agricultural research, technology dissemination and uptake.

FARA's **vision**: reduced poverty in Africa as a result of sustainable broad-based agricultural growth and improved livelihoods, particularly of smallholder and pastoral enterprises.

FARA's **mission**: creation of broad-based improvements in agricultural productivity, competitiveness and markets by supporting Africa's sub-regional organizations in strengthening capacity for agricultural innovation.

FARA's Value Proposition: to provide a strategic platform to foster continental and global networking that reinforces the capacities of Africa's national agricultural research systems and sub-regional organizations.

FARA will make this contribution by achieving its *Specific Objective* of **sustainable improvements to broad-based agricultural productivity, competitiveness and markets**.

Key to this is the delivery of five *Results*, which respond to the priorities expressed by FARA's clients. These are:

1. Establishment of appropriate institutional and organizational arrangements for regional agricultural research and development.
2. Broad-based stakeholders provided access to the knowledge and technology necessary for innovation.
3. Development of strategic decision-making options for policy, institutions and markets.
4. Development of human and institutional capacity for innovation.
5. Support provided for platforms for agricultural innovation.

FARA will deliver these results through the provision of networking support to the SROs, i.e.

1. **Advocacy and resource mobilization**
2. **Access to knowledge and technologies**
3. **Regional policies and markets**
4. **Capacity strengthening**
5. **Partnerships and strategic alliances**

FARA's major donors are The African Development Bank, The Canadian International Development Agency, European Commission, the Governments of the Netherlands, United Kingdom, Italy, Ireland, Germany and France, the Consultative Group on International Agricultural Research, the Rockefeller Foundation, Bill and Melinda Gates Foundation, the World Bank, and the United States of America Agency for International Development.



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ISBN 978-9988-1-1060-X (print)

ISBN 978-9988-8438-5-2 (pdf)