

**A MULTI-COUNTRY  
AGRICULTURAL PRODUCTIVITY PROGRAM (MAPP)  
FOR AFRICA**

***DRAFT ISSUES PAPER***

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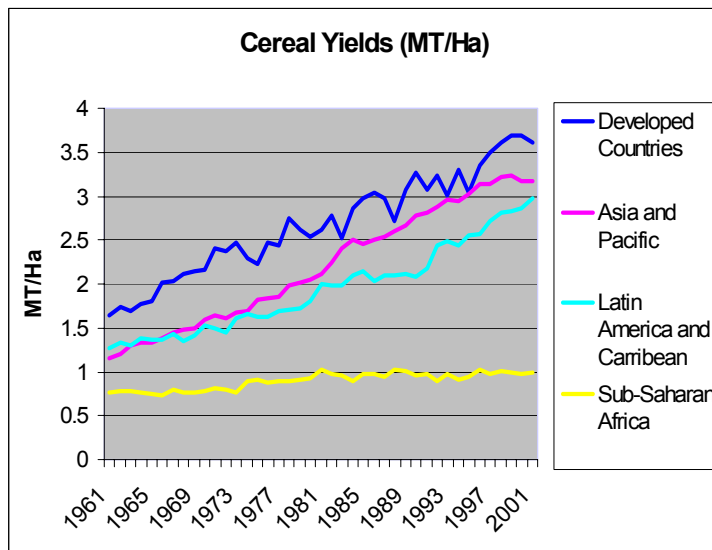
# **I Program Development Objective**

## ***A. Program Purpose***

1. **The Challenge.** Despite gains in the second half of the 1990s, Sub-Saharan Africa enters the 21<sup>st</sup> century facing enormous challenges. The region's average per capita income is the lowest in the world – just US\$315 – a level that has changed little, and in some countries actually declined, from the 1960s. Income disparities are also very high, and Africa's poor are the poorest of the poor. Almost half of the continent's 600 million people live not with less than one dollar but with less than US\$0.65 a day. And this number has grown relentlessly, causing Africa's share of the world absolute poor to jump from 25 to 30 percent during the 1990s.
2. The reasons of Africa's poor performance are many: wide-spread conflicts on the continent; the deterioration of terms of trade for non-oil primary commodities and African countries' vulnerability to declines in terms of trade because of their failure to diversify into more dynamic product lines; faulty economic policies and poor governance which created a hostile environment for investments and growth and resulted in a dramatic decline in both the amount and efficiency of public and private investments; the lack of investment in people and in basic infrastructure; and the AIDS crisis.
3. Reversing this trend is possible. Africa has enormous unexploited potential, in resource-based sectors – and in processing and manufacturing, and it has barely tapped the potential of its people. Globalization and new technology, especially information technology, offer a great opportunity for Africa, historically a sparsely populated and isolated continent. Many African countries have started to undertake important economic reforms, improving macroeconomic management, liberalizing markets and trade and creating a policy and institutional environment more friendly to private sector activity, especially to agriculture. Where these reforms have been sustained, economic growth has increased and poverty fallen. Countries with political stability, good macroeconomic management and improved policy environment saw output per-capita grow at close to 3% a year in the second half of the 1990s. But the response hasn't been sufficient to overcome years of economic decline – including low national savings rates (at 13% of GDP the lowest in the world), inadequate infrastructure, the loss of human capital, eroded by AIDS and the poor performance of health and education services as well as by the sustained drain of the educated work force (it is estimated that some 23,000 trained professionals emigrated every year), and weakened institutions. African economies are deeply decapitalized (capital per worker is half that in South Asia and run-down infrastructure is a critical barrier to growth).
4. Broad-based and sustained growth will be essential to reduce poverty. With African population expected to grow at 2.8% per annum, simply preventing an increase in the number of Africa's absolute poor will require annual growth of at least 5%, almost twice the level achieved since 1973. Achieving the International Development Goal of halving severe poverty by 2015 and bringing SSA malnutrition trends in line with those projected for the other developing countries (a 30% reduction in the number of malnourished children), average GDP growth would have to average 8% over the period. This is the objective that African Heads of State have adopted for their New Economic Partnership for African Development (NEPAD). Achieving this objective will require (i) improving governance and preventing conflict; (ii) massively investing in people; (iii) and increasing the competitiveness and diversification of the economies. This is an immense challenge that requires an equally immense level of determination and commitment from African governments, but also of the international community for opening market opportunities for African economies and providing the necessary resources. Achieving the target annual growth rate of 8% calls for sustained investment rates at 30% of GDP and this in turn will require an extended period of concessional external financing.
5. **The Central Role of Agriculture.** In most African countries, because of its importance in overall GDP, export earnings and employment, as well as its forward and backward linkages to the non-farm sector, growth in the agricultural sector will continue to be the cornerstone of poverty reduction.

Increased agricultural productivity and growth, driven by technology and investments, has a powerful dynamic effect that benefits the poor throughout the economy, directly through increased agricultural income and employment, and indirectly through increased food availability and lower food prices as well as through the demand created by increased agricultural incomes for non-farm goods and services produced by the very large, employment intensive non-agricultural rural economy.

6. Africa's agricultural performance over the last 30 years has been the worst in the developing world. Agricultural productivity has stagnated and agricultural growth has averaged 2 percent per annum, not keeping pace with population increase. This has resulted in falling per capita incomes in agriculture and more globally in rural areas, and in an increasing level of food insecurity at both the national and the



household levels. While agricultural productivity soared world-wide during the second half of the 20<sup>th</sup> century, through the combination of improved biological potential of crops and intensive crop management techniques (wheat yields quadrupled in Mexico, and rice production tripled over a 20 year period in South Asia), yield increases were minimal in Africa and fell dramatically behind those in other developing regions (cereal yields in SSA fell from 65% of developing countries' average in 1967 to only 43% by 1997). Per-capita cereal production actually declined from 128 kg to 124 kg during the period. Calories intake in Africa is currently the lowest in the world.

Malnutrition has actually increased over

the last thirty years and Africa is the only region where the number of malnourished children was higher in 1997 than it was in the mid-sixties (33 million against 22 million). While about one in ten malnourished children in developing countries resided in Africa in 1970, one in five did in the mid-1990s. Continuation of this trend would lead to a human disaster of unprecedented proportion. A study undertaken in the context of the preparation of the Bank's Rural Development Strategy (*Reaching the Rural Poor*) projects that the per-capita calorie availability in SSA would increase only marginally between 1997 and 2020 and that the region's number of malnourished children would continue to increase (from 33 to 39 million), while all other developing countries would achieve a decline of more than 30% in the absolute number of malnourished children.

7. As the new millennium begins, Africa's agriculture therefore faces the daunting challenge of being the main engine of economic growth and poverty reduction in Sub-Sahara Africa. African leaders have therefore clearly positioned agriculture at the center of their new vision for the future of the continent, calling for a growth rate of 6% per annum through 2020. Successfully facing this challenge will require

- supporting an enabling policy environment for agricultural trade and market access, at the national, regional and international levels;
- promoting agricultural productivity to improve competitiveness and reap the full benefit of expanding markets;
- promoting agricultural diversification and boosting the share of high value products, as well as the processing of commodities further along the value chains;

- improving the efficiency of land markets and rural financial services; and
- fostering non-farm economic growth by supporting the development of activities with strong upstream and downstream linkages with agriculture.

8. This will involve the unflinching pursuit of competitiveness of Africa's agricultural production, to successfully penetrate developed countries' demanding and often protected markets and meet the challenges and opportunities of globalization. Policy and institutional reforms should be deepened for making input and output markets more competitive, including the removal of excessive regulatory controls, strengthening property rights and the rule of law to foster private initiative, and improving the efficiency of public institutions and public expenditure programs. Massive investments in rural transport infrastructure and communications, and reducing the barriers to inter-African trade in agricultural and agro-industrial goods, will also be needed to link producers to markets. Finally, maintaining competitiveness will require increased and sustained investments in science and technology to support the much faster generation, diffusion and adoption of technological solutions suited to the problems of African farmers.

9. **Commitment of African Leaders.** African political leaders have singled out agricultural productivity increase as one of the critical drivers of economic growth and poverty reduction. They have affirmed their commitment to the improvement of agricultural technology generation and dissemination systems, as a key priority in the New Partnership for Africa Development (NEPAD), and *called for a doubling of the current level of public funding of agricultural technology generation and dissemination by 2013*. The Forum for Agricultural Research in Africa (FARA) was recently created as the apex organization of the three sub-regional networks and to take over the global coordination responsibilities of SPAAR. FARA, which will become NEPAD's operational arm in the area of agricultural technology, has already defined in May 2001 the broad lines of the new strategy for Agricultural Research and Development in Sub-Saharan Africa in its "Durban Statement" (Box 1), calling for a broad alliance between the public and the private sectors.

**Box 1 . THE DURBAN STATEMENT**  
**The Way Forward for Agricultural Research and Development in Sub-Saharan Africa**

Agriculture is the engine for improved rural livelihood and economic development in Sub-Saharan Africa (SSA). Recognizing this, the African political leaders have positioned agriculture at the center of their new vision for the future of the continent. In full support of this vision, the SSA agricultural research and development community has called for regional agricultural production to grow at an annual rate of 6% through 2020. [...] The target level of agricultural growth can not be achieved without a focused and market-driven technology development and transfer system, an enabling policy environment, and effective institutions.

The considerable efforts and financial investments that have been made by national and international institutions over the past 30 years have had limited pay-offs. At the present time, SSA is still dealing with first order challenges of increasing agricultural productivity, lagging behind most of the rest of the world. Additionally, new challenges that threaten the potential of agriculture to contribute to sustainable economic development in SSA have emerged. These include increasing urbanization, globalization and market competitiveness, environmental and natural resource issues (land degradation and desertification, water scarcity and competing demands for water, deforestation, loss of biological diversity, climate change, etc.), and the devastating impact of HIV/AIDS.

4. To address these challenges, we, the members of the SSA agricultural research and development community, recognize that effective and broadened partnerships are essential. The national agricultural research systems (NARSs) must play a central role in these partnerships. The African countries have made considerable efforts, over the past decades, to develop a solid base-line research infrastructure. In order to harness these resources, the NARSs have taken the initiative towards reforming themselves for greater accountability, fiscal stability and impact. They have also strengthened regional collaboration through the formation and development of sub-regional organizations (SROs), and more recently through the creation of the Forum for Agricultural Research in Africa (FARA). The light structures coordinate many decentralized networks, based on subsidiarity principles and increasingly on competition. Other partners, including the CGIAR Centers, have similarly responded to the challenge through more intensive consultation with NARSs and greater collaboration among themselves.

5. The way forward is to build on the gains already made. We, the members of the SSA agricultural research and development community hereby agree to commit ourselves to pursue the stated Vision through the following lines of action: (i) develop and disseminate technologies for increased agricultural productivity and sound natural resource management; and (ii) utilize the benefits offered by the emerging technologies, including information and communication technology, and safe use of biotechnology. Action will be guided by the principles of :

- inclusive partnerships which reach out to producers, agribusiness, and consumer organizations, as well as other development-oriented non-governmental organizations (NGOs)
- substantive agenda based on programmatic priorities
- operational efficiency based on competition and decentralization
- mutual respect and shared credit
- and using the following instruments:
- high quality human capital
- increased and sustained financing, and
- effective institutions.

6. On the occasion of the CGIAR Mid-term Meeting held in Durban, South Africa, we call upon:

- The SSA governments to translate their political commitment to agricultural development into concrete actions by providing the necessary resources and creating an enabling policy and institutional environment;
- The SSA governments to ensure that issues of sustainable agriculture receive their due place on the agenda of the Johannesburg Earth Summit
- FARA, with the support of the Global Forum on Agricultural Research (GFAR), to play an advocacy role to place agricultural research at the center of the SSA agricultural development agenda;
- The international investor community to coordinate its efforts, and significantly increase and sustain financial support for African agricultural research;
- The international agricultural research system, including the CGIAR Centers and advanced research institutions, to forge more effective and efficient partnerships with African NARSs and achieve greater programmatic integration; and
- The CGIAR System to ensure that the proposed changes in program, governance structure, and funding mechanisms are consistent and reinforce our efforts to achieve the African Vision.

*\* Forum for Agricultural Research in Africa (FARA); Special Program for African Agricultural Research (SPAAR); Association for Agricultural Research in East and Central Africa (ASARECA); Conférence des Responsables de la Recherche Agronomique en Afrique de l'Ouest et du Centre (CORAF/WE CARD); Southern African Center for Agricultural Research (SACCAR); CGIAR -Supported Future Harvest Centers*

Durban, South Africa, May 22, 2001

**10. The Role of the Public and Private Sectors in Technology Generation and Adoption.**

Sustained productivity increase through technical change will be the engine of the future growth of agricultural income and of the rural economy. Public intervention in support for technology generation, dissemination and adoption is justified by the public good nature of much of the technology necessary to overcome the main constraints to the sustainable development of African agriculture, the limited capacity to pay of African smallholders and the imperfections prevailing in output, input and credit markets. While technology adoption is a private decision by farmers, ineffective information/knowledge systems and market imperfection severely limit farmers' ability to access new technologies and the equipment and/or inputs such as seeds and fertilizers into which it is embodied. If not remedied, market imperfections would lead to serious under-investment into agricultural technology relative to profit maximizing investment levels, and therefore into a shortfall in agricultural growth.

11. *Mitigating Credit Market Failures.* To promote technology adoption, most governments started out by setting up public specialized agricultural credit institutions. Specialized agricultural banks proved unprofitable and required recurrent large injection of public money. They have been abolished in most countries and replaced by public support to the agricultural portfolios of private or cooperative banks, including by subsidizing interest rates, mortgage banking schemes, matching grants to technology adopters (sometimes targeted to poor farmers), credit guarantee schemes, and subsidized crop and livestock insurance.

12. *Overcoming poor development of output and input markets.* (Karen Brooks to write corresponding paragraphs)

13. *Public Funding of Advisory services.* Publicly provided extension services have often been highly centralized and used a top down approach to delivering specific technological messages, rather than served as advisory services in response to farmer demand. Since the mid-1990s, countries have implemented reforms to make public advisory systems more accountable to end-users, better suited to answering the complex nature of African farming systems and the diversity of African farmers' technical and economic constraints and more financially sustainable. In some countries, governments also co-finance advisory services provided by the private sector or farmer organizations. While these reforms have improved the efficiency of the national advisory systems, they do not solve the financing problem of advisory services for small farmers who have insufficient incentives or are too poor to pay for the services, and continued and sustained public funding of national technology transfer systems will be necessary in the foreseeable future.

14. *Financing technology generation.* Public intervention in support of new technology generation is justified by the fact that, once discovered and developed, scientific and technological knowledge is freely available to all, and can be embodied into capital goods and/or inputs by firms which did not contribute to the discovery and development costs. The patent system is designed to overcome this market imperfection, and has recently been extended to include genetic information and the derived seed varieties and animals. As a consequence, in OECD countries most applied research leading to new seed varieties, livestock strains, chemical inputs, and machines is now performed by the private sector. The private seed and chemical sector has also flourished in some large developing countries such as Brazil and India, but remains very poorly developed in the very small markets of Africa. This is partly a legacy of the excessive reliance on public sector marketing of inputs and outputs, but also because the investment climate for the private sector remains poor in many countries, excessive regulatory interventions and intra-African trade restrictions on agricultural inputs continue to fragment the markets for new seeds and chemical inputs. Reforms in these areas are necessary. However, even after reforming the regulatory and trade systems, a compelling need remains for public finance of research and development. Except where hybrid varieties are the most productive, the need will remain especially large for the development of new genetic technology for food and cash crops, trees, and livestock, and for research into the large array of agricultural techniques which cannot be patented, including agronomic research, research into soil and water management, storage of crop and livestock output.

15. In addition, the strategic and basic science research, even in developed countries, is financed by the public sector, and often executed by public sector institution such as specialized research centers or universities. This will also be the case for developing countries, through their national public institutions and a close collaboration with international centers of excellence, in particular the centers of the Consultative Group for International Agricultural Research (CGIAR), specifically created to overcome the many incentives problems which constrain agricultural research expenditures for the small markets in Africa and other small developing countries. National public agricultural research institutions have also suffered from the neglect of their own governments and from public sector rules and regulations which are inappropriate for institutions involved in the discovery and adaptation of new technology. In addition, the CGIAR centers and the public agricultural research institutions have often been too centralized and lacked responsiveness to the demands and needs of farmers and other stakeholders. Moreover, the almost exclusive channeling of research funding to these institutions has undermined the development of research in other centers of excellence like universities, as well as the development of public-private partnerships for research. The reform agenda therefore includes the empowering of the stakeholders into the governance of these institutions at local, national and Africa-wide levels, and the opening of the funding to competition from universities, public-private partnerships and international centers of excellence outside of the CGIAR system, primarily through the setting up of competitive funds for research at various levels, and the provision of funding for downloading technology from higher level to lower level institutions and farmers organizations. Institutional reforms and increased financial support for bringing a much increased flow of research outputs and innovations into African agriculture are therefore urgently needed.

## **B. Program Development Objectives and Phasing**

16. The World Bank Group has invested significant resources in agricultural technology generation and dissemination efforts in Africa, both at the international level through its support to the CGIAR and at the country level through its support of the national agricultural research and extension systems. A review of Bank assistance to national systems carried out in 1997 by OED concluded that, while Bank support had had a positive impact on national agricultural service delivery systems, long-term effort and commitment were necessary to ensure their efficiency and sustainability. OED report concluded that, although ultimately the National Agricultural Technology Delivery Systems (NATDS) and the governments to whom they report must take responsibility, the international community, and the Bank, because of the central role of agricultural productivity in economic development and poverty reduction, had a key role to play in helping to enhance technology development and transfer.

17. The central goal of the overall program would be to dramatically increase productivity, competitiveness and incomes in African agriculture and rural non-farm sector, through farmers improved access to technologies well suited to their opportunities and constraints, with a specific emphasis on the needs of the poor vulnerable groups. Its specific objectives would be to strengthen the efficiency and sustainability of the agricultural technology generation and delivery system in Africa, both at the regional/sub-regional and the national levels.

18. The overall program would (i) include inter-related/coordinated actions at the international, regional and country levels; (ii) involve technology generation and transfer by both public and private institutions; and (iii) be supported by a consortium of donors. IDA assistance would focus on providing long-term support for the improvement of national agricultural technology delivery systems and strengthening their interactions/synergies with the international and regional research institutions.

19. Improving the efficiency and sustainability of the agricultural technology generation and delivery system in Africa is a long-term challenge. Accordingly, IDA's assistance would be phased over a fifteen years period and financed through a *series of multi-country, pre-approved lines of credit* structured as both an "horizontal" and a "vertical" adaptable program lending (APL) instrument:

(i) *“Horizontal” APL*: IDA credit line would be accessible to countries where government commitment and the existing economic and sectoral policy and institutional framework is favorable to strengthening the NATDS . Country eligibility criteria are set out in section... below;

(ii) *“Vertical” APL*: IDA financial support to each eligible countries would support a long-term program and be channeled through a long-term APL with clear sequencing and phase triggers. Country-specific development objectives, sequencing and phase triggers would be defined in the context of the preparation of individual country project under the program.

20. The credit line would be financed by a mix of IDA loans and IDA grants. It would be complemented by financial support from interested donors through a central Donor Trust Fund managed jointly by IDA and participating donors. Implementation arrangements would be designed to support the following four main objectives: (i) strengthening end-users capacity to define their constraints and access the services they need, on a demand basis; (ii) promoting the “subsidiarity principle” in the supply of the services required; (iii) increasing the transparency and efficiency in service delivery; and (iv) supporting the increasing financial sustainability of service institutions, in particular by the increased cost recovery from end-users. Program preparation and implementation would be overseen by NEPAD which would provide overall guidance on institutional reforms and governance issues. Implementation support would be coordinated by FARA and undertaken jointly by all participating donors.

21. One of the central objectives of each country-specific program and APL would be to move away from the project funding approach in favor of the “budget support approach”. The program would be supported through the coordinated funding of a coherent public expenditure program for the development of the national agricultural technology generation and dissemination system. Government and donor funding would support a clear strategy and medium-term program to do so which would be :

(i) based on a set of agreed upon “*basic Principles*” in the areas of market-oriented policies, end-users empowerment, good governance arrangements, social and environmental sustainability, translated into operational milestones (including APL’s second phase triggers) for tracking progress toward the program development objectives; and

(ii) translated into detailed annual public expenditures programs to be funded by all interested donors

22. Phase I of the MAPI would last five years (2003-07). IDA financing would be through an overall line of credit/grant authorized by the Board on the basis of pre-approved country eligibility criteria, objectives, design framework and performance indicators. Individual country-specific operations financed under the line of credit would be approved by Africa Region Management. MAPI’s subsequent phases would be subject to Board’s approval upon its review of Phase I achievements.

**Box.: Mozambique PROAGRI**

### **C. Key Performance Indicators**

23. Monitorable milestones for the overall MAPP would be developed during the program’s detailed preparation, to track progress in institutional reforms/development (poverty focus, governance and



responsiveness, efficiency, financial sustainability) as well as specific triggers for Phase II and Phase III of the program. Specific performance indicators would also be developed for each country-specific operation to be financed under the MAPP, tailored to the specific country circumstances.

## II. Context, Main Issues and Strategic Choices

### A. *Strategic Context.*

24. **Agricultural productivity and poverty reduction.** In most if not all African countries, agriculture accounts for a large share of total income and employment. Boosting growth in agricultural productivity will therefore have an important direct effect on agricultural production and income, either directly through increased own-farm production, or through providing greater agricultural employment and income opportunities for smallholders and landless laborers. But agricultural growth also generates important second rounds of income and employment growth within the non-farm rural economy, and within the economy at large. African farmers are overwhelmingly smallholders who spend a large share on their incremental income on labor intensive local non-tradable, goods and services. This leads to growth in the non-agricultural rural economy and, via employment multipliers, to decreases in rural poverty. The engine of this rural economic growth is the production of tradables, i.e. the goods that are marketed outside the producing region itself, and in particular of tradable agricultural products. Their demand lies mostly outside the producing region and growth in tradables is promoted essentially by overcoming both demand-side and supply-side constraints. The increased agricultural incomes then generate second round effects by propelling demand-led growth in rural non-farm activity.

#### **Box 2: Empirical Evidence of the Relationship Between Agricultural Growth and Poverty Reduction**

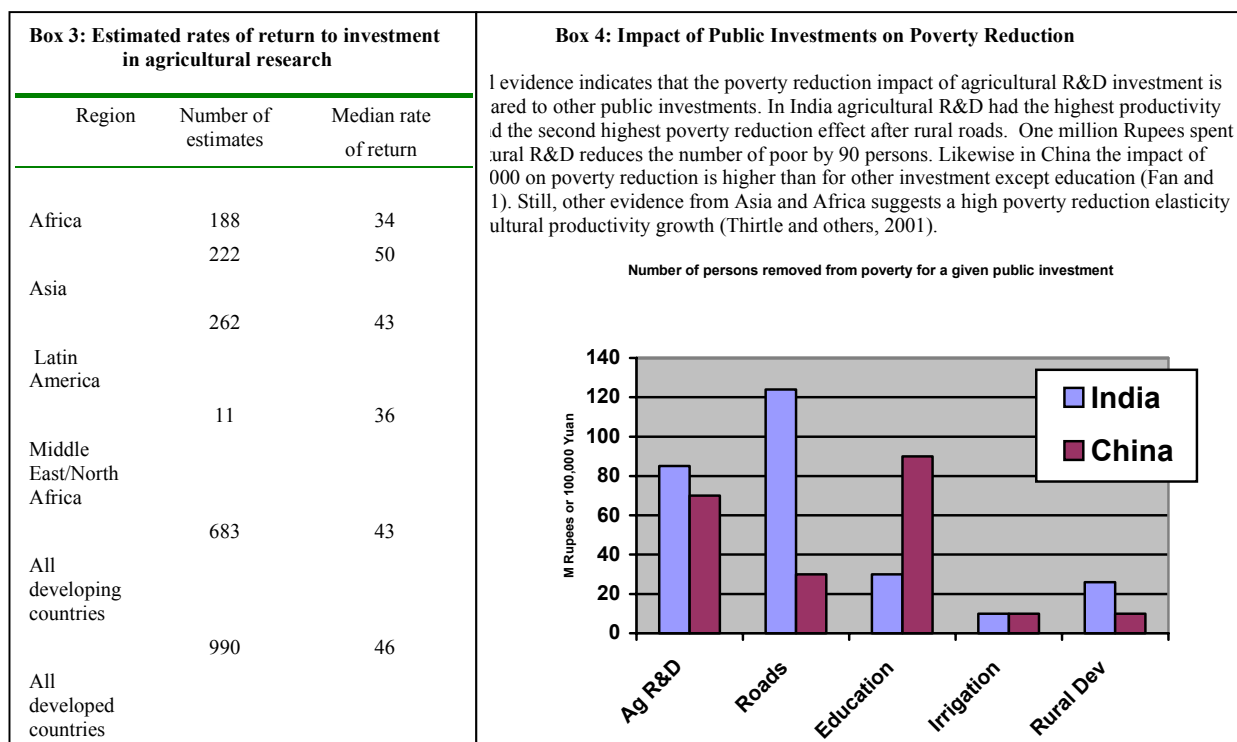
- A one percent increase in agricultural GDP per capita led to a 1.6% gain in the per capita incomes of the lowest income fifth of the population in 35 countries analyzed (Timmer, 1997)
- A 10% increase in crop yields leads to a reduction between 6% and 10% of people living on less than \$1 a day, according to a recent study (Irz, et al., 2001). For African countries, a 10% increase in yields leads to a 9 % decrease in the percentage of those living on less than \$1 a day
- Wheat prices would have risen 34%, and rice prices 41%, more between 1970 and 1995 in the absence of international agricultural research efforts (Evenson, 2001)
- The average real income of small farmers in southern India rose by 90% and that of landless laborers by 125% between 1973 and 1994, as a result of the 'green revolution' (World Bank, 2001)

Source: World Bank (2002)

25. The second round effects of agricultural growth play a critical role in rural poverty reduction. Numerous studies have shown that they can be as large as the direct impact of agricultural growth itself, each 1 percent increase in agricultural income generating a 1 percent increase in the non-farm income. It is estimated that the rural non-farm economy accounts on average for at least 20% of full-time rural employment in Africa, and non-farm income for about 40% of rural incomes. Non-farm employment and incomes are particularly important for rural landless or near landless, and for women. They also provide an important source of financing for agricultural inputs and investments, and play an essential tool for stabilizing the poor income during crisis. Finally, the impact of increased agricultural productivity is not restricted to the rural sector. Consumers, especially poor urban consumers who spend a large proportion of their income on food, benefit directly from cheaper food prices. Cheaper food, the major wage good in developing economies, has a positive impact on the competitiveness and growth of other sectors of the economy. Indeed, there is growing evidence that in developing countries, while urban income growth doesn't contribute to rural poverty reduction, increases in agricultural productivity and growth in rural incomes contribute to both rural and urban poverty reduction.

26. **Impact of research on agricultural growth.** Growth in agricultural productivity depends on the interplay of many factors as diverse as macroeconomic policies (trade and exchange rate policies), infrastructure such as roads and irrigation schemes, access to input and services and the formation of human (such as general and specialized education and health) and social capital in the sector. However, a critical factor is technological change and the knowledge system that underpins it. In spite of the difficulty of isolating its impact on agricultural productivity and growth from that of these other factors,

many studies have demonstrated the high economic returns of investments in agricultural research and dissemination, with returns typically above 40 percent (table 1). Investment in agricultural research and extension is thus a crucial input of agricultural growth.



27. There hasn't been a comprehensive review of the impact of past investment in agricultural research. There have been significant successes: cotton in West Africa, hybrid maize in Southern Africa, rubber and oil palm in Cote d'Ivoire, tea in Kenya and, recently, the development of the Nerica rice variety. But the past poor performance of Africa's agriculture indicates that technological change has by no means been widespread or deep enough to support sustained agricultural growth.

## B. Main Issues

### 1. Research Agenda for African Agriculture.

28. **The Technology Challenge.** The defining characteristic of the African agricultural sector is its diversity. Across the continent, within countries or even within individual farms, a wide range of crops is usually grown, often inter-cropped. These complex cropping systems, in particular for food crops, exploit a diversity of climates and soils to buffer production from pest and climatic risks. African research and extension systems have struggled to adapt well-entrenched top-down research models, focused on controlling the plant growth conditions of a few selected crops (the Asian rice revolution), to the needs of African farmers which require a much deeper understanding of farming systems and the development of a menu of possible techniques and technologies adapted to local conditions.

#### Box 5: WARDA's Nerica

In 1992 the West Africa Rice Development Association (WARDA) initiated a research program aimed at developing high performance rainfed rice varieties well suited to African agro-ecological conditions, by combining the ruggedness of African rice with the productivity of Asian species. WARDA used molecular biology to overcome sterility, the main problem in crossing species, and accelerate the breeding process. Trials were carried out in farmers' fields in Guinea, through an approach called participatory varietal selection (PVS). In 1996, the NERICA (New Rice for Africa) was born. NERICA combines the resistance of the African parent to pests, diseases and water stress with the yield potential of Asian parent; it reduces weeding requirements and displays both drought and acid soil tolerance. In addition, it tastes good, say the farmers. The challenge now is to disseminate Nerica quickly throughout West Africa.

29. The main sources of agricultural growth include area expansion; increase in yields and change in crop mix.

- *Area expansion* has been the traditional source of agricultural production in Africa. Population growth is however rapidly closing the land frontier in much of Africa. Area expansion now comes at an increased cost, in terms of the high labor cost but mostly in terms of environmental degradation as it comes through the conversion of the rapidly declining forest resources, wetlands and marginal land (in marginal rainfall environment or of steep slopes). In the future, agricultural research should not promote area expansion, but attempt to mitigate its effect y focusing on the more sustainable management of soil and water resources.
- *Increasing and protecting crop, livestock and fisheries productivity*, based on improving the plant growth-environment will be absolutely necessary to future agricultural growth. This will require a combination of genetic improvement and the development of yield-protecting technologies that help to attain a greater potential of the yield potential in the field and include both genetic improvement and improved crop management practices. New discoveries in molecular biology have opened new frontiers and prospects for the application of biotechnology to genetic improvements and for protecting crops and livestock against biotic and non-biotic stresses (water deficit/logging, toxic elements...). Given the complexity of this research, this will primarily be the responsibility of International Centers and, increasingly of the private sector.
- *Improved crop management*. Improving moisture and nutrient availability will present a major challenge. Irrigated agriculture, in particular wetlands and bottomlands should receive increased attention. However, the most critical issue to address is water management in rainfed farming, to capture and better use rain where it falls through better agronomic practices. Water management will thus be an integral part of soil management which is the greatest challenge for African agriculture. Soil degradation and nutrient depletion should be one of research major focus. High rates of nutrient depletion are found in most of Africa and poses the gravest threat to agricultural productivity. Better agronomic practices are needed to provide low costs responses affordable by poor farmers. But they will not be sufficient by themselves to maintain the long-term productivity of the soil resources. External inputs will also be necessary and this in turn requires both (i) that the cost of these inputs to farmers be reduced by investments in transport infrastructure and policy/trade reforms; and (ii) intensified research in nutrient management to improve the efficiency in their use. Many crop management problems are location-specific and will require strong national research capacities as well as close collaboration with extension services and end-users.
- *Shifts in crop mix*. One of the most dynamic aspects of African Agriculture has been the shifts in crop mix (it is estimated that more than 50% of the agricultural GDP in Kenya over the 1968-87 period was due to a shift toward high-value crops (coffee, horticulture). This is true for a shift in favor of crops for export but also, with the growing urbanization of the population, for domestic urban markets. For agricultural research, this makes crop priorities somewhat of a moving target and requires that strong ties be established between research and producers for defining a fast-changing market-driven agenda.
- *Targeting poverty reduction*. Increasing productivity and production, although necessary, will not be sufficient to support widespread poverty reduction. To have a significant impact, productivity increases will have to be spread across the wide range of crops produced by smallholders to generate the production and consumption multiplier effects that are essential to overall economic growth. in particular the main food staples. In most countries, smallholders cannot expand cultivated areas without causing further degradation of the natural resource bases. Research and development is thus essential to achieve sustainable increase of productivity and income on often degraded and marginal land. To help the poor, technological change will need to be targeted at:

- Broad-based growth by increasing the productivity and production of staple foods;
- Helping smallholders diversifying into higher value crops, which often generate employment opportunities for landless laborers, and focusing on the specific needs of vulnerable groups;
- Increasing productivity in many less-favored areas, with a priority given to heavily populated low potential areas;
- Reducing post-harvest losses which are considerable and undermine small-holders' income; and
- Increasing employment and income earning opportunities for landless and near landless workers, in agricultural (small livestock production, small-scale agro-processing) or non-farm rural sector.

30. ***Bridging the Scientific Divide.*** Research will need to continue investing in conventional technologies. Many high-yielding varieties have already been successfully developed and introduced and promising new ones are in the pipelines. Improved crop management techniques and more judicious use of inputs will also improve productivity, bridging the gap between potential yields and those achieved in field. Biotechnology also offer developing countries hope to successfully addressing critical production and nutrition constraints: (i) crops' resistance to non-biotic stresses (acid, or alkaline soils, salinity tolerance...) and to pest; (ii) production disease-free planting material (banana, plantain, cassava...); (iii) input replacement (reduced need for fertilizers pesticides); (iv) improved livestock productivity through disease resistant stocks and cheaper vaccines; (v) improved nutritional quality of food crops. So far, biotechnology activities have been concentrated in developed countries (less than 20% of the trials have been conducted in developing countries), where they have bee used for the improvement of crop and livestock and the diagnostic of diseases and the production of vaccines. The cultivated areas under genetically modified (GM) crops have grown from 2 million ha in 1996 to more than 44 million ha in 2000. In developing countries, Argentina, China, Mexico and in Africa South Africa have significant commercial planting of GM crops. Commercial application of biotechnology has also started in Kenya and Zimbabwe, but in this area too the continent is lagging behind other countries in the world.

#### Box 6: Biotechnology in Africa

In Africa, only South Africa, Zimbabwe, Kenya have significant activities in the field of biotechnology. However, there is a growing awareness of the potential productivity impact of biotechnology and other countries have expressed strong interest, such as Nigeria and Cote d'Ivoire. Several success stories are coming out of the continent were biotechnological approaches have increased crops resistance to biotic and non-biotic stresses, reduced the cost of pest controls and created new employment opportunities.

- The wide adoption of disease-free banana plantlets in Kenya;
- The use of pest-resistant cotton varieties in South Africa;
- The use of new vaccines in Kenya and Zimbabwe

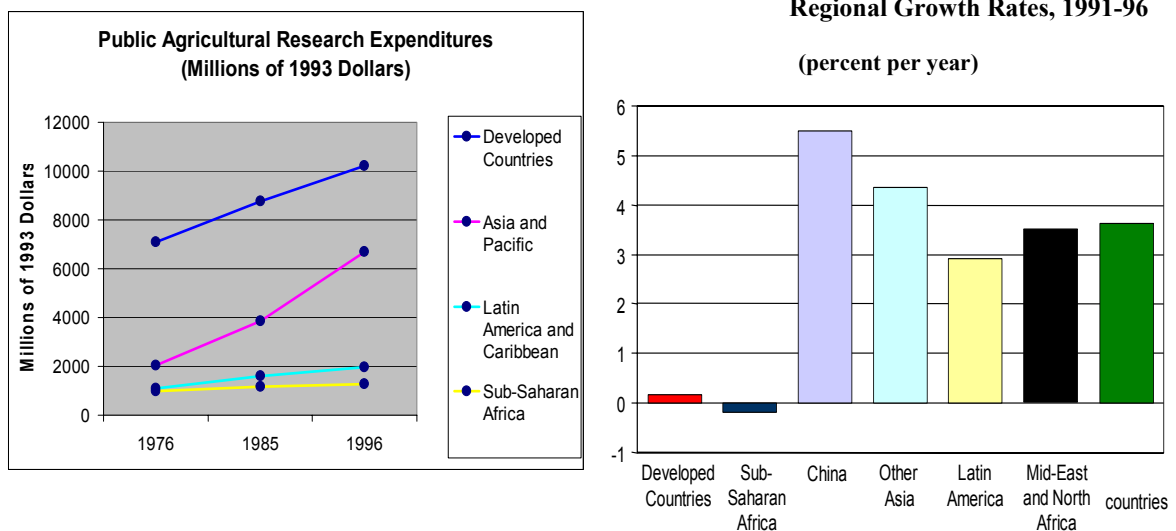
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31. Africa cannot be excluded from the biotechnology revolution. The challenge will be to articulate an African biotechnology agenda and strategy that in particular focus on the need of poor farmers, build the capacity of African institutions to participate in BT research and develop the necessary regulatory framework for protecting against potential risks to human health and to the environment. Public research will play a fundamental role in the development of biotechnology in Africa. As most African countries don't have the resources, human and financial to take advantage of the benefits of biotechnology, the

international community, and in particular the CGIAR system, will have a critical role in identifying opportunities and potential risks; leading research programs while supporting national capacity-building; and facilitating information access/sharing.

## 2. Insufficient Public Investment in Agricultural Technology Generation.

32. Although there has been significant investment in national agricultural research in Africa over the last three decades, African investment levels have been much lower than in Asian and Latin American countries. In contrast to the situation of the 1960s and 1970s when public spending more than doubled, spending for agricultural research in Africa stagnated in the 1980s and declined in the 1990s, increasing Africa's technology lag behind other developing countries.



- Africa public agricultural research spending in 1996 amounted to US\$ 1,270 million against US\$930 million in 1976 (in 1993 US\$), i.e. an average growth rate of 1.5% per year over the period against 4.5% for the developing countries as a whole; worse yet, most of the growth was concentrated in the first ten years of the period, with growth actually turning negative at -0.2% p.a. during 1991-96;
- As a result, the share of Africa in developing countries' global expenditures on public agricultural research fell from 21% in 1976 to 11.1% in 1996, underscoring the grave danger for Africa to fall further behind in terms of agricultural productivity and competitiveness;
- International donor support to agricultural research, after decades of strong support, began to decline around the mid-1980s and Africa, where agricultural research relies heavily on donor support, was particularly hard hit.
- The budget of CGIAR centers, which play a key role in African agricultural research, also started to decline in real terms from the beginning of the 1990s (in 1995 it represented only 1.5% of the nearly US\$22 billion spent on public-sector agricultural research worldwide, down from 3.8% a decade earlier).

33. The reasons for this decline in funding of African public agricultural research are many: from the need for African governments to reduce spending generally for restoring macroeconomic balances, to growing pressures for meeting other urgent development needs in the education, health and infrastructure

sectors. But also a complacency borne from the very success achieved globally over the last four decades in increasing global agricultural productivity (today's farmers are feeding almost twice as many people from virtually the same crop land), and a mistaken belief that private research, in particular through biotechnology, will be able to shoulder a fast growing share of the research agenda. None of these views are correct.

34. The private sector has always played a key role in technology generation and adoption. It is estimated that by the mid 1990s, about one-third of the US\$33 billion total investment in agricultural research worldwide was private. But little of this research took place in developing countries (5.5%) and, although it is difficult to ascertain, it is doubtful that much of the private research was directly relevant to developing countries' needs. Private research is concentrated on food processing and post harvest technologies (in 1995, only 12% dealt with farm-focused technologies) and the farm technology needs of commercial agriculture (seeds, vaccines, agrochemicals and farm equipment) where profits can be captured.

**Estimated Private Agricultural R&D Investments (1995)**

	Expenditures			Shares		
	Public	Private	Total	Public	Private	Total
	(1993 US\$ million)			(percent)		
<b>Developing countries</b>	<b>11,469</b>	<b>672</b>	<b>12,141</b>	<b>94.5</b>	<b>5.5</b>	<b>100.0</b>
<b>Developed countries</b>	<b>10,215</b>	<b>10,829</b>	<b>21,044</b>	<b>48.5</b>	<b>51.5</b>	<b>100.0</b>
<b>Total</b>	<b>21,692</b>	<b>11,511</b>	<b>33,204</b>	<b>65.3</b>	<b>34.7</b>	<b>100.0</b>

35. Private agricultural research relevance to African agriculture will develop in the long run, as profitable markets develop. In the meantime, African agricultural research will continue to rely overwhelmingly on public support, through international centers or NARSs. This is especially true for addressing the needs of poor farmers. The decline in public funding of African agricultural research must therefore be immediately reversed if the agricultural growth target of 6% p.a. necessary for significant poverty reduction in Africa is to be achieved. Given the lag between investing in technology generation and its impact on widespread adoption and productivity increases --measured in years and sometime in decades-- the necessary major increase in public funding of agricultural research cannot be delayed.

### **3. Agricultural Technology Generation, Transfer and Adoption System**

#### ***(i) Agricultural Technology Generation System.***

36. Most of the research in Africa is still done by public agricultural research institutions (NARSs). The contribution of universities and of the private sector to the NARSs are marginal. The International Agricultural Research Centers (IARCs) of the CGIAR system have also been very active in Africa, and have developed the basic material for many of the new varieties which are spreading through the continent. Africa now receives the largest share of CGIAR expenditures.

37. **National Agricultural Research Systems.** Most NARSs are dominated by public research institutions. Their past performance has often been poor. Low and unreliable funding, lack of strategic planning, poor linkages with end-users who are rarely involved in the governance of the systems, limited human resources, poor staff incentives and poor internal management have considerably limited the relevance and efficiency of their activities. African NARSs have to face both the complexity of the research agenda -- most African countries have a mosaic of agro-ecological conditions and cropping systems -- and the low capacity of governments in providing adequate and reliable funding for agricultural research. NARSs have had great difficulties in applying the stringent selectivity necessary to match national research priorities with the limited available funding and research system capacities. In spite of agroecological and farming system similarities among African countries, cooperation among NARSs for implementing regional programs of common interest has been limited.

38. In the early-1990s, with the support of the SPAAR, four *Regional Frameworks of Action* were designed for the Sahel, Humid Tropic, Southern Africa and Eastern Africa sub-regions, to improve NARSs efficiency and strengthen their collaboration. Implementation of these Frameworks for Action led to the identification of six principles for building strong NARSs: (i) increasing the input of stakeholders in strategic and operational research planning, and in the monitoring of results; (ii) ensuring a reliable funding mechanism to improve financial sustainability; (iii) improving internal efficiency through increased transparency and accountability; (iv) strengthening the linkages between research, extension and end-users; and (v) increasing regional and international collaboration.

39. Many NARSs have started to implement reforms along these lines, restructuring their managerial and governance systems to become more responsive to end-users and improving their financial and accounting systems. A growing number of semiautonomous or autonomous research institutions (Kenya Agriculture Research Institute, National Agricultural Research Organization of Uganda, Senegal Institute for Agricultural Research, National Center for Agricultural Research of Cote d'Ivoire) have end-users on their governance bodies and are formulating agricultural research programs in close collaboration with farmer organizations. The move away from the top-down, supply driven publicly-financed model in favor of more open and client-driven systems has also allowed some NARSs to improve financial sustainability through cost recovery. Competitive research mechanisms and contractual research with partial cost recovery from users have also been introduced in many NARSs. In many countries, R&D outreach programs empowering farmers and their organizations in technology generation and delivery, are being piloted. In Kenya, Uganda, South Africa, Zimbabwe, Malawi and Tanzania, among others, private firms are conducting or funding research on commercial crops.

**Box 7: on RCI ANADER/CNRA**

40. **International Agricultural Research Institutions.** The bulk of international agricultural research effort is carried out by the CGIAR's network of independent International Agricultural Research Centers (IARCs). Africa alone absorbs half of CGIAR's total annual budget. Four Centers are located in Africa, of which three have built major research infrastructures. All Centers have a sizable activities ranging from upstream biological research to training. Funds to support the operations of the CGIAR system come from members' contributions. Members include industrial and developing countries, foundations, and international and regional organizations including the World Bank. Industrial countries, specifically the members of the Development Assistance Committee of the Organization for Economic Cooperation and Development, contribute more than two-thirds of CGIAR financing. The World Bank assumes the role of donor of last recourse. Although the ICs have produced impressive results, the overall efficiency and impact of the system have been less than optimal: (i) the system is only now developing a comprehensive and focused African strategy – each center having pursued its own specific strategy; and (ii) ICs coordination between themselves and with NARSs and their support to strengthening national research capacities have only recently started to improve. The CGIAR system is currently going through a restructuring process aiming at strengthening its relevance, efficiency and sustainability through a much greater collaboration with the NARSs and the newly established Sub-regional research organizations. In addition to the CGIAR system, there are a number of independent

agricultural research and academic institutions (with international mandate) which operate in Africa, often outside any national or sub-regional collaborative framework. The Global Forum for Agricultural Research (GFAR) was recently established to expand the boundaries of the coalition for international agricultural research beyond the CGIAR , and also capture the research potential of the private sector.

41. **The Sub-regional Research Organizations** . Three sub-regional agricultural research networks (SROs) have been established over the last two decades (ASARECA in Eastern Africa, CORAF/WE CARD in Western and Central Africa and SACCAR in Southern Africa). Their mandate is to (i) coordinate the research programs of common interest to the NARSs in their sub-region; (ii) organize systematic knowledge sharing and human resource development; and (iii) strengthen partnerships with CGIAR centers and other advanced research institutions. The funding of the SROs come from grants of bilateral and multilateral donors, in particular the European Union and the United States which have taken the lead in coordinating donor support to these organizations. The African member states bear some of the SROs' operating costs and provide as well substantial in-kind contribution in facilities and human resources.

42. **The Forum for Agricultural Research in Africa (FARA)** was recently created as the apex organization of the three sub-regional networks and to take over the global donor coordination responsibilities of SPAAR. FARA represents the African agricultural research systems in the Global Forum for Agricultural Research (GFAR) and in the CGIAR system.

#### ***(ii) Technology Transfer and Adoption System***

43. African governments have invested heavily in technology transfer (extension) systems. It is estimated that about 80% of the world's extension services are publicly funded and delivered by civil servants, with universities, parastatals and NGOs delivering about 15% of services and the private sector an other 5 percent. Although no estimates is available, this proportion is probably even higher for Africa. Traditional extension approaches focused on delivering to farmers "technical packages" generated by agricultural research. One such system, supported by the World Bank, was the Training and Visit (T&V) system -- which tried to introduce sound management practices in governments' public extension systems and strengthen its linkages with research -- which at one time employed an estimated 100,000 civil servants who worked directly with up to 10% of African farmers. Although it is difficult to assess the efficiency of extension systems, on agricultural productivity, there were and still are clear shortcomings -- lack of accountability to farmers and resulting low relevance of extended messages; low accountability of extension staff in a public sector environment and resulting low internal efficiency; unsustainable demand on governments budgets -- and low perceived impact have led to a growing disenchantment with these largely supply-driven public extension systems.

44. Since the mid-1990s, countries have increasingly developed extension systems better suited to answering the complex nature of African farming systems and the diversity of African farmers' technical and economic constraints. These systems attempt to shift away from the traditional approach of transferring prescriptive information to that of enhancing farmers' technical skills and understanding of issues and technologies. The low capacity to pay of most of Africa's agricultural producers and rural entrepreneurs will require continued and sustained public funding of national technology transfer systems in the foreseeable future. Public funding will also be required to support the deep institutional reforms of existing national extension systems and the drastic up-grading of extension agents necessary to create advisory systems able of efficiently assisting farmers to diagnose problems and select appropriate technologies from a menu of possible techniques provided by the research system.

### ***C. Strategic Reform Agenda***

45. Improving the sustainability and efficiency of the technology generation and adoption systems requires immediate action in three areas: (i) continuing policy and regulatory reforms to reduce trade



barriers and liberalize input and output markets and promote private investments in agriculture and the rural economy at large; (ii) accelerating and deepening the institutional reforms already on-going at the national and regional levels to improve the efficiency of the technology generation and dissemination system ; and (iii) increasing both the public and user funding of these systems and other services essential to the sustained increase of Africa's agricultural productivity and competitiveness.

## **1. Policy and institutional Framework.**

46. The driving force of agricultural growth is linking farmers to markets. Typically, countries which have pursued macro-economic stability and openness of their economies have grown faster and investments in technology development have contributed more to growth and poverty reduction in countries with liberalized markets and good infrastructure. To reap the full benefit of increased investments in technology generation and dissemination, African countries should (i) increase public investments in transport, market and information infrastructure to reduce intermediation costs and promote better market integration and a more efficient transmission of market signals; and (ii) pursue policies and regulatory reforms to reduce trade barriers impeding access to international and regional markets, eliminate distortions in incentives, remove excessive regulation and liberalize input and output markets. Reducing trade barriers with OECD countries should be high on African countries' agenda. However, progress in this area will probably be slow. Reducing regional tariff and non-tariff barriers that hurt farmers by impeding their access to technologies and increasing the cost of inputs can be achieved more rapidly and should be undertaken immediately.

## **2. Sustainability and Efficiency of the Technology Generation and Transfer System**

47. **Determinants of Increased Sustainability.** Achieving sustainability will require the commitment and support of a broad and powerful coalition of stakeholders -- governments, end-users and external partners – to provide adequate and stable funding. Mobilizing this broad support will require a much increased accountability and efficiency of the technology generation and transfer systems to their end-users and stakeholders,, based on the following principles:

- Stakeholders participation in the governance of the systems and in the definition of research priorities to ensure that research programs and results are relevant to the stakeholders' main concerns – including social and environmental objectives ;
- Promotion of cost sharing arrangements with end-users according to their capacity to pay, to increase their stake in the efficiency of services provision and improve the financial sustainability of the system;
- Promotion of pluralistic, competitive systems by opening the systems to other service providers (universities, NGOs, private sector) and the introduction of competitive contractual schemes for service delivery; and
- Increased accountability of technology generation and transfer institutions through improved internal MIS and systematic M&E systems;

48. **Institutional Reforms: Agricultural Technology Generation System.** Considerable improvement in the way available human and financial resources are used, can be achieved by the restructuring of the existing technology generation and transfer systems. This involves: (i) defining clear lines of responsibilities and collaboration between NARSs, the sub-regional research organizations and the international agricultural research system; and (ii) aligning, for the system as a whole and each of its three components, processes and resources with their central objective and operational strategies.

- *Division of Responsibilities Among Research Institutions.* Because of the complexity of the agricultural research agenda and the severe constraints on the availability of resources, there is an urgent need to define a rational division of labor for between NARSs, sub-regional research institutions and ICs, and between private and public actors at each level, to ensure that their respective research activities are well integrated and coordinated. This division of responsibility should take into account the comparative advantage of each of the partners (i.e. NARSs are better suited to undertake location-specific research), and existing capacities. One of the driving consideration will be the limited capacities of NARSs. Indeed, many Africa countries have small research systems (only six national systems have more than 200 researcher) and the basic tension of these small NARSs is to ensure that they move toward an affordable and sustainable portfolio in line with both national priorities and existing capacities. More specifically:
  - International Centers of Excellence, including CGIAR, should concentrate efforts on strategic and basic research (germplasm improvement); germplasm safekeeping; bio-safety and IPR issues; assessment of global scientific advances; collation and dissemination scientific information; ecoregional problems associated with maintaining and sustaining natural resources; method development and capacity-building of NARSs;
  - NARSs should concentrate on more location-specific adaptive research, crop/livestock husbandry and resource management research;
  - Sub-regional Research Organizations should concentrate on coordinating and facilitating collaboration among NARSs within the sub-region and between NARSs and the international centers.
  - Private sector capacities should be mobilized to undertake some type of research, on public or private funding, for which it has both an interest and a comparative advantage.
- *Improving NARSs Capacities and Efficiency.* Major efforts are still required in most NARSs to improve the planning and relevance of research programs; improve the internal management of research institutions; and develop human resources. This will involve the following reforms:
  - Developing NARSs capacity for priority-setting and linking resource allocation to priority research programs;
  - Upgrading of NARSs technical skills and human resource management through sustained training programs, severing NARSs from civil service policies and procedures and introducing a performance-based human resource incentive and management system;
  - Developing information technology to link NARS to external scientific information networks;
  - Establishing efficient Internal Management Information Systems in agricultural research institutions; and
  - Introducing systematic scientific external reviews and evaluation, and strengthening Monitoring and Evaluation Systems to track internal efficiency, outputs and impact.

49. **Institutional Reforms: Agricultural Technology Transfer/Adoption Systems.** As in the case of national agricultural research systems, the reforms of national technology transfer systems should be continued and deepened, aiming at:

- establishing and financing pluralistic farmers advisory systems (FAS) involving public and private suppliers largely demand-driven and based on performance-based contracts;

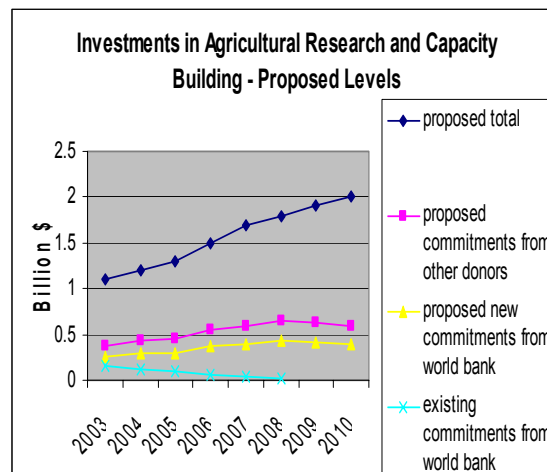
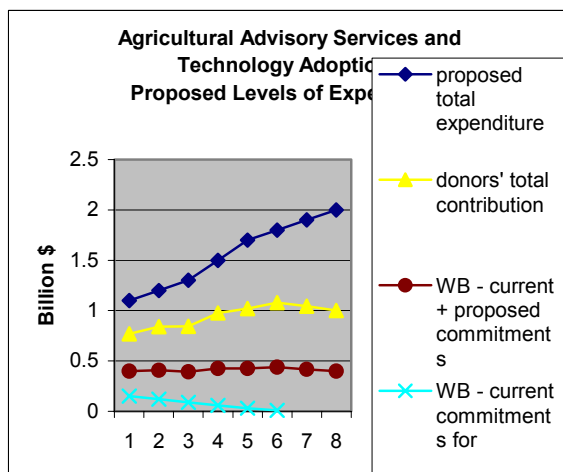
- empowering farmers/farmers associations for the selection and contracting of service providers of their choice;
- promoting a gradual transition to a system of largely publicly-funded but privately-subcontracted agricultural extension services, with affordable cost recovery from farmers for advisory services to ensure ownership and cost-effectiveness;
- broadening the scope of advisory services beyond on-farm technologies to marketing, processing and non-farm rural activities and to business management aspects; and
- Increasing the use of modern information technology to increase rural producers access to global and local technical and market information.

### 3. Ensuring Adequate Funding of the Technology Generation and Transfer System

#### (i) Funding Requirements.

50. African political leaders have singled out agricultural productivity increase as one of the critical drivers of economic growth and poverty reduction. They have affirmed their commitment to the improvement of agricultural technology generation and dissemination systems, as a key priority in the New Partnership for Africa Development (NEPAD). ***The goal is to double the current annual spending on agricultural technology generation and dissemination in Africa within 10 years from about US\$2.3 billion currently to about US\$4.5 billion in 2010 (an average increase of 7.0 percent a year during the next decade:***

- *from US\$1.3 to approximately 2.3 billion for agricultural research; and*
- *from about US\$ 1.1 billion to about US\$ 2.0 billion for advisory services.*



#### (ii) Sources of Funds.

51. The funds necessary to finance this much increased support to African technology generation and transfer systems will have to come from many sources, including government, producers, agribusiness firms and donors. Initially, government and donor funds will need to provide the largest proportion of funds.

- *Governments.* In the past, governments' commitment to supporting national research and extension systems has been lukewarm at best. Public expenditures for these services as a proportion of agricultural GDP (the "research intensity") has typically be low (less than 0.5% against 2.4% in developed countries). In the future, although external support will continue to be necessary for the development of efficient agricultural technology systems, the main responsibility for the provision of adequate funding will rest with the governments themselves and their full commitment is an absolute pre-requisite if NEPAD objective for agricultural growth is to be achieved.
- *Donors funding support* will continue to play a central role in the development of African agricultural technology generation system (over the past three decades, donor funding provided on average 35 to 40% of expenditures of NARS in Sub-Saharan Africa, and for one-third of the countries, up to 65%). In the short-to-medium term, donor funding will continue to be critical for supporting not only the International Centers and the newly established Sub-regional research networks, but also the NARSs and national extension systems as African government will continue to face severe fiscal constraints in funding priority sectors. In the longer-term, as end-users ability and willingness to pay increase, along the improved efficiency of the national technology generation and transfer systems, the need for donor funding is expected to decline.
- *The efficiency of donor funding* will need to be improved. In particular, past donor support has been less than optimal, as donor priorities have often driven the research agenda, imposed a large administrative cost of NARSs limited capacities and not always been supportive of NARSs' institutional strengthening. Future donor funding will therefore need to address two central issues in the development of sustainable and efficient NARS:
  - Ensuring a stable and sustainable funding base through a long-term commitment matching the long-term nature of the research and institutional development process;
  - Providing funding through a common, consolidated research funding mechanism ensuring the autonomy of NARSs' governance bodies and management in setting the research agenda and deploying the resources accordingly.
- *Producers and other technology users* will not able, at this stage of the continent development, to cover more than a small share of costs of technology development and dissemination until their incomes rise significantly. It is however critical that they contribute to its funding from the start, to ensure that they have a clear stake in the governance and efficiency of the system and that a strategy be developed for increasing end-users' funding according to their capacity to pay. Also, the involvement of private sector in technology generation and dissemination should be promoted through joint ventures, contract research or other institutional arrangements, or by tapping the growing capacity of private non-profit institutions.

### **(iii) New Funding Mechanism for Agricultural Generation Transfer and Adoption Systems.**

52. FARA and NEPAD have over the past two years developed proposals for the reform of the funding mechanisms for African Agricultural Technology Generation and Adoption Systems. The central objective of the proposed financing framework is to foster the development of African technology generation and diffusion systems that is (i) responsive to its users/clients; (ii) flexible, competitive and supportive of innovation while benefiting from the necessary long-term stability for its core funding needs; and (iii) closely integrated and coordinated around well defined regional, sub-regional and national priorities. The new financing mechanism would have five interrelated components:

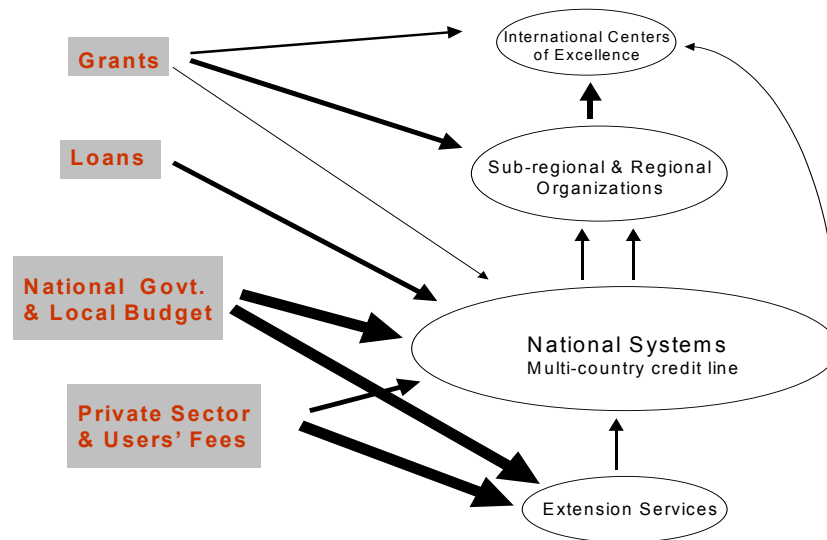
- *Funding support to end-users.* This component will provide (i) support for the development of end-users capacities to be full partners in the development of national agricultural technology generation

and dissemination systems and (ii) funding, on a matching grant basis, to producer associations and other rural entrepreneurs for assisting them in accessing (short-term/adaptative) research activities and advisory services, on a demand basis and through contractual arrangements.

- *Funding of national Advisory Services.* This component will provide support for (i) developing efficient, responsive and sustainable agricultural advisory services, largely driven by the demand of its clients; (ii) undertaking the inventory and piloting and/or scaling-up of “best-bet” technologies; (iii) supporting activities for developing markets, farmers access to markets (for inputs and outputs), and the capacity of the private sector to undertake processing and marketing activities;
- *Funding of NARSs.* This component will provide (partial) funding of the part of the core operating and investment expenditures of national agricultural research systems. NARSs funding will come from (a) cost recovery from clients under contractual research (see above); (b) allocations from national budgets; and (b) donors’ grants and loans ;
- *Funding of Sub-regional Research Institutions.* The component will provide funding for the core and program activities of the three sub-regional regional institutions, and their apex body (FARA). Funding of FARA will be through donors’ grants. Funding for the sub-regional research institutions will come from: (i) donors’ grants to fund the core functions of sub-regional organizations; (ii) donors’ grant and participating NARSs’ contribution, on a matching grant basis (50/50), for the marginal cost of regional research programs of common interest and capacity-building activities (training, internships...for NARSs researchers), undertaken under contract at NARSs’ request; and (iii) donors’ grants to fund research programs of a regional interest to be awarded through a competitive basis to NARSs (individually or jointly), ICs or other qualified research providers.
- *Funding of ICs and other Centers of Excellence.* The component will provide grants to fund core activities of the CGIAR, including system-wide initiatives and challenge programs (funding of the CGIAR system would be maintained at least at its current levels). In addition funds would be provided to FARA, the sub-regional organizations, and the NARS to commission research and capacity building from the ICs and other centers of excellence around the World.

53. The central principle of the new funding system depicted in the figure below is the rigorous application of the *Subsidiarity Principle*: technology generation and dissemination will be funded and executed at the lowest possible level which is able to efficiently carry out the relevant activities, taking due account of economies of scale and externalities. Therefore, the funds, rather than trickling down through the system, need to be provided to the lowest level consistent with the Subsidiarity Principle, for empowering these levels to (i) undertake the required research and/or extension programs, and (ii) commission and fully or partially finance the technical and managerial support they require from higher levels. In addition, the principle of Plurality (of providers in the systems) implies that the lower level organizations will be able to contract with any provider of services among national, sub-regional, or international institutions.

## New Funding Flows for Technology Generation and Adoption



7

### III. Program Description

#### A. *Program Objective*

54. The proposed Multi-Country Agricultural Productivity Program (MAPP) would be part of the overall *African Agricultural Technology Generation and Transfer Initiative* which includes three main components:

- (i) Support to the International Centers of Excellence, including the CGIAR institutes, which would be financed by public and private sources in the international community;
- (ii) Support to the Sub-Regional Research Institutions, to be financed by interested donors led by the EU and USAID; and
- (iii) Support to National Agricultural Technology Generation and Transfer Systems (NATGTSS), which would be the focus of the proposed *Multi-Country Agricultural Productivity Program (MAPP)*, to be funded by IDA Credits/Grants and other interested donors.

55. The ***Multi-Country Agricultural Productivity Program (MAPP)*** would be both: (i) an “horizontal” APL, supporting a series of country-specific agricultural technology generation and transfer operations through a multi-country line of credit/grant open to countries meeting the eligibility criteria set out below; and (ii) a “vertical” APL providing long-term support to each eligible individual countries through a long-term, sequenced program with clear sequencing and triggers.

56. The *first phase of the MAPP, “the Program”*, would support a series of individual country operations up to the total amount of the line of credit/grant approved by the Board (para...). The Board would approve the multi-country line of credit and the first two country-specific operations. The subsequent country-specific operations would be circulated to the Executive Directors for information, after clearance by the Regional Management. Formal approval would become effective 10 working days

thereafter. Any individual operation could be scheduled for Board discussion if at least three Executive Directors so requested.

**B. *Country Eligibility Criteria***

57. Countries would qualify for support under the MAPP on the basis of the following “eligibility-at-entry” criteria.

- *Satisfactory macroeconomic situation and sector policies supportive* of the efficient functioning of input and output markets, including an input regulatory framework based not on product efficacy but on the prevention of negative externalities (health and environment hazards) and of agricultural development. Macroeconomic stability is a necessary condition for the profitability of agriculture and therefore for increasing farmers and government’s capacity to fund agricultural technology generation, dissemination and adoption;
- *An operational agricultural technology generation and transfer strategy* fully incorporated in the country’s poverty rural strategy, which (i) is pro-poor; (ii) is demand-driven and includes cost sharing by end-users; (iii) is based on the subsidiarity principle and pluralistic in the provision of services; (iv) promotes good governance, efficiency and financial sustainability; (v) adopts a program funding approach through a common funding mechanism; and (iv) promotes collaboration with sub-regional and international centers of excellence;
- *Government commitment* to (i) provide the required budgetary support in a timely fashion; (ii) support the financial and managerial autonomy of the public agricultural technology generation and transfer institutions, including the introduction of efficient performance-based human resource management systems.

58. Bank assistance to each eligible country would support a long-term development program through an APL with country-specific objectives, sequencing and phase triggers. The design of each country operation would depend on the country’s specific policy and institutional environment, and include components selected from a menu of relevant activities outlined in the “Description Summary below”, aiming at:

- (i) Empowering and strengthening producer organizations and other end-users;
- (ii) Improving the efficiency, accountability and sustainability of the National Technology Generation System;
- (iii) Improving the efficiency, accountability and sustainability of the National Rural Technology Advisory System; and
- (iv) Supporting private marketing and agro-processing development; and
- (v) Strengthening Governments’ capacities to carry out their core functions (including policy-making, defining and enforcing the sector regulatory framework and tacking impact assessment).

**C. *MAPP Description Summary***

**Component 1: Empowering Farmers.**

59. The component would support: (i) the development of an effective information system, for better linking farmers and traders to markets; and (ii) the promotion of farmers organizations.

- **Linking Rural Communities to Markets through better Information Services.** The project would support the development of an efficient Agricultural Information System (AIS), by coordinating the information systems which already exist in public and private institutions and integrating them into a demand-driven system based on a partnership between the public and private sectors, and (partial) cost recovery.
- **Strengthening Farmers Organizations.** The component would support the development of viable farmer organizations able to (i) represent farmers' interests in public policy-making; (ii) open new market opportunities for their members; and (iii) efficiently provide their members with the services and inputs their needs. The component's possible activities may include:
  - The review of the current legal and regulatory framework for creating a supportive institutional environment;
  - The sensitization and mobilization of farmers for the creation of groups/associations around economic activities (input access, credit access, marketing, agro-processing);
  - The strengthening of the capacity of existing farmers associations and national organizations for providing efficient services to their members;
  - Assisting the FOs to participate in policy making, priority setting and governance of their NARS and advisory service systems;
  - Support for the development and implementation by FOs of promising pilot activities.

## **Component 2: Strengthening Technology Generation**

60. The objective of this component would be to establish a national research system that (i) is responsive to national priorities and the demands of farmers; (ii) relies on a multi-source system based on strong partnership with the international research system and the domestic private sector; and (iii) is sustainable in terms of human and financial resources. The component may include:

- Updating the national agricultural research strategy and master, plan to align them with national priorities;
- Strengthening the financial and management autonomy of public research institutions (with a governance body including all stakeholders, responsible for undertaking research programs on the basis of stakeholders requests, and financed through a sustainable funding mechanism including adequate funding of core functions, research contracts, competitive grant systems, and cost recovery for some of the services);
- Funding of (i) capacity-building activities to be contracted from national, regional and international centers of excellence and (ii) NARS participation in regional research programs;
- Building the human resource base of the research institutions, through relevant training programs, including on-the-job training with international agricultural research centers.
- Piloting and subsequent development of a competitive grant mechanism, open to all qualified research institutions;
- Piloting and subsequent development of a Rural Technology Enterprise Facility (RTEF) to (i) identify and access appropriate existing technologies (world-wide); (ii) co-finance with



interested private partners the adaptive research necessary to adapt the technologies to local conditions, as well as the manufacturing and the marketing of these technologies;

### **Component 3: Strengthening Farmers Advisory Services.**

61. The objective of this component would be to establish/strengthen a pluralistic farmers advisory system (FAS) involving public and private suppliers, largely demand-driven and based on performance-based contracts. The component may include the following activities:

- Strengthening of farmers/farmers associations for selecting and contracting the service providers of their choice;
- Strengthening the capacities of advisory service providers, including private operators and NGOs; and
- Promotion of advisory service delivery through detailed and monitorable performance-based contracts to ensure accountability.

The component would also support the *up-scaling of successful technologies*: While the emphasis of the program would be on demand-driven approaches, some of the pressing technical issues will however need to be addressed through a push strategy. This is in particular the case for activities with significant externalities and that would improve/maintain productivity in the longer-term, such as soil and water conservation measures or other technologies already identified as “best-bets” -- such as the NERICA rice varieties in West Africa or the PROSCAP soil fertility program in Malawi -- for rapid scaling-up. An inventory should be made of these promising technologies.

### **Component 4: Agricultural Diversification and Promotion of Private Sector**

62. The objective of this component would be to support the development of markets and of private sector initiative for the marketing and agro-processing of agricultural produce. The program may include:

- The piloting of a Rural Technology Enterprise Facility (para... above).
- The preparation of detailed strategies/programs for promising crops, including market and trade facilitation/value chains studies, to identify specific markets and markets’ requirements, constraints to be removed to improve competitiveness.
- Pilot activities for the development of a rural trader network and farmer associations-private sector partnerships for marketing and agro-processing activities.

### **Component 5: Strengthening of Core Public Services**

63. The program would support the strengthening of ministries’ capacity to carry out their core responsibilities: policy analysis, defining and enforcing clear regulations and safety standards, sector impact assessment, and agricultural statistics. This component would involve (i) capacity-building through selective recruiting and targeted training programs; (ii) the preparation of detailed operational strategies in each of the target areas; and (iii) the undertaking of specific priority reviews and studies. The program may include:

- The preparation and implementation, on the basis of the core functional analysis of the relevant services, of a detailed human resource management strategy (recruitment/deployment policies, training programs);

- The preparation of a Public Expenditure Review (PER) and a Medium-term Expenditure Framework (MTEF) for the agricultural sector, to align public expenditures with priorities and fiscal resources;
- The strengthening of ministries' capacity in critical areas such as (i) policy-making; (ii) trade issues and regional market integration; (iii) definition and enforcement of regulations, guidelines and standards, in particular in the areas of inputs/seeds, food safety and pest management; and (iv) agricultural statistics..
- The development of an efficient agricultural information and impact monitoring system to provide a solid basis to policy-making and the design of development program integrating information on social and economic parameters from various sources, public and private, at sub-regional, national and local levels;
- The preparation of detailed studies and action plans on selected strategic issues, such as: (i) a national food security policy; or (ii) a detailed pest management program.

#### **D. Program Cost and Financing Requirements**

##### **1. Estimated Total Cost.**

64. The table below presents (i) the projected increase in annual costs for Africa's *global agricultural technology generation and transfer system* (including strengthening to farmers organizations and other rural end-users), with total annual cost increasing from US\$ 2.4 billion in 2003 to US\$ 2.9 billion in 2007 and US\$4.6 billion in 2012, in line with NEPAD targets; and (ii) the projected increase in annual costs of *the national systems*, to be financed under the proposed MAPP, projected to increase from US\$2.1 billion in 2003 to US\$2.55 in 2007 and US\$3.9 in 2012.

**Estimated Total Incremental Costs: 2003-2007/2003-2012**

1. Research	2003 (base)	2007	2012	Incremental 2003-07				Incremental 2003-12		
				Total	MAPP	IDA	Other	Total	IDA	Other
Total annual cost	1,200	1,450	2,400	200				1,200		
ICs of Excellence	300	350	600	50	0			300	0	
FARA/SROs	0	50	100	50	0			100	0	
NARSs Total	<b>900</b>	<b>1,100</b>	<b>1,700</b>	<b>200</b>	<b>160</b>	<b>110</b>	<b>50</b>	<b>800</b>	<b>270</b>	<b>130</b>
Investment	150	200	300	50	40	30	10	150	50	25
Op. Costs	750	900	1,400	150	120	80	40	650	220	105
Non-Salary	150	200	600	50	40	30	10	450	150	75
Salary	600	700	800	100	80	50	30	200	70	30

2. Extension	2003 (base)	2007	2012	Incremental 2003-07				Incremental 2003-12		
				Total	MAPP	IDA	Other	Total	IDA	Other
Total annual cost	<b>1,200</b>	<b>1,450</b>	<b>2,200</b>	<b>250</b>	<b>200</b>	<b>130</b>	<b>70</b>	<b>1,000</b>	<b>330</b>	<b>170</b>
Investment	200	250	500	50	40	30	10	300	100	50
Op. Costs	1,000	1,200	1,700	200	160	100	60	700	230	120
Non-Salary	200	300	700	100	80	50	30	500	160	90
Salary	800	900	1,000	100	80	50	30	200	70	30
<b>3. TOTAL NARSs=Extension</b>	<b>2,100</b>	<b>2,550</b>	<b>2,900</b>	<b>450</b>	<b>360</b>	<b>240</b>	<b>120</b>	<b>1,800</b>	<b>600</b>	<b>300</b>

## 2. Total Financing Requirements and IDA's Line of Credit/Grant.

65. The MAPP and the proposed IDA line of credit would finance 10 to 12 country-specific operations approved during the 2003-2005 three years period: 2 in calendar 2003, 4 in 2004 and 6 in 2005. Each country-specific operations would be of a three year period (the first phase of the "vertical APL"). MAPP funding requirements would therefore cover a 5 years (1993-07) period. The table below presents the total estimated financing requirements under the MAPP. The overall cost of the MAPP is estimated at US\$ 1.71 billion over the 5 year (2003-2007), of which:

- (i) US\$342 million by governments and cost recovery from beneficiaries (20% of total costs);
- (ii) US\$912 million by IDA credits and grants (55%); and
- (iii) US\$456 million by other external financing (25%).

**Table: Financing Projections : 2003-2007 (US\$ million)**

	2003	2004	2005	2006	2007	Total	Total %
<b>Total</b>	90	270	450	450	450	1,710	100
Gov/end users	54	90	90	90	342	20	
IDA	48	144	240	240	240	912	55
Other External	24	72	120	120	120	456	25

## 3. Financial Support : from Project to Budget Support Lending

66. One of the central objectives of each country-specific program and APL would be to move away from project funding and provide coordinated funding to a coherent public expenditure program in support of the development of the national agricultural technology generation and dissemination system. Government and donor funding would support a clear strategy and medium-term program to do so which would be :

- (i) based on a set of agreed upon "*basic Principles*" in the areas of market-oriented policies, end-users empowerment, good governance arrangements, social and environmental sustainability, translated into operational milestones (including APL's second phase triggers) for tracking progress toward the program development objectives.;

- (ii) translated into detailed annual public expenditures programs to be funded by all interested donors.

67. Progress in achieving milestones and in implementing agreed upon annual public expenditure programs would be reviewed jointly by government and donors, and would be the basis for approving each subsequent annual work plan and budget. A detailed monitoring system would be set up up-front to track implementation progress. This approach is being tested successfully under the first

**Box.: Mozambique PROAGRI**

Phase of the Mozambique Agricultural Sector Public Expenditure Program (PROAGRI) and lessons from this program would be incorporated in the design of the proposed MAPP.

68. Non-IDA external funding would be provided either through the common trust fund, which would follow IDA procedures or through parallel funding which would follow the relevant donor specific procedure. However, all interested donors would agree up-front to the principle of adopting common implementation procedures based on transparent and efficient public expenditures management -- budgeting, financial management and auditing, asset management, procurement, monitoring and reporting -- which would permit moving toward (sectoral) budget support lending when the necessary pre-conditions are met.

69. Accordingly, it is expected that IDA credit/grant resources and the resources under the common trust fund would be disbursed through two mechanisms:

(i) the standard “investment lending approach” for which all policies and procedures for operation implementation and IDA disbursements would apply; and/or

(ii) through an “budget support approach” along the lines of sector adjustment lending or PRSCs for countries meeting the requirements in terms of public expenditure management, as determined by public expenditure reviews and fiduciary assessments. In this case, annual programs would be funded through tranches (two a year), the first tranche covering IDA share of the cost of the program’s first six months and providing the necessary pre-financing. Tranches would be released upon satisfactory implementation of the program, based on a detailed review by government, national stakeholders, IDA staff, other external partners.

70. There may be a few countries that already meet the eligibility criteria for “budget support lending”. This would be confirmed during appraisal. In this case, their program would be financed from the start through budget support lending. It is however expected that most countries wouldn’t meet the necessary pre-requisite and their program would be supported, sequentially, first through the traditional project approach during the first phase of the APL, then through the “budget support approach” during the second phase of the APL, if the country meets the necessary eligibility criteria. One of the objectives of the first phase, coordinated with other IDA-financed operations in the country, would therefore be to assist the country in undertaking the necessary fiduciary reforms for becoming eligible to budget support lending.

## **E. *Implementation Arrangements and Key policy and Reforms supported by the Program***

### **1. Overall Framework.**

71. Each country-specific operation would be clearly imbedded in the country’s poverty reduction strategy.

- The country’s PRSP would provide the cross-cutting assessment of the country’s social, structural and sectoral development policies and government’s strategy and the policy and institutional reforms priorities for sustainable growth and poverty reduction, in particular in rural areas.
- A *Letter of Development Policy (LDP)* and a multi-year matrix of policy and institutional reforms (with result-based performance indicators) would provide a detailed description of (i) Government’s strategy and operational program to improve the efficiency and sustainability of the country’s agricultural technology service delivery system, and (ii) the program’s underlying “Basic Principles”(para..) and critical milestones and triggers for program implementation.

- The operation would be undertaken only after Government's and stakeholders' commitment to the objectives, reforms, design and funding of program has been confirmed by meeting the MAPP's eligibility criteria (para..)

72. Implementation arrangements would be designed to support the following four main objectives: (i) strengthening end-users capacity to define their constraints and access the services they need, on a demand basis; (ii) promoting the "subsidiarity principle" in the supply of the services required; (iii) increasing the transparency and efficiency in service delivery; and (iv) supporting the increasing financial sustainability of service institutions, in particular by the increased cost recovery from end-users. The table below summarizes the activities undertaken by each of the institutions of global agricultural technology generation and dissemination system, and the institutions' corresponding sources and use of funds.

<b>Institution</b>	<b>Use of funds</b>	<b>Source of funds</b>
<b><i>International Centers of Excellence</i></b>	<ul style="list-style-type: none"> <li>• Own activities</li> <li>• Research programs contracted by FARA/SROs;</li> <li>• Training and capacity building programs in favor of NARSs</li> </ul>	<ul style="list-style-type: none"> <li>• International community</li> <li>• FARA/SROs</li> <li>• NARSs</li> </ul>
<b><i>FARA</i></b>	<ul style="list-style-type: none"> <li>• Own management</li> <li>• Funding of contracted Africa-wide CGIARs programs;</li> <li>• Funding of SROs management</li> <li>• Funding of SROs agreed upon annual research and capacity-building work programs</li> </ul>	<ul style="list-style-type: none"> <li>• International community</li> <li>• Governments' contributions</li> </ul>
<b><i>SROs</i></b>	<ul style="list-style-type: none"> <li>• Own activities/management</li> <li>• Funding of sub-regional programs contracted to ICs</li> <li>• Funding of sub-regional research programs through competitive mechanism</li> <li>• Co-funding of agreed upon capacity-building programs for NARSs</li> </ul>	<ul style="list-style-type: none"> <li>• International community and/or FARA</li> <li>• NARSs contributions</li> </ul>
<b><i>National Research Institutions</i></b>	<ul style="list-style-type: none"> <li>• Own activities</li> <li>• Contribution to SROs</li> <li>• Co-funding of regional research programs</li> <li>• Co-funding of own capacity-building programs</li> </ul>	<ul style="list-style-type: none"> <li>• Governments/Donors</li> <li>• End-users</li> </ul>
<b><i>National Advisory Services</i></b>	<ul style="list-style-type: none"> <li>• Own activities</li> <li>• Co-funding of FOs and private sector capacity-building and pilot activities</li> </ul>	<ul style="list-style-type: none"> <li>• Governments/donors</li> <li>• End-users</li> </ul>
<b><i>Farmers Organizations</i></b>	<ul style="list-style-type: none"> <li>• Own activities</li> <li>• Contribution to NARSs and advisory agencies</li> </ul>	<ul style="list-style-type: none"> <li>• Members contribution</li> <li>• Matching grants from Government/public advisory agencies</li> </ul>
<b><i>Private Sector Operators</i></b>	<ul style="list-style-type: none"> <li>• Own management and activities;</li> <li>• Contribution to professional associations</li> </ul>	<ul style="list-style-type: none"> <li>• Own funds</li> <li>• Matching grants from Government/public advisory agencies</li> </ul>

## **2. Implementation Arrangements.**

73. The overall program would be implemented under the leadership of NEPAD, which would chair MAPP's proposed Steering Committee. FARA, NEPAD's operational arm for agricultural productivity issues and programs, would be the Technical Secretariat of the Program and would be responsible for coordinating (i) the preparation/appraisal of individual country-specific operations; (ii) the preparation of these operations' annual work programs within the framework of the agreed upon "Basic Principles"; and (iii) the assessment of the programs' implementation progress, including progress toward institutional objectives, milestones and triggers. It would be responsible, jointly with IDA and other donors, for undertaking a mid-term review of MAPP's first phase and for the preparation of its completion report, as well as for the preparation of MAPP's second phase. In each participating country, a National Steering Committee and Secretariat would be set up, chaired by the responsible ministry, to prepare the country-specific operation, oversee its implementation by national institutions, monitor output/impact and prepare progress reports. Implementation support would be provided jointly by FARA and concerned donors.

## **3. Monitoring and Evaluation.**

74. Improving focus and efficiency in the generation and dissemination of agricultural technologies is a long-term undertaking which will require careful monitoring of a broad range of measures and the assessment of impact on productivity and incomes. In most countries, M&E systems are weak and don't permit to collect and analyze the necessary information. The MAPP would invest substantially on strengthening and harmonizing M&E capacities at country, sub-regional and regional levels, to track progress and impact and reformulate objectives and design as necessary. This would be done during the first phase of the MAPP, both globally and at country level. During this first phase, performance indicators would mostly focus on input, processes and outputs rather than outcomes and impacts which are longer-term. The latter would start to be at the center of the program's M&E system during its second and third phases.

## **4. First Phase's Mid-term and Completion Reviews.**

75. A mid-term review of the overall MAPP would be organized at the beginning of the third year of the program, to assess progress and fine-tune program design and implementation arrangements. A completion mission would be organized during the last year of the program, to assess progress in meeting first phase's central objectives and efficiency in implementation, and to draw lessons for the detailed preparation of the program's second phase. In the same way, each country-specific operation funded under the MAPP would carry out a mid-term review and a completion review for assessing progress and guiding the preparation of its second phase.

## ***F. Issues Requiring Special Attention***

76. During the preparation and implementation of the overall MAPP and of each of the country-specific operations, the greatest emphasis would be given to the various aspects of the efficiency and sustainability of agricultural technology generation and dissemination systems: (i) economic/financial in terms of impact on agricultural productivity and incomes; (ii) social, in terms of the focus on poor and vulnerable target groups; (iii) institutional, in terms of good governance and internal management efficiency; (iv) fiscal; and (v) environmental.

77. **Financial/Fiscal sustainability.** The financial sustainability of the country-specific and regional agricultural technology generation and transfer system will be the central objective of the program. It will critically depend on the commitment of the various stakeholders to provide the necessary funding. The latter in turn will depend on the relevance and efficiency of the systems in meeting stakeholders' expectations in terms of the relevance of the technologies to specific needs of farmers, and of the society at large.

- *Relevance*: the systems will have to generate and disseminate technologies which both (i) have a quick impact on farmers and other rural entrepreneurs productivity and income; and (ii) provide answers to government's more long-term social and environmental concerns.
- *Efficiency*: the systems will need to meet its objectives through an efficient use of available resources. This will require that (i) objectives be clearly prioritized and (ii) work programs be implemented with efficiency and transparency.

78. Improving relevance and efficiency, and thus sustain stakeholders' commitment to provide the required level of funding, the program will therefore support institutional reforms to :

- (i) empower end-users to define priorities and work programs of the research/advisory institutions, and to monitor results, through ensuring that they are adequately represented on the institutions governance bodies;
- (ii) ensure the autonomy of the research/advisory institutions and the transparency and accountability of their management, in particular by improving their internal procedures and MIS.

79. **Social Sustainability.** The focus of the research and transfer programs should be on fostering wide-spread economic growth, and therefore should have for priority to address the productivity constraints of the smallholders and other small-scale rural entrepreneurs, which are the back bone of the rural economy, and also of disadvantaged/vulnerable groups (women, HIV –stricken households). In particular, research programs will to address issues critical to smallholders and poor rural households survival — such as droughts – and develop technical packages aimed at mitigating these risks. Social targeting of research and advisory institutions' activities would be clearly defined from the start on the basis of a poverty/social assessment during the preparation of the country-specific operations. IDA's relevant guidelines on social issues would be strictly implemented.

80. **Environmental Sustainability.** Among the main challenges to sustained agricultural growth in Africa are (i) the conservation of the resource base, and (ii) the environmentally sound use of agricultural inputs to support productivity increases while protecting natural habitats and human health. These topics would be at the center of the research agenda. A major effort would be made to promote IPM approaches and particular care would be exercised in supporting the development of biotechnologies. Bank's relevant guidelines would be strictly enforced. A review of country-specific environmental issues would be carried out during preparation, to support the development of the research agenda and the improvement of national regulatory framework. As in the case of social issues, environment-targeted output and performance indicators would be defined and closely monitored.

81. **Institutional Reforms.** Institutional reforms, at regional and national levels, will be at the heart of improving the coherence, governance and efficiency of the overall regional system and individual national systems: ensuring stakeholders' empowerment, the accountability of institutions and the improvement of their internal resource management systems. High priority will be given to the careful design and sequencing of reforms to ensure that they are tailored to countries' specific circumstances and implementation capacity.

## G. *Next Steps*