



END OF TERM EVALUATION OF THE AGRICULTURAL DEVELOPMENT SUPPORT (ADSP) PROJECT

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Contract No. AEP-I-825-00-00022-00
February, 2004

Executive Summary

Project Purpose

The Project purpose, as stated in the September 1997 USAID, ADSP Project Authorization memo reads as follows: “The Project purpose is to increase the participation of the private sector in agricultural markets so as to efficiently and effectively supply yield-enhancing agricultural inputs to smallholder farmers and to increase demand for outputs from these farmers”.

The main purpose of this evaluation report is to¹:

- Assess achievement of Project outputs and impacts outlined in the Project proposal and other documents
- Assess the sustainability of Project impacts and institutional capacity of Seed Trade Association of Kenya (STAK)
- Assess environmental and gender compliance

Methodology

Fieldwork on the ADSP final evaluation took place between 5 January and 28 January 2004. The Evaluation Team was made up of Alfred Muthee (Agricultural Economist), Elon Gilbert (Agricultural Economist), and David Neubert (Agribusiness Specialist-Team Leader).

Research on the final evaluation of the ADSP began with an extensive review of Project documents and included the original USAID Project document, the ASDP Mid-Term Evaluation, numerous Project reports, presentations and training materials. Interviews with senior management and staff from the implementing partners (KARI, STAK, KEPHIS, Winrock, Lagrotech, and Technoserve) were carried out early in the evaluation process and for key partners such as KARI, Lagrotech and Winrock, meetings and interviews occurred on an ongoing basis throughout the evaluation period.

ADSP Project staff selected and arranged client interviews in the field for the Evaluation Team. In total, the team met with 9 of the Project’s CBO core-client groups, 6 located in western Kenya and 3 located in eastern Kenya. The Evaluation Team also interviewed 5 stockists associated with the Project and two licensed commercial seed companies, one of which worked with ADSP. One team member visited the KARI National Research Centers (NRCs) at Thika and Tigoni and toured the several farms using improved horticultural technologies in the Central Province. The Evaluation Team also met with senior managers at CRS and the Rockefeller Foundation, both of which are involved in Kenya seed sector. On 15 January 2004, an ADSP stakeholder workshop was held at KARI’s

¹ This report does not include an examination of the Tegemeo Institute of Agricultural Policy and Development Agricultural Policy Reform. A review of this component was omitted from the evaluation as this organization was undergoing a process of reorganization at the time during which the Evaluation Team was in the field.

main administration facility in Nairobi. The workshop examined lessons learned from ADSP and the way forward for its clients.

Following the submittal of the working-draft report, comments were received from ADSP partners and USAID. In preparing the final report, the team took into consideration all comments submitted. In some cases, changes were made to the report, and in other instances, after careful consideration, the Evaluation Team refrained from making changes in the final report in response to comments.

The Evaluation Team expresses its thanks to all of the implementing partners for their cooperation, insight and assistance in the preparation of this report. Thanks are also expressed to USAID Kenya staff for sharing their knowledge and experience with the team throughout the evaluation process.

Project Impacts and Outputs

The Project has had positive impacts in various areas. Yields have increased by between 200-300% above local genotypes, as reported by KARI. Interviews with farmers show that yield in maize has increased by 50-600%, while that of beans has increased by over 300-500% as shown in Annex F. Sales for OPV seeds have increased with KARI selling 149 MT during the Project period, while ADSP CBO's have produced 250 MT during the period, demand for other inputs has also increased¹. The private sector has participated in the market with over 300 stockists selling inputs. Over 400 farmers in CBO's have been trained in seed multiplication. A functional market has developed for CBO produced certified seeds with members purchasing 20% of sales, non-members 15%, stockists 36%, NGOs 25% and other purchasers/carryover for 4% of total sales. The Project has made it possible for improved planting materials to reach an estimated 460,000 farmers. The Project, through Winrock, has also given grants to 11 CBO's, enabling them to participate fully in seed production, processing and marketing. The improved varieties of maize, beans, cowpeas, sorghum, millet, green grams and dolichos released were early maturing and higher yielding than local genotypes in these arid and semi-arid areas with erratic rains. The CBO's are establishing a forum for networking and this may replace the vacuum left by the closure of the Project. Some positive steps have been taken in the liberalization of the seed sector but the relevant acts have not been reviewed and the recent re-instituting of KSC as a parastatal may send wrong signals to the seed industry.

At the household level, the Project had positive impacts in improving household welfare by improving food security for both group and non-group members by as much as 50%. The Project also increased household income (89% of group and 67% of non-group members in the east and 62% of group and 42% of non-group members in the west). The income from the Project has been used to meet basic household needs, hiring of labor, purchase of inputs and savings.

In the horticultural sector, the Project (mainly based in high potential areas) has also had significant increases in yields as shown in Annex Table II. There has also been some increase in demand for improved seedlings, although the supply can hardly meet the demand. Sales by KARI for bananas were (over 15,000

plantlets-33 acres) avocados (about 9,000 seedlings-90 acres), passion fruit (over 32²,000 seedlings-73 acres), pawpaw and fruit seedlings from Matuga (over 12,000 seedlings-27 acres) and Katumani (over 64,000 seedlings of various varieties). Although the private sector companies have always dominated the horticultural sector, the ADSP Project facilitated the greater involvement of CBO's, farmers' self-help groups, NGOs and church organizations.

KARI

Over the years, KARI researchers have identified and developed several technologies designed to improve productivity of agricultural production in the various agro ecological zones of Kenya. Prior to initiation of ADSP, many of these technologies were not being actively disseminated to the majority of the small-scale farmers. The Project sought to facilitate greater utilization of improved technologies in the Project areas through their commercialisation in the private sector as a means to increase incomes and reduce poverty. In KARI, the Project supported three subcomponents, notably assistance to the KARI Seed Unit (KSU), the Horticultural Program and the Socio-Economics Program. As guided by the SOW for the evaluation, the Evaluation Team assessed progress during the Project in five areas as follows:

Transferring seed multiplication efforts to the private sector: The private sector has been active in seed production and marketing for some time, but primarily for hybrid maize. Significant progress has been made in expanding private sector participation in recent years and conditions have become increasingly competitive. There is limited interest in OPVs, but the Project has demonstrated that there is a market for improved OPVs and interest is growing. CBO's and stockists in the Project area became involved in seed production and marketing, as a result of cooperation and agreements involving KARI, KEPHIS and the Winrock Consortium, but the extent to which these organizations will continue with the conclusion of the Project is in question. A retreat by the private sector from the production of OPVs in particular is a possibility, unless ways are found to sustain the activities initiated through the Project. The private sector is also playing an increasingly important role in the production of improved planting materials for selected horticultural commodities including tissue culture (TC) bananas and Irish potatoes. KARI is adjusting its role, guided by the ability and interest of the private sector to participate and increasingly by its own comparative advantage, as KARI is enjoined by GOK and donors to be financially self supporting as much as possible. These considerations could lead to conflicting objectives, but this does not appear to be a major problem as yet.

Release of germplasm: KARI has released a significant number of new technologies in recent years and entered into several agreements with private commercial firms to produce and distribute these technologies. Hybrid maize is the main commodity where there is significant interest by the private seed companies. Formerly, all KARI hybrid parent lines went to KSC. That is no

^{2 1} RADS Agrovat in Bondo has increased fertilizer sales from 0.2MT in 1997 to 8.2MT in 2003

longer the case. Materials developed prior to 1994 are available to anyone. Materials released since 1994 are available for sale to anyone and KARI can decide what is in its own and the public's best interests to do in each instance.

Providing technology to farmers and market demands: There are several related procedures/processes that KARI observes to ensure that research efforts focus on the needs of farmers in all parts of the country, including priority setting, farming system research, ATIRI, M&E, ex post and ex ante impact assessments, market surveys, and adoption surveys. Shortages of qualified personnel and financial constraints have tended to limit the coverage, but a significant number of studies have been completed nonetheless. The quality and effectiveness of these studies varies, but there has been a significant improvement in the extent to which KARI's research activities have become more "demand driven" as a result of these efforts in the past 10 years.

Contrary to KARI's statements that all materials developed by KARI before 1994 are available to the public, these materials are available only to Kenya Seed Company, to which the materials were passed. KARI and KSC have jointly applied for Plant Breeder's Rights for some of these varieties and several objections have been submitted to KEPHIS' Plant Variety Protection Office against these applications.

Marketing Studies: The marketing studies carried out by KARI Socio Economics Department are of reasonable quality, but their nature makes them of limited utility to those involved in production and trade for these commodities. Given the considerable demands on the limited socio-economics capacity within KARI, the Evaluation Team questions the degree to which KARI should try to carry out in-depth studies of marketing systems, at least in-house.

Adoption of improved technologies: The adoption of improved varieties for the several commodities covered by ADSP has been significant. The major focus of Project activities was upon the grains and legumes, particular OPVs, but there has been progress with new varieties of cassava, sweet potatoes and a range of horticultural crops as well, featuring disease resistance, as well as greater productivity (compared to local varieties)

STAK

The Seed Trade Association of Kenya (STAK) was formed in 1982, supported by a grant from the Kenya Seed Company. Kenya's seed industry was liberalized in the early 1990's. USAID's relationship with STAK began in 1999. In May 2002, USAID provided STAK with approximately 594,000 USD over a three years period. Since then, STAK's membership has grown to 24 members and become an effective independent voice for the Kenya's private seed industry.

STAK's policy agenda is based on key issues that are relevant to Kenya private seed producers. The broad objectives of the agenda are to shift more regulatory responsibility to the private sector, improve the intellectual property rights and bring Kenya seed laws and regulations closer to international standard.

Working in concert with KEPHIS, STAK has developed a new draft regulatory language on plant breeders' rights that will simplify the process of obtaining plant variety protection. STAK has also worked with KEPHIS to develop a regulatory system that will shift the responsibility of the in-field and processing facility certification to private inspectors. STAK plans to work with Moi University and the private seed industry to identify an equitable solution to issues involving vegetable seed viability testing and regulation. STAK plans to complete its research this year, following which it will draft new regulatory language and begin the lobbying process.

STAK was elected to take the lead role by the Eastern and Central Africa Program on Agricultural Policy Analysis, Seed Regional Working Group (ECAPAPA, S-RWG) to develop a set of standardized seed sector policies and regulations for the region.

Historically, there has been a very close link between STAK and the Kenya Seed Company; however, this link has weakened over time. In order for STAK to be viewed as independent and free of special interest by its membership as well as the domestic and regional agribusiness community, it must have leadership that is unquestionably independent and free of any hint of bias or prejudice.

KEPHIS

KEPHIS has worked to build its own capacity; it has good top-leadership that has a clear understanding of the important role the organization plays in the industry. KEPHIS may at times be overzealous in enforcement of regulations and can be slow to respond to the needs of the private sector, particularly in the areas of seed field inspection and lot certification. This problem can be remedied with the planned licensing of private field inspectors and building capacity in the organization. The private sector has suggested that KEPHIS build capacity by increasing the number of MS and PhD level plant breeders to management positions in key departments.

In 2001 and 2002, KEPHIS did not grant any plant variety protection rights to applicants³; however by the end of 2003, they had granted protection to 90 applicants and approved (but not yet granted) an additional 80. By end 2003, KEPHIS finally had begun moving variety protection application through their pipeline. The majority of plant materials submitted for protection have been horticultural, mainly flowers of foreign origin. KEPHIS reports that, on average, it takes about 12 months for an application to be processed; this assumes all the paper work is complete when the application is submitted. The process can be faster for plant materials that are already registered in other countries.

On the key issues involving the fine-tuning of the Seed Varieties Act, KEPHIS and STAK are in agreement on most of the regulatory changes and both organizations are optimistic that their joint efforts will result in the GOK adopting the suggested changes to the current Seed Varieties Act rather than

³ Source: KEPHIS – USAID ADSP Monitoring and Evaluation Performance document, undated

adopting a more radical redrafted version prepared by KEPHIS and the GOK. If the fine-tuning language is adopted, then KEPHIS and STAK can take credit for facilitating the establishment of an appropriate seed sector regulation framework. KEPHIS expects the GOK to approve the new regulations in 2004.

The Winrock Consortium

Winrock International joined with Technoserve and Lagrotech to form a consortium of NGO's under ADSP. Winrock and Lagrotech took the leading role in training farmers in the areas of OPV maize, sorghum and bean seed production, soil fertility and crop nutrition, IPM, gender and environmental issues. Technoserve's focus was in training of stockists in business management, marketing and customer service.

Winrock International's component was the largest of the three groups, with approximately 2.18 million USD in funding; Lagrotech funded about 500,000 USD and Technoserve had approximately 318,000 USD in funding. Technoserve completed its work on the Project in December 2002, and Lagrotech continued to provide training and extension services to Project clients through May 2003. Winrock International, operating under a cooperative agreement no-cost extension, is expected to complete its work on ADSP by mid-February 2004.

Of the 60-farmer groups (439 individuals) trained in seed multiplication, about 11 groups developed skill levels that would allow them to produce and sell commercial quality seed. Since the farmer group had no seed marketing experience, Winrock linked the best 4 or 5 farmer groups (CBO's) with seed companies and stockists that could assist them in marketing their product.

Given the lack of marketing skills and resources available to the CBO's, as well as the unique nature of the OPV market, the best path forward for the CBO's that wish to stay in the seed production business is to link these groups with licensed seed companies. The CBO's can then produce seed under contract and the licensed seed company will be responsible for marketing the seed. There is strong interest in this type of relationship by both seed CBO's and commercial firms. Given the complexity of operating a viable commercial seed company, it is unlikely that any of the CBO's is ready at this time to become fully licensed producers and marketers of seed themselves.

Over the course of the Project, Winrock provided over 7300 on-farm person-training sessions⁴ to client farmers and developed 544-field demonstration site that assisted in technology transfer. The Project also provided 273 person-training sessions in seed, soil and fertilization and provided business skills training to 121 smallholder certified seed producers.

Between 2001 and 2003, ADSP's CBO seed farmers produced 196 MT of certified seed valued at 2.97 million KS (about 41,250 USD in aggregate sales, or about 94 USD in mean marginal income per farmer trained in seed production).

⁴ Many of Winrock client farmers and stockists attended more than one training session. Each training session lasted from one to two days.

Income increased by 60% for households that became active in ADSP activities through a combination of increased crop yields and seed sales.

Stockists are an important link in the transfer of technology and know-how to farmers. To capitalize on this fact, the consortium provided 214 person-training sessions to stockists. They worked with stockists to develop new products, including a re-packaged 2 kg bag of fertilizer that increased sales by cooperating stockists significantly. Winrock also worked to link stockists with seed-producing CBO's. The number of CBO's and stockists involved in this activity is small (in the 5-10 range) but it provides an important link between the farmers and the market and helps to assure income sustainability for these groups.

ADSP's greatest contributions to the broader GOK and USAID policy goals were in: increasing food security, reducing poverty and creating an environment for broad-based economic growth. If ADSP is to be judged against these goals, it can be considered a success.

Sustainability

Technology Development: The performance of the research system has been seriously hampered by discontinuities in funding for research agencies in the past decade. The situation has improved in recent years and there are reasonable prospects that support will be forthcoming to continue the KARI activities in KSU, horticulture and socio-economics to a fair degree. While the GOK contributions are expected to remain limited, support from USAID and other donors will continue and KARI is endeavoring to increase income from its own activities through their selective commercialization. These efforts may place KARI in competition with the private sector in some instances, but are not expected to seriously affect the mandated focus of KARI programs on meeting the needs of the majority small and low resource farmers in the country. A more serious concern is that capacity constraints and the current emphasis on technology transfer will adversely affect KARI's ability to provide the next generations of new technologies required to address farmer requirements in the future.

Sustainability of Private Seed Producers and Stockists: The project has been instrumental in expanding the numbers of private organizations producing and distributing seed, some of whom have been formally registered as seed companies and seed traders. Most of the certified seed production associated with the Project has been by CBO's operating under the umbrella of KARI/ KSU license to produce seed. CBO's are capable of producing quality seed, but their ability to successfully market (other than locally) remains very much in question. One stockist and one CBO have applied for licenses as certified seed producers and as many as three of the applications might be approved. The stringent entry requirements, together with the licensing fees, make it difficult for most CBO's and stockists to qualify. The successful establishment of CBO-based seed enterprises that can stand alone may be an unrealistic expectation in all but a relatively few instances. Efforts have been made to connect the most promising

CBO's with licensed seed companies to enable them to continue to produce certified seed.

Range of Commodities and Practices: The range of commodities handled by input producers and stockists assisted through ADSP has definitely expanded and changed in the face of market conditions and a growth in capacity. The challenge for CBO's producing seed and improved planting materials is to stay ahead of the game by anticipating what the market is likely to require several months from now. This may be more a matter of changing varieties or commodities rather than trying to handle a broader range of commodities simultaneously. Facilitation by the Winrock Consortium has been critical in making these adjustments and it is not clear how well this service will be provided with the conclusion of the project.

Stockists were already handling fertilizer, but assistance from the Project enabled stockists to blend and package fertilizer to better meet local requirements. In general, stockists were already well ahead of the game in terms of the range of commodities they handled and required little encouragement from the Project to pursue additional opportunities. There is a danger that some stockists could overextend themselves by diversifying into areas where they have limited expertise.

Sustaining the ADSP Model: The ADSP emphasis on the commercialization of improved technologies, especially those that are essentially public goods, represents an innovative approach that improves upon more conventional technology transfer methods in terms of potential impacts and sustainability. ADSP represents a somewhat unique partnership among rather diverse set of organization partners that was sustained by a strong convergence of interests. Replication of such a partnership seems difficult, but by no means impossible.

The successful participation of CBO's in the production of certified planting materials is likely to remain limited and require extensive facilitation by projects such as ADSP or links with established commercial concerns. Spontaneous replication even in nearby communities is unlikely. The timeframe and level of effort required might be substantially reduced through the careful selection of CBO's with established track records. Attention needs to be given from the onset to connecting selected CBO's to stockists and established seed enterprises with a view to the initiation of formal contractual arrangements among these parties well prior to the conclusion of a project.

The assistance to stockists is most likely to result in sustainable progress and spread to non project areas. In retrospect, the focus of the project might have been shifted more this group and somewhat away from CBO production of inputs.

Environmental Compliance

The Evaluation Team's observation during the mid-term evaluation, current observation and interviews show that the conclusion reached at mid-term evaluation in relation to I.E.E are still being followed. Further, training has been

initiated in minimum residue levels and tractability issues as stipulated in international protocols. Several technologies have been identified and/or promoted with support from ADSP that are resistant to pests, notably for maize and a number of horticultural crops.

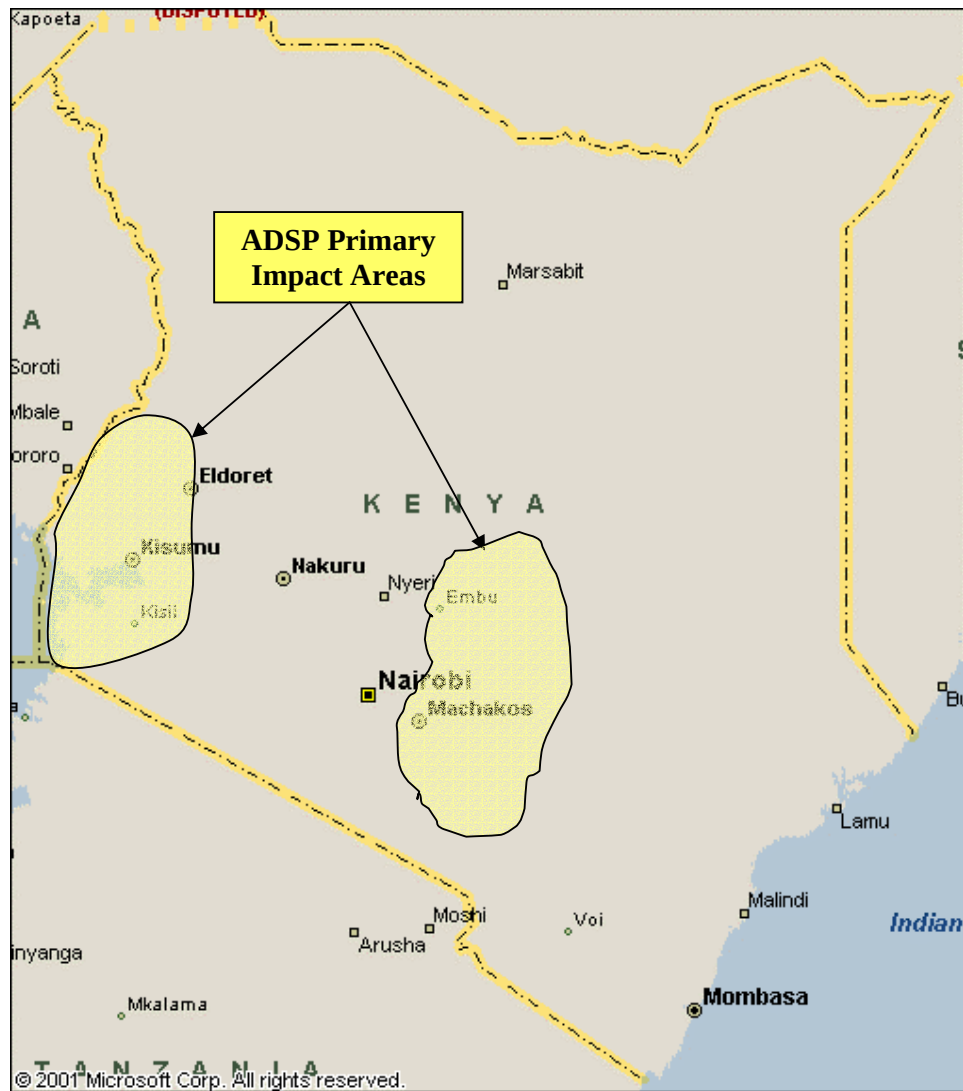
Gender Issues

Women constitute the majority of active participants in the two primary project areas served by the Winrock Consortium. In contrast, nearly all of the stockists participating in the project are men. Men manage most of the horticultural enterprises receiving assistance from the Project, although women definitely participate and probably do much of the fieldwork. Women are prominent among contact farmers producing flowers.

In the primary Project areas, women have benefited directly from the training, grants and other assistance as well as receiving a significant portion of the proceeds from the sale of certified seed. Women farmers generally benefited from better access to improved inputs that were facilitated by the project. The Winrock Consortium also provided gender training/sensitization to all the participating groups, which was generally well received and internalized by them.

KARI has a policy of gender mainstreaming in all its activities, but in the case of the horticultural activities supported by ADSP, the attention given to gender considerations appears rather limited. Some of the studies have focused on gender issues, but there was no systematic effort to assess the status of gender relations of participants or to provide training in gender sensitization.

Map of ADSP's Approximate Impact Areas



Abbreviations

ADS-Forum	Agribusiness Development Support Forum
ADSP	Agribusiness Development Support Project
ARIS	Agricultural Research Investment Services
ASAL	Arid and Semi-Arid Lands
ASTA	American Seed Trade Association
ATIRI	Agricultural Technology and Information Response Initiative
BRC	British Retailers Consortium
CBO	Community-Based Organization
CIAT	International Center for Tropical Agriculture
CIP	International Potato Center
CRAC	Center Research Advisory Committee
CTC	Center Technical Committee
CIMMYT	International Center for Maize and Wheat Improvement
DUS	Distinctness, Uniformity and Stability
ECAPAPA	Eastern and Central Africa Program on Agricultural Policy Analysis
EOP	End of Project
EUROGAP	European Union Retailers Protocol on Good Agricultural Practices
FFS	Farmer Field Schools
GNIS	French Seed Association
GOK	Government of Kenya
HRD	Human Resources Development
ICRISAT	International Crop Research Institute for the Semi Arid Tropics
ICT	Information and Communications Technology
IEE	Initial Environmental Evaluation
IP	Intellectual Property
IPM	Integrated Pest Management
ISTA	International Seed Testing Association
KAPP	Kenya Agricultural Productivity Project
KARI	Kenya Agricultural Research Institute
KEPHIS	Kenya Plant Health Inspection Service
KFA	Kenya Farmers Association KSC Kenya Seed Company
KSTP	Kakamega Striga Tolerant Product
KSU	KARI Seed Unit
M&E	Monitoring and Evaluation
MD	Managing Director
MIS	Management Information System
MOA	Ministry of Agriculture
MRL	Minimum residue levels
MSV	Maize Streak Virus
MTP	Medium Term Plan
NALEP	National Agricultural and Livestock Extension Project
NARS	National Agricultural Research System
NGO	Non Governmental Organization
NPT	National Performance Trials
NRC	National Research Center

NSDC	National Seeds Development Committee
OECD	Organization for International Cooperation and Development
OPV	Open Pollinated Variety
QAG	Quality Assurance Group
PSV	Peace Corp Volunteer
PGI	Project Generating Income
PRA	Participatory Rural Appraisal
PRSP	Poverty Reduction Strategy Paper
PSTT	Private Sector Technology Transfer
RATES	Regional Agricultural Trade Expansion Support (project)
RCC	Research Co-ordination Committee
RF	Rockefeller Foundation
RRC	Regional Research Center
RREAC	Regional Research/Extension Advisory Committee
SOW	Scope of Work
S-RWG	Seed Regional Working Group on seed policy harmonization
STAK	Seed Trade Association of Kenya
TC	Tissue Culture
UPOV	Union for the Protection of New Varieties of Plants
USAID	United States Agency of International Development
WI	Winrock International

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AGRICULTURAL DEVELOPMENT SUPPORT PROJECT END OF TERM EVALUATION

1.0 Purpose and Scope of the Evaluation

The Agribusiness Development Support Project (ADSP) has two primary components: technology development and technology transfer. The activity's main technology focus is improved plant genetics and dissemination of improved cultural practices. The implementing partners and their key areas of responsibility include:

- The Kenya Agricultural Research Institute (KARI), which develops new corn, beans, millet and sorghum varieties for use by ADSP
- Kenya Plant Health Inspectorate Services (KEPHIS), which ensure seed quality and provide seed industry regulation
- Seed Trade Association of Kenya (STAK), which represents the private sector seed industry
- The Winrock International, Lagrotech Consultants and Technoserve consortium which support seed commercialization and training activities
- Tegemeo Institute of Agricultural Policy and Development Agricultural Policy Reform, implemented by and the Department of Agricultural Economics of Michigan State University, which endeavors to improve Kenya's agricultural policy environment.

The main purpose of this evaluation is to:

- Assess achievement of Project outputs and impacts outlined in the Project proposal and other documents
- Assess the sustainability of Project impacts and institutional capacity of Seed Trade Association of Kenya
- Assess the activity's environmental and gender compliance

This report does not include an examination of the Tegemeo Institute of Agricultural Policy and Development Agricultural Policy Reform. A review of this component was omitted from the evaluation as this organization was undergoing a process of reorganization at the time during which the Evaluation Team was in the field.

1.1 Background

ADSP is a five year, \$12 million USAID cooperative grant agreement project whose goal is to strengthen and increase competitiveness of agricultural markets by increasing the supply of agricultural inputs to smallholders and improving efficiency of the market for smallholders' agricultural outputs. The Project's two main components are:

- Technology development and transfer
- Agricultural marketing policy reforms

The Technology Development and Transfer component strengthens the capacity of KARI to increase the use of commercially oriented technologies by smallholders and enhance agricultural productivity. This component focuses on KARI's Seed Unit (KSU) and the Horticultural and Socio-Economic Programs.

- KSU maintains lines for breeding, multiplies breeders and pre basic seed and other planting materials for sale to input enterprises.
- The Horticultural Program encompasses the range of research and outreach activities for all horticultural crops.
- The Socio-Economic Program sets priorities, assesses impacts of technology adoption, develops post-harvest technologies in horticulture and; promotes intellectual property rights protection.

The Winrock International, Lagrotech Consultants and Technoserve consortium are implementing another element of the Technology Development and Transfer component known as the Private Sector Technology Transfer, in collaboration with the Kenya Plant Health Inspectorate Services (KEPHIS) and KARI. This element promotes seed multiplication by non-governmental organizations (NGOs) and small-scale farmers, enhances input distribution to smallholders by private sector distributors and stockists and, promotes private sector technology transfer systems that complement extension services of the Ministry of Agriculture (MOA). KEPHIS facilitates private sector technology transfer through inspection and certification of seeds multiplied by farmers for onward sale. STAK, on the other hand, deals with seed policy issues. Activities of this component are expected to lead to enhanced availability and demand for yield-enhancing inputs.

The second component, Agricultural Market Policy Reform, implemented by Tegemeo and Michigan State University under the name of Tegemeo Agricultural Monitoring and Policy Analysis Project, collects household level and other data and analyzes as an empirical basis for agricultural sector policy formulation, facilitates policy dialogue and outreach, enhances local research capacity and monitors rural household incomes. This component will not be part of this evaluation.

The Project's objective was to liberalize agricultural input markets and increase smallholder production beyond the subsistence needs. The latter would result from increased use of high-yielding seeds and fertilizers. The key activity to achieve this was to enhance the national research system's capacity to develop

and certify yield-enhancing technology packages and link the same to the private sector-led technology multiplication, extension and distribution system.

2.0 Project Outputs and Impacts

The Private Sector Technology Transfer (PSTT) sub-component of ADSP was undertaken by the Winrock Consortium, consisting of Winrock International, Lagrotech Consulting Services and Technoserve Inc. working in collaboration with the Ministry of Agriculture, KARI and KEPHIS. The main objectives of the PSTT were i) increase participation of smallholder in seed production, ii) increase availability of agricultural market information and iii) promote and increase demand and usage of yield enhancing inputs for targeted crops. To achieve these objectives, the Consortium focused on smallholder farmers formed into farmers groups, inputs stockists and community-based organizations (CBO's). KSU provided seeds for multiplication; KEPHIS provided inspection services from production to processing while the MOA provided extension services.

The assessment of outputs and impacts takes into account the PSTT specified EOP outputs vis-à-vis achievements, data from KARI, data from the Consortium and data and information collected by the Evaluation Team during field visits to the Project areas.

2.1 Improved Yields by ADSP Farmers as a Result of Improved Seed Use

Increase in yields is a factor of interactions between many variables including time of planting, genotype of crop, plant population, rainfall, fertilization and other cultural practices. Availability of improved seeds by itself will not increase yields unless good husbandry is practiced alongside. Available information and interviews in project areas show that yields at farm-level have increased.

Research data from KARI (KARI-Katumani ATIRI Report 2004) for various OPVs are shown in Annex F. For maize and beans, farmers' historical yielded were 200-400 kg/ha and 180-360kg/ha respectively. With improved varieties, ADSP farmer's achieved yields of these commodities to 450-1700 kg/acre for maize and 360-490 kg/acre for beans without using other inputs. With the use of fertilizer, yields can increase to 900-1150 kg/acre and 600-800 kg/acre for the two crops. These yields are almost equal to research yield potential.

Interviews at farm-level (Winrock external impact assessment) indicated an increase in yields with 89% of farmers indicating an increase in maize, 83% indicating an increase in beans and 67% indicating an increase in sorghum. Among non-group members, there were also increases in yields with 80% of farmers indicating increases in maize yields and 60% of farmers indicating increases in yields of maize and sorghum. The increases in yields among non-group members indicate some technology diffusion to the communities not involved in the Project.

The reasons given for increases in yields were: use of improved seeds (55% of group farmers and 53% of non-group farmers) use of fertilizer (91% of group farmers and 7% of non-group farmers), use of manure (53% of group farmers and 75% of non-group farmers), use of agro-chemicals (6% of group farmers and 13% of non-group farmers) and improved agronomic practices (67% of group farmers and 81% of non-group farmers). Both categories of farmers are in agreement on use of improved seeds but group farmers rely more on fertilizers while non-group farmers depend heavily on use of manure and improved agronomic practices.

Based on the above results, the Evaluation Team concluded that the introduction of improved OPV varieties, availability and use of fertilizers and other agro-chemicals coupled with training of farmers in good husbandry has improved yields for both group and non-group members.

2.2 Demand Increase For Agricultural Inputs In The Target Area

The agricultural inputs made available to farmers through stockists under the ADSP project include various OPV varieties of maize, beans, sorghum, millet, cowpeas, pigeon peas, green grams and dolichos), fertilizers and agro-chemicals. Usage and demand for inputs depend on availability of the right inputs in adequate quantities as near as possible to the farmers at the beginning of the planting seasons.

Prior to the ADSP the only available OPV improved seeds were the KARI Katumani (KCB) seeds. Since 1999 when the ADSP Project and KSU started promoting improved OPV's, demand has increased. Use of OPV maize has increased by 171% from 1998 to 2003 while that of OPV bean has increased by 613% from 1999 to 2003. Other OPV's have registered mixed growth with sorghum peaking in 2001, then declining. Similar developments have also been shown in other OPVs. KARI has now over 93MT of stored OPV seeds that can be used to supply seed deficit areas instead of the previous practices by relief agents supplying 'standard' seed of unknown quality.

The ADSP Project through its seed growers has produced over 250 MT of various OPV seeds during the Project life and CBO's have managed to sell 84% of total production. This has been achieved despite a very 'crowded' seed market with over 40 registered seed merchants and competition from relief agencies that supply free seeds to farmers. The extent to which CBO's can participate is illustrated by the case of Bung Kwach CBO and Maguje CBO which experiences significant increases in bean seed sales between 2001 and 2003.

Fertilizer demand: Usage of fertilizer in Kenya is about 280,000-300,000 MT including 20,000-30,000 MT of aid fertilizer. Demand has stagnated at these levels due to low usage by coffee and cereal farmers as a consequence of low producer prices. ADSP supported farmer training in fertilizer use as well as training for over 150 stockists in fertilizer blending and business management. Before the Project, less than 10% of farmers used fertilizer but adoption has increased to an average of 53% for group members and 40% for non-group

members. The most significant determinant in increasing usage and demand has been in packaging in smaller units (10kg, 2kg, 1kg) that are more affordable and easily transported. ADSP has been encouraging sales in small packets and impact of this can be illustrated in the case of RADS Agrovet in Bondo (see Box 1).

Box 1: RADS Agrovet – Bondo
‘Small is Beautiful’: Increasing Fertilizer sales through Small Packages

RADS Agrovet started its operations in 1997 with initial capital of about Kshs.200,000 raised by Mr. A. O Rading, the owner, from his pharmaceutical shop. In 1999, he started working with ADSP/Winrock International and received training on fertilizer and its application, soil fertility, sampling/testing and fertilizer blending, book keeping/business management and marketing techniques. The stockist has a wide product mix of agro inputs including fertilizers, animal feeds, veterinary products, farm equipment, ADSP and other seeds. The business attracts customers from a 50km radius area and customers consist of 70% men (60% young and 10% old) and 30% women (20% old and 10% young). An estimated 60% of women customers are heads of households.

The fertilizer business is the most important aspect of the enterprise. Fertilizer is bought in bulk (50kg bags) from Kisumu (United Millers, Meghji Devji and Lagrotech). A grant from ADSP (Kshs. 100,000 in cash and Kshs. 100,000 in kind (packaging materials and sealing machine), to facilitate repackaging operations. Repackaging in 2 kg packets started in 1999 with certification by KEPHIS and Kenya Bureau of Standards (KBS). The fertilizer is marketed under RADS Agrovet/ADSP-Winrock Label.

The growth in the fertilizer business between 1997 and 2003 is shown below:

RADS Fertilizer Sales						
MT						
1997	1998	1999	2000	2001	2002	2003
0.5	0.7	1.0	1.2	1.5	2.2	8.2

The stockist attributes the growth in demand for fertilizer to: i) packaging in small packets (2 kg) which farmers can afford and transport easily to their farms, ii) Attractive packaging and guarantee of quality and quantity by KEPHIS, KBS and ADSP – Winrock, iii) Development of a distribution system network to small rural centers, iv) price reduction as a business development strategy since competition from other stockists has increased significantly and v) technical knowledge acquired from ADSP training which is imparted to customers over the counter.

2.3 Private Sector Participation in Yield Enhancing Inputs due to ADSP

In analyzing the impacts of the ADSP intervention in increasing participation of the private sector in marketing yield enhancing inputs, various groups have to be considered: i) seed growers/farmers, ii) input stockists, iii) input suppliers, iv) seed companies, v) NGOs (Sector), vi) Church based organizations etc.

Historically, in Kenya seed large farmers under contract to seed companies, notably the KSC, have practiced production and multiplication. ADSP has introduced the technology to small-scale farmers, and with partnership with KARI and KEPHIS has demonstrated that smallholders can produce good quality certified seeds. During the project period over 400 small-scale farmers were trained in seed production

Input stockists have been well developed in high potential areas especially through Kenya Farmers Association (KFA), which in its heydays had over 2,000 stockists in all urban centers. Cash crop based cooperatives, especially coffee cooperatives, expanded the network to coffee processing factories. However, in the target areas, which had no major cash crop, there were few stockists. By the end of the Project, the Winrock Consortium had provided training to 150 stockists in record keeping, stock management, finance-credit linkages, public relations and imparting knowledge to farmers. The stockists trained under ADSP represent about 75% of stockists in the region.

The ADSP has dealt with 60 CBO's/farmers groups of which 11 have been producing seed. These CBO's, Lake Basin Development Authority and some individual farmers produced about 87MT of seed in 2002/2003 valued at Kshs.4.7mi. Apart from CBO's attached to the Project, other NGOs in the region have benefited from the Project through purchase of seeds. In the Eastern Project area, there are about 60 NGOs operating - notably church agencies, World Vision, CARE, Action Aid, ADRA, Kenya Freedom from Hunger, World Neighbours, etc., while in the west Project area, there are about 100 NGOs operating, including Christian Children Fund, CARE, World Vision, Africa Now, Plan International, Pride, and ITDG. These NGOs are normally involved in relief, but also purchase seed for distribution to poor farmers.

ADSP also formed training-links to private firms including but not limited to: NORISK, MEA, DEVJI, Metro Plastics Ltd, Bayer, Hoechst, Pfizer, Lagrotech, Kenya Seed Company, Monsanto, Pioneer, Freshco, and the East African Seed Company.

2.4 ADSP's Contribution Towards Creating Vibrant and Functional Market

In Section 2.2, the overall increase in demand for OPVs and other inputs has been described. In this section, the analysis shows how the market has been developed at the CBO's and stockist levels.

At the CBO/seed grower level, a vibrant market has developed for seeds. Interviews with CBO's show that they have developed a market with members, non-members, stockists and NGOs. Some CBO's are also contracted to grow for stockists/seed merchants e.g. K.K. Mkulima, Siaya Farmers Center (SFC) and to Lagrotech Seed Company. The sales to various market segments by CBO's are as shown in Table 1:

Table 1: CBO Seed Sales by Market Percent (in units of % of total CBO sales)					
CBO	Members	Non-Members	Stockists	NGOs	Others
Maguje	20	10	40	30	-
Uzima	30	30	25	10	5
Bung Kwach	10	5	60	20	5
Nyacoda	30	20	30	20	-
Kyeko	10	10	25	45	10
Average	20	15	36	25	4

Sales to members range from 10-30% of sales averaging at 20% while sales to non-members ranges from 5-30% averaging at 15% of total sales. Stockists take the largest share of sales ranging from 25-60% and averaging at 36% while NGOs take the second largest share ranging from 10-45% averaging at 25% of total sales while other buyers average at 4% of sales. This market has been created entirely by the Project and has direct impacts on seed growers and CBO members. Apart from direct impacts, it has diffusion impacts to non-group members in the surrounding communities and to outside communities through sales by stockists and NGOs.

In 2002, the seed market system included 439 growers producing about 83 MT of seed valued at Kshs.2.97mi (Kshs.34/kg) farm-gate price. The value of seed processed and marketed was Kshs. 4.71mi (Ksh.54/kg) CBO price, giving a value addition of Kshs.20/kg.

The strong development of the markets for yield enhancing inputs can be gauged by trends in sales of inputs by stockists. There was a significant increase in sales of all yield-enhancing inputs, as shown in Table 2 below:

Table 2: ADSP Stockists Indicating Change in Demand for Inputs Between ADSP Startup and EOP (Units: % change in KS sales)		
Type of Input	Area East	Area West
Improved Seeds	73	68
Fertilizer	81	53
Chemicals	58	54
Animal Health Products	65	60

The reasons given for increases included i) availability of OPV seed due to multiplication of seeds by farmers, ii) creation of awareness to farmers of the potential gains from using improved seeds and inputs through training and demonstrations, iii) re-packaging of fertilizers in smaller packages and iv) creation of market opportunity awareness through the Project.

The Evaluation Team concludes that a modest but growing agri-input market has been created during the Project period. In the case of seeds produced by CBO's, market growth has been limited by weak business skills, infrastructure, logistical and other constraints.

2.5 ADSP Role in the Strengthening of Agricultural Markets

The extent to which the Project assisted and strengthened the private sector in agricultural markets can be analyzed using three criteria: (i) making OPV seeds readily available by financing KARI Seed Unit (KSU), (ii) direct assistance to CBO's/stockists and (iii) creating awareness and markets for inputs in Project areas.

KSU started operating in 1997 and was registered by KEPHIS as a seed merchant. Financing from ADSP started from 1999. The finance from ADSP enables KSU to bulk the existing bred and pre-release varieties existing in the station. These included 42 varieties of OPVs that had not attracted commercial production by private seed companies. The crops include maize (KCB, DLC, KAT MPYA), beans (KATB1, KATB2, KATE56, KATX69, Mwitemania), sorghum (MTAMA 1, SEREDO, SERENA, GADAM), pearl millet (KATPM 1-3), cow peas (K80, M66, KVVU 27-1, KVVU 419), Pigeon peas (MBAAZI 1, KAT 60/8, KAT0040), green grams (N26), dolicos (DH1002) and finger millet (KATFM1).

Prior to ADSP, KSU only produced 3MT and 4.526MT of maize seed in 1997 and 1998 respectively. In 1998, it produced 3.3MT of sorghum seed. From 1997 to 2003, KSU has produced 302.4 MT of seed of which 291.6 MT (96%) has been produced during the funding period under ADP Project. This is a considerable availability of improved seed. During the period, KSU has sold 149 MT of seed of which 148 MT was during the ADSP Project.

Availability of OPV seed has attracted 5 private companies and 40 NGOs to deal with KSU in the OPV seed market. The major NGOs purchasing from KSU include Winrock International (6.235 MT for Area East), World Vision (10.75MT distributed to 2321 households in Makueni), German Agro-Action (4.8MT for Makueni) and Ngangani Redeemed Gospel Development Programme (320 kg for 2861 farmers in Machakos). KARI estimates that the beneficiaries from the OPV seeds total 460,132 farmers of which 301,681 are in the eastern region and 158,451 farmers are in other areas.

Direct assistance for private sector in marketing has been through providing grants to seed enterprises and stockists (by Winrock / ADSP). The total grant was Kshs. 5.8 mi of which Kshs.4.3 mi was allocated to CBO's (Nyacoda, Maguje, Bung Kwach, Kyeko, UCCS, Ciambaraga, Mitunguu and Thiba farm) and Kshs.1.5mi to stockists (Siaya Farmers Centre, RADS Agroviet, KK Mkulima and Ngelani Enterprises). The disbursement to these enterprises was to enable them to undertake technical and business aspects of agri-input supply. About 90% of the grants were used to purchase certified seeds from farmers and processing and marketing of seed. These ensured prompt supply of foundation

seeds to growers and prompt payments to seed growers. The rest of the funds were used for purchase of mixing drums, weighing scales, sealing machines, printed polythene bags and bicycles. In this respect, the Project assisted the 12 private sector enterprises in participation in agricultural markets.

Possibly, the most critical aspect of assistance to the private sector was creating awareness of availability of inputs to farmers and thus creating an additional market to the private sector for inputs. This awareness was created through demonstrations, at which it is estimated 25,533 farmers were exposed. The other area is training of stockists in agronomy, fertilizer use and business skills. Over 150 stockists have been trained and this has helped them to expand their businesses. This enables them to advise farmers and stock a wider range of product mix, encouraging private sector seed suppliers, input suppliers and livestock products suppliers to market with them.

2.6 The Relevance and Appropriateness of ADSP Seeds Activities to Farmers

The Project target areas are characterized by low to medium potential lands with erratic rains, low soil fertility, low yields of local land races and over 60% of people below the poverty line and faced with food insecurity. The relevance of the crops can be illustrated by percentages of households growing the crops as shown below.

Table 3: Households growing crop (% of Kenya Households)			
Crop	Project East (%)	Project West (%)	Kenya Households
Maize	20.9	17.1	3.342 mi
Millet	29.6	8.9	0.323 mi
Sorghum	25.7	49.8	0.5883 mi
Beans	25	11.5	2.176 mi

The two areas account for 38% of all households growing maize, 38.5% of households growing millet, 75.5% of households growing sorghum and 36.5% of households growing beans. These figures, together with low potential and poor rainfall, indicate the need for developing OPV's for these areas. Maize and sorghum are the staple foods for area west while maize, millet and beans are the staple foods for area east.

These crops although developed before 1999 were not available to farmers but as soon as awareness was created during the project, demand has increased due to their early maturity and higher yields than local landraces. A recent demand by farmers in area West is for striga weed resistant variety of maize and this has led to the multiplication of Kakamega Striga Tolerant Product (KSTP maize) that was bred in Kakamega some years back, but only recently released.

2.7 ADSP's Success in Encouraging CBO's to Form Regional Associations and Registered as Seed Companies

The PSTT sub-component of ADSP concentrated on 12 CBO's and stockists involved in seed production and processing and fertilizer repackaging. The list is shown in table below:

Table 4: Names of Seed Enterprises Supported by ADSP 2002		
Name of District Cluster	Name of Sub Grantee	Activity Involvement
Kisumu/Nyando	-Nyakach Community Development Association (Nyacoda), CBO	Seed production, processing and marketing
Homa Bay/Suba	-Maguje Community Resource Centre, CBO -Bung-Kwach Seed Growers Association, CBO	Seed production, processing and marketing
Siaya/Bondo	-Siaya Farmers Center (Trading as Wilson Ltd), Stockist -RADS Agrovet – fertilizer, Stockist	Seed production, processing and marketing. Fertilizer packaging and distribution
Kitui/Mwingi	-Ukamba Christian Community Service (UCCS), CBO	Seed production, processing and marketing
Tharaka/Nithi	-Ciabaraga Farmers Self Help Group, CBO -Mitungu Seed Growers, CBO	Seed production, processing and marketing
Machakos/Makueni	-Kyeko Self-Help Farmer Group -K.K Mkulima Stores, Stockist -Ngelani Enterprises, Stockist	Seed production, processing and marketing Fertilizer packaging and distribution
Mbeere District	-Catholic Diocese of Embu (Thiba Farm), CBO	Seed production, processing and marketing.

The ADSP-Winrock Consortium was to establish these CBO's and stockists as sustainable commercial and community based agri-inputs distribution system, which could be licensed by KEPHIS as seed companies on their own right. In this respect they were supported by a Kshs. 5.8 mi grant to develop their technical and business capability.

In as much as ADSP would have liked the CBO's and stockists to form regional associations and be licensed, the process has been slow and at the end of the

Project, none has been licensed. However, initial steps have been taken to form an Agri-Business Development Support – Forum (ADS-Forum) with a vision of sustainable availability of yield-enhancing inputs through partnerships involving the public sector, private sector, community based organizations and smallholder farmers. The mission of the forum is ‘to enjoin the community based organizations and farm inputs stakeholders in a forum to articulate the needs and aspirations of the CBO’s in certified seed production processing and marketing and to lobby for an improved operational environment for seeds and fertilizer businesses.

The goals of ADS-Forum include:

- Establishing a forum whose responsibility is to network for the 12 ADSP seed and fertilizer enterprises with Lagrotech Seed Company to enable them access to improved high status seeds from researchers, inspection and certification services from KEPHIS, extension services from various extension providers and market information when ADSP closes.
- Identifying partners to provide essential support services to CBO’s and lobby for such services at affordable prices.
- Networking CBO’s with local and international research centers for the provision of appropriate germplasm for multiplication.
- Lobbying for pro-poor seed policies from government.

The secretariat consists of Lagrotech Seed Company, NYACODA and K K Mkulima, and is already working on registration of the forum and articulation of objective strategies, operations and activities of the forum. Membership of the forum will include 7 CBO’s from the East and 5 CBO’s from the West plus Lagrotech Seed Company.

During the Project, the Winrock Consortium has acted as the umbrella body for the disjointed CBO’s in their dealing with KARI and KEPHIS. With the closure of the Project, a vacuum would be created, and as such the formation of the forum is timely. The goals of the forum focus on the need to continue building the CBOs’ capacity to help them close the bridge, developing strong linkages with the private companies and licensing them as seed companies.

The issue of licensing and registration a seed company is more complex, as the various Acts (Plant and Seed Varieties Act, Plant Protection Act and Suppression of Noxious Weeds Act) set the regulatory framework to be followed in licensing. So far, 5 CBO’s and stockists have applied. KEPHIS indicates possibly three can meet the criteria of i) capacity to maintain quality in the seed chain, ii) confirmation on source of foundation seeds, iii) improved seed processing by linkages with KARI or Lake Basin Development Authority.

2.8 Extent to Which the Seed Sector has been Liberalized

Kenya has considerable experience in the production of improved seed with certified seed production, starting in the 1960s. Most of the cereals and legume seeds are produced locally, but a considerable amount of floriculture and horticultural seeds are imported. The seed industry in Kenya is regulated under

the Seed and Plant Varieties Act (Cap 326), and to a lesser extent, by the Plant Protection Act (Cap 324) and Suppression of Noxious Weeds Act (Cap 325). These acts and many of the other 33 acts that affect the crops sub-sector have not been reviewed or are at various stages of being reviewed. Many of the acts date back to periods of government control of agriculture and although they are not strictly applied in the current liberalized environment, they can be a hindrance to the smooth running of the industry.

In the last decade, the Kenya's seed sector had undergone some significant changes towards a more open seed industry.

- First, the past inter-linkage between KARI, KSC and KEPHIS as government institutions has been weakened. KARI now has a mandate for research and bulking of basic seed that it sells to any certified seed company.
- Second, KEPHIS has been de-linked from KARI, to operate independently as a seed certification service.
- Third, the number of companies involved in seed has increased. Those registered under STAK include 15 dealing with production distribution of seed and 5 offering services to the seed sub-sector. A significant development towards liberalization is the increase of the number of companies dealing with seed maize. In the past, KSC controlled nearly 100% of hybrid maize sector. NGO's in the seed sector estimate that KSC still has 95% of the commercial maize seed market but it is expected to lose market share as competition grows.
- Finally, seed pricing, mostly for maize and beans, which was in the past done by government due to the monopolistic nature of KSC, has largely been left to individual companies. However, the recent re-instatement for KSC as a parastatal raises some questions on whether seed price controls will be introduced.

By and large, the seed sector is to some extent liberalized, but the recent development in KSC appears to point to some re-introduction of government control. The Plant and Seeds Varieties Act also needs urgent review, especially in the areas of certification, seed allocation/contract system, breeders' rights and release procedures, sampling and testing issues, compulsory certification especially for OPVs, standardization of seed classes, etc.

2.9 Extent to which ADSP Impacted Household Welfare

The Project (in part) was formulated to address the problem of poverty and food security in the target areas. ADSP has, to some extent, increased food security, although the problem of erratic rains mitigates the full benefits of the Project being realized. The Project had considerable food security impacts, especially in Area West where the diffusion effect has been considerable. In areas outside

ADSP Project in the East, the months of food insecurity are 6-8 months while in the West they are 8-10 months.

Income generation among households arises from sales of surplus food due to use of yield enhancing technologies. In the East, 89% of group members and 67% of non-group members reported an increase in income while in the West, 62% of group members and 42% of non-group members reported an increase in household income. In both areas, the reasons given for increase in saleable surplus were use of improved seeds, improved agronomic practices, fertilizer and agro-inputs and improved marketing. The accrued income was used in payment for various items as summarized below (Table 5).

Table 5: Households' Use of Marginal Increase in Income (Units: % of households that apply part or all of their marginal increase in income to a given budgetary line item)				
	Area East		Area West	
	Group	Non-Group	Group	Non-Group
Medical	35.9	20	17.8	19.4
School Fees	61.50	53.3	89.5	78.7
Food	94.9	93.3	31.9	59.4
Labor Cost	38.5	46.70	75.8	6.5
Clothing	43.6	33.3	62.5	29.0
Farm Inputs	25.6	26.6	34.2	22.6
Home Construction	3.8	0.0	12.6	9.7
Savings	25.6	6.7	69.2	9.7

Most income goes to meeting basic household basic needs. However, the Project has encouraged hiring of labor, and purchase of farm inputs especially among participating group members. The Project has also encouraged households to save some of their income.

2.10 Improved Yields by ADSP Farmers as a Result of Improved Horticultural Materials

The introduction of improved varieties for a broad range of horticultural crops has significantly improved yields on farm, as illustrated by the table in Annex E (Yield Improvement for Selected Commodities Promoted Under ADSP). Many of the varieties that KARI has introduced are old-line standard varieties used worldwide. A few examples of these include the Hass avocado, the Tommy Atkins mango, the Solo pawpaw, and the Nema 1200 and 1400 tomato varieties. Products such as the Hass, Atkins and Solo are still used by commercial growers worldwide. Commercial growers, due to their low yield potentials, have long abandoned the Nema variety tomatoes. It is likely that KARI included Nema's in their testing and commercialization material, as it is resistant to nematodes. The Nema varieties were developed in the early 1980's, and since that time, newer more effective nematode-resistant varieties have been developed. KARI's

research staff needs to do additional work on identifying advanced varieties in the horticulture sector that deliver benefits to farmers.

2.11 Demand for Horticultural Inputs Under ADSP

Under the ADSP and previous projects, KARI has evaluated various varieties from outside and demonstrated them to farmers. The demand situation of some of horticultural crops is shown below, see Table 7.

There has been an increase in demand for all horticultural varieties. In the case of TC bananas, the supply by KARI, Genetic Technology Laboratories and Jomo Kenyatta University of Agriculture Technology (JKUAT), can hardly meet the farmers' demand. JKUAT, the largest supplier (with 8 hardening nurseries owned by farmers groups) has distributed over 300,000-500,000 seedlings. Availability of improved passion cultivars is timely, as diseases had seriously affected the sub-sector. Improved potato varieties possibly present the highest challenge to KARI, due to unavailability of planting materials and the threat of wilt diseases. Introduction and demonstration of cupflowers to smallholders has increased acreages and opened a new avenue for income generation. In Kenya, most fruit growers have been purchasing fruit seedlings from 'road-side nurseries' that provide very low quality materials, and the 110 KEPHIS registered nurseries can hardly meet the increasing demand.

Table 7: Change in Sales / Supply for Horticultural Materials by KARI						
Item	1999	2000	2001	2002	2003	Total
Banana (Tissue Culture) Seedlings	112	210	218	7757	7652	15949
Avocado Seedlings	1552	1187	709	2188	3080	8716
Passion-Improved Cultivars (gr.)	3894	2102	10774	7799	13538	38099
- Rootstock	261	1489	5641	4349	119	11589
- Rootstock seed	437	1121	780	1224	317	3879
Pawpaw- Improved	774	5488	5523	3288	1828	16901
- Seed (gr.)	55	621	2019	1046	1781	5522
Potatoes – Tigoni (MT)	2135	3816	-	-	-	5951
- Asante (MT)	1856	3154	-	-	-	5010
Gladiolus (# of farmers)	20	38	114	135	175	482
Fruit Seedlings	840	1004	1099	5972	3456	12461
- Matuga	2884	6475	16821	14246	22258	64559
- Katumani						

2.12 ADSP Effect on Horticultural Market Development

The horticultural sector has always been private sector driven in terms of supply of seeds and seedlings. The government was mostly involved in extension and demonstration of new varieties. Horticultural vegetable seeds have mostly been

supplied by private companies, i.e. Regina Seeds, Hortec, Simlaw, East African Seeds, Pannar, Hygrotech among others.

The ADSP Project has introduced a new dimension by introducing CBO's/farmers groups and NGOs, as well as KARI centers serving as hardening nurseries for some varieties. In the case of tissue culture bananas, the outlets participating include KARI (Katumani, Kitale, Embu), Baraton University, Mukangu SHG, Wangu Investments, Winrock SACDEP, Embu Catholic Diocese, World Vision and individual farmers. These outlets have distributed 17,150 plantlets (enough material to plant about 38 acres). The training and demonstrations by KARI have exposed over 10,000 farmers to the technology. Improved passion fruit cultivars have been distributed through various organizations. These groups have handled 6,150 seedlings and over 3,000 kg of seed. Demand is estimated at 60,000 seedlings per year, but supply has only been about 45,000 per year (KARI 30,000 and private nurseries 15,000 seedlings).

Macadamia nut seedlings have mostly been supplied by Kenya Nut Company at Thika, which also processes the nuts. During the Project years, KARI has distributed 32,960 seedlings (sufficient to plant 316 acres on a 20'x 20' planting) of which 8,871 were supplied by the Baringo farmers through MOA, World Vision, Wundanyi farmers through DANIDA, and Naitiri in Bungoma. Improved mangos is one of the crops with increased demand, and distribution channels have been developed through KARI (Katumani, Masongaleni, Njoro-ATIRI CBO's), World Vision, Winrock, World Relief, farmers in Baringo through MOA, Wangu Investments, Daystar University and Moi University. Avocados have been distributed through Nyakio Ndindiruko, Mbari ya Mboce, Kiorugari self help groups (SHG) and KARI-ATIRI CBO's. Pawpaws have been distributed through similar outlets as mangoes. Seedlings from Perkeria have been distributed through World Wide Fund for Nature (WWF), UNOPS, organized CBO's, MOA, Kerio Trade Winds and individual farmers. It can be included that the Project has encouraged private sector participation in building a vibrant market through CBO's, self-help groups, church organizations and the public sector (KARI stations and MOA).

3.0 KARI's Contribution to Project Goals & Objectives

Over the years, KARI researchers have identified and developed several technologies designed to improve productivity of agricultural production in the various agro ecological zones of Kenya. Many technologies have been released in the past 6 years (see Table) including streak resistant maize, high yielding sorghum, climbing bean, disease free TC banana, potatoes, small-scale drip irrigation, options for soil fertility replenishment and recaptalization, CMD resistant cassava, MSV resistant maize, flower varieties, high quality mangoes, and macadamia varieties.

Table 8. Sample of Technologies Released by KARI since 1985

Commodity	No. of Technologies			
	1985-1990	1991-1995	1996-2002	2003
Maize	2	2	10	18
Sorghum/Millet	1	3	16	
Wheat	3	6	8	-
Potato	0	2	3	4
Legumes	0	7	15	-
Flowers	0	16	42	
Sweet Potato	0	0	5	5

Source: Adapted from Table 3 in the Implementation Completion Report for NARP II (2003).
Data for table was extracted from progress reports of KARI research programs.

As of the late 1990s, many of the released technologies were still not being actively disseminated to the majority of the small-scale farmers. Constraining factors included lack of access to the technologies, especially planting materials such as seeds and seedlings of various crops; limited effort to translate several technologies into commercial enterprises suitable for small holders in particular; and minimal attention to the social acceptability, product and input markets, gender concerns, potential impacts and enabling policies.

ADSP represents an effort to address these constraints for selected commodities and areas. The Project has focused primarily on those technologies, which by their nature are de facto public goods, notably OPV's easily replicated planting materials and crop management practices, and where dissemination was constrained by the absence of effective public or private technology transfer mechanisms. The key objective of the Project is to facilitate greater utilization of improved technologies through their commercialisation in the private sector as a means to increase incomes and reduce poverty.

In KARI, the Project supported three subcomponents as follows: KARI Seed Unit (KSU) activities to make improved planting materials available to input producers and farmers; horticultural program to develop, fine-tune and promote the use of horticultural technologies for commercial production by smallholders; socio-economics program to conduct a) socio-economic analyses to determine the economic viability of the technologies as commercial enterprises; b) social analyses to ensure the technologies are socially acceptable and gender friendly; c) market research to provide the market information; and d) adoption and impact assessment studies to document the achievements of the Project at different levels.

The Project has supported KSU activities and horticulture and socio-economic research work in four KARI Centers, namely- KARI-Thika, KARI-Katamani, KARI-Perkerra, KARI-Tigoni, and two sub-centers - KARI-Matuga and KARI-Masongaleni. The Project coordination/administrative unit at KARI headquarters

facilitated the activities of the Project by providing the financial and logistical support for the successful implementation of the Project.

For virtually all the KARI-related activities, ADSP support complimented support from GOK and other donors, notably the World Bank through the second National Agricultural Research Project (NARP II). The KARI component of ADSP provided a total of 2.0 million USD. The Project was scheduled to end in 2002, but KARI was allowed a no cost extension through the end of March 2004.

KARI has provided extensive documentation relating to the questions that the final evaluation has been asked to address⁵. This section draws on the documentation as a complement to information obtained through field visits and discussions with KARI staff and stakeholders. The conduct of the evaluation and the preparation of the report have been guided by the SOW. As such, the report may not do justice to the entire scope of ADSP supported activities implemented by KARI. The remainder of this section summarizes the findings of the evaluation with reference to following KARI-related issues:

- Transferring seed multiplication efforts to the private sector
- Release of germplasm
- Responsiveness of technology development efforts to farmer and market demands
- Usefulness of market assessments
- Adoption of improved technologies

3.1 Transferring Seed Multiplication Efforts to the Private Sector

The private sector (including NGOs) has been involved in seed multiplication since well before the inception of ADSP. Most farmers rely upon their own production and purchases from neighbors and local markets for seeds and other planting materials. Purchases of certified seed available through commercial channels have been increasing in recent years, in part due to a liberalization of the seed sector's regulatory environment and recognition by farmers that improved planting materials allow them to expand their options (flexibility in time of planting/harvesting), reduce risks and increase productivity. However, the participation of commercial enterprises in seed multiplication has been largely limited to research and development efforts related to hybrids grains and more generally to technologies that are not by their nature public goods. The KSC has dominated the hybrid seed market in Kenya for decades, and although the situation is very much in flux as a result of the opening of the market to other seed companies, KSC still handles most of KARI generated hybrids. Multiplication and primary distribution of OPVs for new materials has been carried out mainly by KARI, in part because prior to ADSP, there were limited efforts to develop viable alternative channels. TC bananas is a notable exception since the nature of propagation of plantlets allows scope for the profitable involvement of commercial enterprises and other public and private organizations, including Jomo Kenyatta University of Agriculture and

⁵ Notably, ADSP End of Project Report: Achievements and Impacts (KARI, 2004).

Technology now dominate the market in this market sector. Private companies are also the dominant (or sole) providers of planting materials for cut flowers and other selected horticultural commodities. For most public good technologies, KARI was ill equipped to develop and meet demand, and as a consequence many promising technologies remained on the shelf.

Most of the activities supported through ADSP have focused on expanding the availability of improved planting materials (primarily grains and legumes, but also a range of horticultural crops) developed by KARI and other research agencies⁶. Strengthening of private sector participation in the production and distribution of these technologies was seen as a potentially viable and sustainable approach to this end. The prospects for successful commercialization of OPVs and related technologies was felt to be greatest in the medium to low potential areas targeted by the Project, since several of the technologies were developed specifically for these areas and it was believed that quality certified OPV seed could compete reasonably well with hybrids in terms of price and performance under the prevailing drought prone, low fertility conditions. Further, the assumption was that direct linkages between local farmer seed enterprises and stockists would reduce production and marketing costs and allow stockists to offer certified seed at attractive prices.

From the onset, it was recognized that KARI by virtue of its mandate and capacities, would have difficulty ensuring farmer access to these technologies without significant participation by other service providers, notably NGOs, private sector agencies, and CBO's as well as public sector agencies responsible for extension and seed regulations. Accordingly, ADSP included support for the Winrock Consortium, STAK and KEPHIS to work in collaboration with one another as well as with KARI in exploring the feasibility of greater private sector participation, particularly by CBO's and stockists, and pursuing this through technical and financial assistance, facilitation of certification procedures and provision of good quality planting materials. The accomplishments in this area are reviewed in sections 2.0 (Project Outputs and Impacts), 4.0(STAK), 5.0 (KEPHIS), and 6.0 (Winrock Consortium).

Somewhat in contrast to other projects and policies promoting privatization almost as an end in itself, ADSP has featured collaboration among service providers in the seed sector based on comparative advantage and a convergence of interests. The collaboration is more "vertical" than "horizontal" in character, linking KARI and other sources of improved planting materials with those capable of multiplying and distributing these materials (seed companies, NGOs, farmer seed enterprises and stockists). KARI's roles include provision of improved planting materials and allowing selected seed enterprises to produce certified seed under the umbrella of its seed producer license. KARI KSU agreed to this arrangement because of its interest in developing these linkages and its confidence in the primary partners (Winrock Consortium and KEPHIS) to ensure the quality of the seed produced by CBO's under KARI's license. KARI has continued to multiply breeders and foundation seed for its varieties and hybrid

⁶ Research partner organizations include Lagrotech (which is part of the Winrock Consortium), ICRISAT, CIMMYT, CIP and CIAT.

parents at its own centers and through contracts with private farmers. Established private seed companies are doing this for their own germplasm, but it probably makes sense for KARI to continue the production of limited quantities of breeder's seed for KARI materials⁷. However, the experiences of the Project strongly suggest that the production of certified OPV seed for sale to producers can most efficiently be done by the private sector, notably farmer seed enterprises. The private sector also has a clear advantage in the area of marketing of planting materials. ADSP's private sector participation in seed multiplication and distribution has been promoted on the basis of comparative advantage, and progress is best assessed from this perspective.

The recent establishment of the Agricultural Research Investment Services (ARIS), a subsidiary of KARI, is an effort to provide financial sustainability⁸ for the organization. ARIS has not focused on the activities supported by ADSP to date, but it seems logical that it may do so. The private sector is increasingly participating in the multiplication of improved planting materials and if KARI opts to continue in this area, this will place it in direct competition with the private sector. KARI/ ARIS needs to develop and implement a business model, which complements the private sector, rather than placing itself in direct competition with it. KARI (and KSU) should not compete in the provision of services and products that the private sector can provide.

The ADSP's Mid -Term Evaluation suggested that the multiplication of pre-basic be done by the private sector under contract to KARI. This is already happening with some private and CBO farmers in the vicinity of the KARI centers.

KARI should commission a study to undertake a financial analysis, which compares the cost of producing pre-basic and basic seed in-house, relative to the cost of contracting it out to private farmers. This study should include an operational and financial analysis of the KARI Masongoleni facility. This analysis should then be used to develop a business plan for Masongoleni.

KARI currently has licensing and seed production contracts with 4 companies (LagroTech Seed Co, Kenya Mountain Beer Company Ltd, East African Seed Company, Freshco Kenya Ltd). Under these agreements, KARI will receive a royalty of 2.5% on gross sales of the products covered under the agreements. KARI has an MOU with KSC allowing them to use certain materials. KARI also has an agreement with Pannar of South Africa to develop varieties and hybrids together, but there has been no activity in recent years.

Some of the contracts, which KARI signed, are currently being contested by the parties involved. KARI has stated that it will soon make parent lines of hybrids

⁷ KARI also produces seed as part of a program to maintain germplasm utilized in its varietal improvement programs. There is possible scope for participation of farmer seed enterprises in this effort.

⁸ ARIS is a wholly owned subsidiary of KARI, whose goal is to develop sustainable internal revenue generation capacity as an alternative source of research funds. The main objective is to provide a mechanism and outlet for marketing and commercializing KARI's research products, capabilities and services.

available to those companies with which it has contracts. There have been delays in doing this, but KARI has said that the remaining problems should be sorted out soon and the materials will be made available to the licensees, to in 2004.

3.2 Interface Between KARI Seed Unit and Private Seed Producers

“KARI sells basic seed of OPVs to small private companies that lack their own variety maintenance programs of the crops under compulsory certification in Schedule II. This enables them to have a one stop shopping for basic seed from which they can multiply certified class for sale to farmers. The sub-contracted farms are often used as demonstrations of improved varieties to neighbors, NGO's and Extension. The seed growers are exposed to improved seed production techniques and to seed companies that may want to contract with them in the future. The seed from such farmers will have a KEPHIS tag for the respective classes and may be sold to private seed companies, private nurseries and other seed projects, which are helping farmers to multiply standard or farm saved seed. If there is need for emergency seed occasioned by drought or any other disaster, the cluster of seed growers can sell their seed to the seed companies that will have the tender to supply the seed. This may reduce the amount of seed of unknown quality procured under this class because KARI or the Ministry of Agriculture (MoA) would suggest to the tender winners where to buy seed of high quality⁹. The seed growers in each area are encouraged to form seed growing groups which can purchase seed immediately after harvest, store it in their own or rented store and sell it to other farmers at the onset of the rains. The money raised can be used as a revolving fund and the CBO seed producers in specific areas can function as seed banks for their respective areas. The seed banks will ensure a steady supply of seed irrespective of fluctuating weather conditions.” (KARI, ADSP Quarterly Report, March-June 2003, p12).

CBO Seed Production: The multiplication of improved OPVs represents a potential niche where farmer seed enterprises can successfully compete, in large part because private seed companies see limited prospects for profitability in this area. A key assumption in the design of ADSP, namely that there is a market for certified improved OPVs, has been confirmed. Further, experiences in the Project have shown that even small-scale farmers are capable of producing seed of acceptable quality. By operating as a group, farmers in specific locations are able to produce sufficient volumes needed to realize critical economies of scale in the transport of seed to seed companies and dealers. Stockists have found success in the marketing of certified seed for improved OPVs. The vertical linkages between the various components (KARI, seed enterprises and stockists) have been facilitated to considerable degree by the activities of the Winrock Consortium. A major concern is the extent to which these linkages will be

⁹ This will probably not work unless the tendering requires that bidders supply certified seed. Otherwise the lowest bidders will certainly buy standard seed from the market at the lowest price possible. However, if the MOA and other agencies seeking seed can be convinced to specify certified seed in their requests for tenders, this could greatly benefit producers of certified CBO and improve the quality of the seed distributed as part of drought relief activities. As argued elsewhere in the report, it is best not to distribute seed free under any circumstances, but to provide mechanisms to allow farmers to buy planting materials of their own choosing.

sustained with the conclusion of the Project. Operating successfully in the market for OPVs is fraught with difficulties and there are serious questions about the viability of seed production and marketing activities for these products on a continuing basis, as is discussed in subsequent sections.

Stockists: By all accounts competition, particularly at the retail or stockist level has increased dramatically in the project areas (as well as elsewhere) in recent years. In response to the growth of demand for purchased inputs, the number of retail outlets (agroveter shops) and the volume of sales have increased significantly. As an example, the number of stockists in Bondo district in the West has increased from 2 to 5 since 2000. These conditions served to reduce prices to the point where margins are modest and has led to an expansion in a range of non price competitive practices, including the provision of information to farmers which serves to increase demand and help ensure efficient use of purchased inputs. The increasingly competitive environment will undoubtedly result in the growth of some firms and the departure of others, but overall, volumes are expected to grow as the range of products and geographic coverage expand. Equally important, the quality of services has shown considerable improvement since the inception of ADSP. Part of this is certainly traceable to the training and other support provided by the Project, but in several cases, stockists are running ahead of the game by expanding the range of products and marketing functions, as well as providing complimentary promotional advisory services in such areas as soil fertility through information and demonstrations. In the process, stockists are assuming some of the functions traditionally reserved for extension and promoting the products they have to sell.

Role of NGOs: NGOs can be considered as part of the private sector and their involvement in seed distribution is considerable, particularly in the drought prone areas of the country. However, the role of NGOs is a special case that needs to be distinguished from the rest of the private sector. KARI has also sold seed to NGOs and in general welcomed their participation in the multiplication and distribution of improved planting materials. Such arrangements can be beneficial to both parties in that NGOs are able to obtain quality materials in the quantities they require at prices that are quite reasonable; and KARI can in effect wholesale improved materials through the NGOs for wider dissemination than would be possible for KARI to do on its own. This complements the role of the government extension services and is consistent with current policies favoring greater participation in the provision of agricultural development services.

The question is the extent to which NGO activities complement or work at cross purposes with efforts to develop viable and sustainable private sector commercial operations for seed and other planting materials. The picture is rather mixed. In some instances, NGOs were instrumental in identifying CBO's that became farmer seed enterprises supported by ADSP. For the NGOs, ADSP represented a means by which some of the more promising CBO's they had worked with or even formed might move to the next level and become self-sustaining through the production and sale of improved seeds. However, for many, this development may be little more than a transition to a new form of dependency. Many of the ADSP assisted CBO's are searching for partners among the NGOs operating in

their areas, as the Project comes to an end, thus bringing the wheel full circle. It is quite understandable that the Project mentality remains, the emphasis that ADSP has given to commercialization notwithstanding.

Some NGOs purchase seed in bulk and distribute free of charge to farmers/farmer groups. This is particularly the case in the more drought prone areas of the east and northeast regions of the country. These gifts are rationalized on the grounds that farmers may have lost their entire crops and do not have adequate resources to even purchase enough seed for planting in the following season. Such programs clearly impact negatively upon private seed production and marketing efforts, including those supported through ADSP. Fortunately, the extent of free seed distribution has gone down significantly in recent years, but there may be pressure to resume it in the wake of poor crop prospects for the current season.

Other NGO seed-related activities are more complimentary to the objectives of ADSP, notably the seed fairs, in which farmers are provided with vouchers for seed and fairs are organized in which anybody wishing to sell seed can participate. By all accounts, these fairs have been reasonably successful and provide an opportunity for local seed enterprises and stockists as well as larger, well established seed companies to promote their products.

3.3 Private Sector Participation in the Multiplication and Distribution of Horticultural Planting Materials

KARI's horticultural program encompasses a broad range of commodities, including Irish potatoes and bananas, as well as fruits, vegetables and flowers. Initially, none of these commodities was included in those handled by the Winrock Consortium, and thus producers and service providers did not receive the training and other services provided in the two main Project areas. Many of the ADSP supported horticultural activities were centered outside of the Eastern and Western districts targeted by the Consortium. Nonetheless, there has been significant progress in private sector participation in the production and distribution of seeds and improved planting materials, as illustrated by cases of disease resistant TC bananas and Irish potatoes.

Local MOA extension staff played important roles in this effort, notably in the identification of some of the farmer groups and individual farmers participating in the Project, and in the demonstration/training activities that followed. Although farmers and farmer groups may have been initially attracted by the prospects of getting assistance in various forms, the fact that this assistance was limited to advice, training and planting materials in technical aspects of production may have served to weed out all but the most serious participants. Although farmers currently active in the production of horticultural crops and improved inputs may have started as members of groups, several of these groups have fallen away, leaving a core of producers that may have the necessary skills and commitment to survive and even prosper. Virtually all of these have developed connections with commercial firms marketing their products and supplying inputs and some are receiving technical guidance through these connections. KARI played a critical role in starting this process in many instances

(although some farmers have been in the business for years), but many if not most farmers are operating with limited regular contacts with KARI. They have “moved on” so to speak and although they continue to be very interested in any new technologies that KARI might offer, they do not depend on ADSP or any project for their survival.

3.4 Release of Germplasm to Private Sector Seed Companies

The Mid Term Evaluation of ADSP examined the processes involved in the release of germplasm and these have been discussed at length in several reports. In brief, the processes are time consuming, involving a series of trials of technologies to assess performance across a range of agro-ecological conditions, as is discussed further in Section 5.0 (KEPHIS). Technologies get released (see Table 8 in section 3.0), but the process might be expedited, and several suggestions have been put forward toward this end (ADSP Mid Term Evaluation, 2002). KARI and particularly KSU have been instrumental in the process.

Box 2: Public Private Discourse on The Availability of KARI's Seed Materials

Kenya's private sector seed companies and KARI are at odds over the issue of the availability of KARI's germplasm. The disagreement lies in the fact that KARI claims that any private seed company can have access to its material (a fee is imposed for materials released after 1994).

The private firms claim that KARI will not provide them with specific breeder lines (implying that KARI wants to keep the best lines for its own certified seed commercialization program) and that they are charging unrealistically high prices for lines they are willing to sell or license.

In order to transfer these technologies to the farmers ASAP (and for the public to benefit from the research it paid for), representatives from KARI, STAK and the private firms involved should negotiate a long-term solution to this issue as soon as possible.

Beyond formal release, KARI has entered into several agreements with private commercial firms to produce and distribute these technologies. Hybrid maize is the main commodity where there is significant interest by private seed companies. Over the years, KARI has made significant quantities of germplasm available to the private sector. Formerly, all KARI hybrid parent lines went to KSC. That is no longer the case. Materials developed prior to 1994 are available to anyone. Materials released since 1994 are said by KARI to be available for sale to anyone and KARI can decide what is in its own best interest to do. They can sell exclusive rights to a single company or sell to several companies – it is their decision. KARI is comfortable with current arrangements that give it

considerable latitude in decisions about how to market its own seed, namely what it does on its own and what type of agreements it enters into with KSC and other companies.

KEPHIS is responsible for certifying the type of seed and must inspect the license agreement for seed produced by a seed company as part of the process. There is one suit pending against a company that was producing seed without an agreement with KARI to do so.

With OPVs and other technologies that are essentially public goods, the problem is not really a matter of making the technologies available to the private sector, but rather a lack of interest by the commercial enterprises in producing and marketing these products.

3.5 Responsiveness of Technology Development to Demand

Nearly all the technologies disseminated with support from ADSP were developed before the initiation of the Project in 1999. A central premise of ADSP was that there were technologies on the shelf that were appropriate for the marginal to low potential areas in Kenya that could with minor adaptation be successfully disseminated to small farmers. KARI was the major source of these technologies, but some came from other research agencies (e.g. ICRISAT) and the private sector (seed companies).

The Winrock Consortium carried out needs assessments using rapid rural appraisal methods in the primary Project areas as part of the initiation of activities in 2000. There were ongoing promotional activities in these areas by public and private service providers, but they were rather limited in the case of the promotion of public good technologies in particular. The initial contribution of the Project was to dramatically increase the availability of improved OPV seeds for varieties that had been already promoted and proven to be acceptable to farmers in the areas. Adoption had been constrained by the availability of the required inputs.

Prior to 2002, the range of materials provided through the Project in the primary target areas was rather limited. However, as the market for improved OPV maize seed became saturated (due in part to the fact that farmers were using their own seed), other commodities were increasingly included, notably sorghum, beans and groundnuts. The selections were based on what was available and recommended by KARI and other research agencies as appropriate for the Project areas. Since these determinations were based in varying degrees upon years of research and on farm testing of the technologies involved, the choices appear to be sound, as has in general been born out by sales of seed.

In horticultural crops, ADSP continued to shift emphasis toward dissemination of already released technologies. Since the ADSP support for this sub-component encompassed virtually all the commodities and activities of KARI's horticultural program, it is difficult to address the question of whether the technology choices made were optimal.

The question of whether ADSP made the best choices of technologies reflects mainly on the efficacy of the processes that KARI and other research agencies utilize in selecting research projects and assessing results. There are several

related procedures/processes that KARI research programs and centers observe to ensure that research efforts focus on the needs of farmers in all parts of the country. Kenya is very diversified in terms of agro-ecological conditions. There is also a significant range of socio-economic conditions. KARI is mandated to cater to all farmers, but gives special attention to small holders in accordance with the Government's emphasis on food security and poverty reduction.

The decentralized structure of KARI that includes a network of National and Regional Research Centers (NRCs and RRCs) is intended to provide research services for all the agro ecological zones (AEZs) in the country. In reality, the provision of services is rather uneven, with more attention going to areas of higher population and higher potential, but the coverage is reasonable, nonetheless. There has been pressure from donors to close some of the centers in an effort to economize, but this would probably reduce KARI's ability to target research activities to the needs of farmers in areas currently served by these centers. The logic is that KARI has difficulty adequately supporting such a large system and might do a better job focusing available resources in a fewer number centers. Obviously, one can argue this both ways, but the choice seems clear if resources are constrained to the point where it is difficult or impossible for the current system to function effectively. This appears not to be the case at present (see section 7.0), but the uneven nature of support from government and donors in recent years adds a major element of uncertainty and adversely affects the quantity and quality of the research activities, and more specifically, the ability of KARI to address the specific needs of farmers in all the agro-ecological zones.

KARI research programs and centers follow several procedures designed to better ensure the targeting of research activities (development of technologies), including the following:

- Priority setting at the national and RRC levels (involving rapid rural appraisal and ex ante impact assessment)
- Farming systems approach
- Monitoring and evaluation of progress
- Farmer participation in research process (on farm trials)
- Farmer choices and feed back mechanism (ATIRI, FFS)
- Lessons learned from ex post impact assessment

Shortages of qualified personnel and financial constraints have tended to limit the coverage, but a significant number of studies have been completed nonetheless. KARI has continuing difficulty in attracting and retaining staff with the requisite skills in socio-economics; as a result many of the tasks are carried out by younger staff with limited experience.

Introduction of these inter-connected sets of procedures has served to systematize efforts to more accurately target research activities to meet the needs of farmers in different socio-economic categories and agro-ecological zones. Previously, much of this was left to the instincts of individual researchers that were often more or less on target, but may have been unduly influenced by technical performance criteria (e.g. maximizing yields under optimal conditions) in many instances. This has changed in the past 20 years, partially in response to a

significant slowdown in the growth of agricultural productivity and the adoption of new technologies. Further, the easier research tasks had been accomplished and what remained required greater sophistication in research design, as well as adaptation to a wide range of local conditions.

The External Program Review of KARI and the Implementation Completion Report for NARP II, both of which were completed in 2003, provide useful descriptions and detailed assessments of these processes. There are several weaknesses, most notably in the extent to which these activities are linked to one another and impact on decisions on the allocation of research resources. There is considerable room for improvement, as noted in these reports, as well as in the Mid-Term Evaluation Report for ADSP. However, the procedures exist and have unquestionably impacted positively on the extent to which research is focusing on the requirements of farmers in Kenya.

The proof of acceptability of new technologies lies in the extent that farmers adopt them. The performance in this regard is significant, as summarized in Sections 2.0 (Project Outputs) and 3.7 (Adoption). Adoption is obviously also a function of the effectiveness of the range of technology transfer activities, including extension, production and marketing of inputs, as well as the availability of ready markets for outputs. The slowdown in the growth of agricultural productivity during the 1990s resulted in a fair amount of finger pointing with all the major parties – research, extension, input and output markets, government policies as well as farmers themselves – being the focus of criticism at various points in time. Obviously, a combination of factors contributed to performance, including weather. But the important point is that the National Agricultural Research System (NARS) in general and KARI in particular, had a responsibility to help ensure that appropriate technologies were not only produced, but were made readily accessible to farmers, directly and via other service providers.

While the process of correctly targeting research efforts remains primarily the responsibility of KARI and other research agencies, it is expected that the process will be increasingly facilitated by developments in the private sector. Input marketing is arguably the most dynamic component of the activities catered to through ADSP and offers considerable promise for expanding private sector participation in a range of technology transfer activities. The roles of KARI and other research agencies will change as those involved in input marketing increasingly seek out the most promising technologies and provide valuable feedback from farmers, which will assist in adjusting the selection of technologies and the focus of research activities. The process will become more truly “demand driven”. Commercial input dealers will increasingly make use of information and communication services (the quality and accessibility of which is expected to improve dramatically in the medium term) that will significantly reinforce this trend.

3.6 KARI's Marketing Studies

KARI Socio-Economics Department has carried out a number of marketing studies covering several commodities including flowers, potatoes and citrus. These studies are of reasonable quality in terms of giving the reader an understanding of the basic elements of the market (structure, conduct and performance) for these commodities. It is not clear that these studies have featured in the decision-making processes associated with priority setting and the allocation of research resources with KARI. The nature of the studies also makes them of limited use to those involved in the production and trade of these commodities. Marketing is definitely a major issue affecting the distribution and demand for improved technologies, as well as the profitability of production involving the use of these technologies. However, given the considerable demands on the limited socio-economics capacity with KARI, the Evaluation Team questions the degree to which KARI should try to carry out these studies, at least in-house. KARI should continue to give attention to marketing constraints as part of the ex ante impact assessments and sub sector analysis required for research planning and priority setting. Contracting out marketing studies to consultants with special expertise in the field is also an option that should be given serious consideration where markets are identified as a major problem area.

3.7 Adoption of New KARI Varieties By Farmers

As noted above, most of the technologies disseminated with support from ADSP were developed prior to the initiation of the Project in 1999. Some adaptive research and other refinements have taken place, and ADSP supported the continuation of research activities in the case of horticultural crops in particular. Further, many if not most of the disseminated technologies involved the participation of other research agencies that were responsible for developing the basic genetic lines.

The adoption of improved varieties for the several commodities covered by ADSP has been significant by any measure. The major focus of Project activities was upon grains and legumes, particular OPVs, but there has been dramatic progress with new varieties of cassava, sweet potatoes and a range of horticultural crops as well, featuring disease resistance, as well as greater productivity compared to local varieties.

KARI's End of Project Report on Achievements and Impacts includes information on adoption of new varieties. In most cases, the focus is upon sales of seeds and other planting materials, which is not always a good indicator of actual adoption by farmers. However, to the extent the materials were sold to farmers rather than given away, gives one some confidence that the results represent a fair degree of adoption¹⁰.

¹⁰ This is not the case with purchases by NGOs or other agencies that subsequently distribute the materials free of charge to farmers as part of relief activities. See discussion of NGO roles in section 3.1.

Table 9: KARI's Volume Sales (MT) of Selected Seed 1999 – 3rd Quarter of 2003

Crop All Varieties	1999	2000	2001	2002	2003	Total
Maize	0.5	4.1	2.7	0.6	2.5	10.7
Beans	1.5	14.1	17.2	9.1	11.0	53.2
Sorghum	6.3	4.5	13.9	5.1	0.4	30.5
Millet	0.5	2.7	1.9	0.5	0.3	6.0
Cowpea	3.1	7.6	18.2	3.4	0.9	33.4
Peas	< .1	< .1	1.1	3.2	0.9	5.4
Green gram	0.4	2.2	3.0	1.2	0.8	7.9
Dolichos	-	< .1	-	0.3	0.5	0.9
Total / Year (rounded)	12.4	35.4	58.0	23.4	17.3	

The 2002 Mid-Term Evaluation of ADSP noted “although KARI collects information on sales of basic seed and planting materials, it does not collect the kind of information needed to monitor the intermediate impacts and results attributable to the ADSP program. In particular, KARI needs to begin setting targets collecting sales volume and value data in respect to certified OPV seed sold under the KSU brand, by seed type (or cutting type), annually and by region.”

The evaluation report went on to recommend that “KARI also should develop a methodology to collect survey data on the number of smallholders purchasing the certified OPV seed and planting materials, again differentiating by seed type (or cutting type), annually and by region, in a manner that allows determination of the proportion which are first-time versus repeat buyers. This is essential for estimation of the adoption rates of improved OPV varieties among the target population.” The current evaluation endorses this recommendation.

As noted in the ADSP Mid-Term Evaluation report, “use of improved seed alone offers limited benefits to farmers, especially where fertility conditions are marginal or worse. Although most farmers have had some exposure to the benefits of the combined use of improved seed and soil fertility enhancement measures over the years, many remain less than convinced of the net benefits or are simply unable to pay the costs of the required inputs, notably improved seed and fertilizer. MOA extension services have had limited operational support in recent years and their effectiveness has been seriously curtailed as a result.”

Recognizing that the benefits of improved planting materials (and hence adoption) would be constrained by the low fertility conditions that characterize the two primary Project areas, the Winrock Consortium sought to include the necessary technical and business knowledge of fertilizer in the training program for stockists, as discussed further in Sections 3.3 and 6.2. These efforts impacted positively on the demand for improved planting materials, as well as on the profitability of input marketing enterprises.

4.0 STAK Contribution to Project Goals & Objectives

The Seed Trade Association of Kenya (STAK) was formed in 1982, supported by a grant from the Kenya Seed Company, which at that time was a parastatal organization. When STAK was formed, it shared executive officers with the Kenya Seed Company and was not an effective representative of the private sector. Over the years, STAK membership has grown from its original three charter members to 9 members by 1999. Kenya's seed industry was liberalized in the early 1990's, which allowed for competition in the sector from both foreign and domestic firms. USAID's relationship with STAK began in 1999. In May 2002, USAID entered into a grant agreement with STAK, which provided approximately \$594,000 USD over a three-year period. Following this support provided by USAID, STAK's membership has grown to its current level of 24 members. With USAID assistance, STAK has grown into an effective independent voice for Kenya's private seed industry. With an estimated 35 seed companies currently operating in Kenya, there is room for further growth and as STAK builds capacity, it is likely that many of the firms that have not yet joined will come on board.

4.1 STAK's Policy Agenda – Progress and Achievements

STAK's policy agenda is based on key issues that are relevant to Kenya's private seed producers. The broad objectives of the agenda are to shift more regulatory responsibility to the private sector, to improve intellectual property rights and to bring Kenya's seed laws and regulations closer to international standards.

STAK's specific agenda covers the following areas:

Creating a policy environment that supports seed sector investment: To support investment in the seed sector, Kenya must reform the regulations that govern the application process and securing of plant breeder's rights. Plant variety protection, or plant breeder's rights, is a core issue for the seed industry worldwide. Without an unambiguous and efficient system to provide intellectual property protection to plant breeders and seed companies, there cannot be growth in the pool of new genetic material developed or a transfer of new technology (genes) to farmers.

One of STAK's primary areas of focus is improving the process by which seed companies apply for and secure plant breeder's rights. Working in concert with KEPHIS, the lead regulatory agency in overseeing plant breeder's rights, STAK has developed new draft regulatory language which, if approved by the GOK, will simplify and speed-up the process of obtaining plant variety protection.

Accrediting private seed companies to undertake seed certification services: Certified seed is the principal product that seed companies produce and sell. In Kenya, as in most other countries, seed must pass a series of quality tests before it can be certified. These tests start in the field and include verification of isolation

distances, checking for pests and pathogens that may affect seed quality and insuring that seed fields are free of weeds that may find their way into the seed lot. After harvest, seed producers must comply with standards that govern how the seed is processed, stored, packaged and labeled. Under current regulations, all inspections are provided by KEPHIS.

To improve the efficiency of seed production, STAK has worked with KEPHIS to develop a regulatory system that will shift responsibility of in-field and processing facility certification to private inspectors. This will greatly improve the system of seed certification from the private sector's point of view. Private inspectors can be licensed in all the districts in which seed is produced; thus making the inspectors more accessible and responsive to the seed companies, while at the same time insuring seed quality.

The system of private seed certifiers has not yet been officially incorporated into GOK regulations. Both KEPHIS and STAK agree that private seed certifiers is a step in the right direction and given the support of these two organizations, it is most likely that the new system will be in place by end 2004.

Examination and reform of seed viability regulations: Seed regulation in Kenya stipulates that the viable period for vegetable seed is six months from the date of sampling. The seed industry and STAK are correct in their desire to change this regulation. From a scientific/ technical standpoint, the length of time vegetable seed will stay variable is not determined by time alone. Other factors such as storage temperature, humidity, exposure to air and sunlight, the type of seed treatment chemical used and exposure time to seed treatment chemicals, post-harvest process techniques such as acid treatments or scarification and seed genetics, all affect a seed's viability period. By standards accepted in most countries, a regulation that sets vegetable seed viability at six month after testing is short, and is not supported with scientific fact and provides a constraint to the industry.

To remedy the current regulatory situation, STAK has proposed a review of the current seed viability regulations. Beginning in the first quarter of 2004, STAK plans to work with Moi University and the private seed industry to identify an equitable solution to this industry constraint. It is expected that by the third quarter of 2004, STAK will have its research completed and will then draft new regulatory language. With the research and proposed regulatory change complete, STAK plans to begin the lobbying process. KEPHIS will play a key role in assisting STAK in realizing the desired changes in the regulations and it will be very important that STAK begins a collaborative working relationship on this issue early in the process. Ideally, KEPHIS should sign off on the research methodology employed by Moi University so that there will be no disagreements over the validity of the research findings once the final report is issued.

Harmonization of seed policy within the East African community: STAK was elected to take the lead role by the Eastern and Central Africa Program on Agricultural Policy Analysis, Seed Regional Working Group (ECAPAPA, S-RWG) to develop a set of standardized seed sector policies and regulations for

the region. Under this body, STAK will work to harmonize seed sector regulation between regional producers in the area of methods and protocols for variety evaluation, release, registration, testing periods, the organization and makeup of variety release committees, regional variety lists, field and lab standards, phytosanitation standards, plant variety protection and import/export documentation.

The importance of STAK's role to the regional and global seed industry is highly significant. If STAK can be successful on a regional level of pushing the ECAPAPA, S-RWG agenda through to a successful outcome of regulatory reform, STAK will save the international seed industry millions of dollars and assist in speeding the transfer of modern seed technology to millions of farmers in Eastern and Central Africa.

STAK plans to begin its work on harmonization in the first quarter of 2004. The plan calls for continued work to identify a set of standards in seed quality, certification protocols for variety evaluation, release and registration. Also in the first quarter of 2004, STAK plans to start the development of regional variety lists and meet other national seed associations to form a regional seed association.

STAK role in improving access to KARI seed materials: As Kenya's leading private sector seed organization, STAK can play a key role in working with KARI to overcome bottlenecks that have developed in transferring KARI seed material to private sector breeders. The current impasse between KARI and some of Kenya's private seed companies over the use of and/ or licensing of breeder lines needs immediate attention. The current deadlock is slowing the transfer of technology to farmers. STAK considers this an important issue on its agenda and the Evaluation Team supports the efforts for both STAK and KARI to resolve this matter as soon as possible.

The task ahead for STAK is substantial. To successfully complete these objectives within the next several years, it will most likely require more full-time professional staff¹¹. Ideally, a full-time employee could support Mr. Obongo Nyachae, STAK's Executive Officer. The new employee would need a background in seed business operations, and a background in seed industry intellectual property rights. USAID needs to view STAK's work as a long-term investment. In the beginning, returns on this investment may be limited but over the long run, it can produce significant returns to both the seed industry and the farmers it serves.

4.2 Stakeholders' Contributions In Drafting of Seed Acts/Regulations

STAK appears to be doing a good job of acquiring industry input on issues that affect the industry. Members played a key role in developing the revised language used in the proposed regulatory changes in the Plant Variety Protection Act. STAK's membership consists of sophisticated businessmen and businesswomen. They understand the importance of the organization and are not

¹¹ Currently, STAK only has one full-time professional level employee

hesitant to voice their positions and interests to STAK's Executive Officer, other members or government officials.

There is one area within STAK that needs to be addressed in the near future. On or about end 2003, Mr. Obongo Nyachae, STAK's Executive Officer, was appointed to a Board of Directors position at Kenya Seed Company. This appointment was made by an official of the GOK. The GOK still owns a controlling interest in the KSC. Historically, there has been a very close link between STAK and KSC; however this link has weakened over time.

In order for STAK to be viewed as independent and free of special interests by its membership, as well as the domestic and regional agribusiness community, it must have leadership free of any hint of bias or prejudice. This matter cuts to the core of STAK's effectiveness as an organization, as well as its sustainability.

4.3 STAK's Institutional Capacity and Effectiveness

STAK has been asked to set high and important targets and accomplish these targets on a relatively-limited budget. To improve its probability of success in reaching these targets, STAK needs to form solid links with other complementary regional activities such as the USAID STCP, RATES Project.

Networking with other national, regional and international seed associations: STAK has forged linkages with a number of regional and international bodies, including ECAPAPA, S-RWG, Union for the Protection of New Varieties of Plants (UPOV), International Seed Testing Association (ISTA), American Seed Trade Association (ASTA), French Seed Association (GNIS) and the Organization for Economic Cooperation (OECD).

With its role as Secretariat for ECAPAPA, S-RWG, STAK plays a key role in setting the regional policy agenda and guiding industry members and governments toward a more efficient and productive regulatory environment. The results will yield benefits to the commercial seed industry, as well as give farmers more rapid access to a wider range of genetic material.

Monitoring and building capacity within STAK: A review of STAK planning and monitoring documents shows that they have a fairly good understanding of both past and future cash flow, as well as tasks, timing and objectives. STAK capacity is limited; with only half-time professional staff, it is not realistic to think about building breadth and depth of institutional capacity. It would be beneficial to STAK as an institution to build in additional capacity through the hiring of one or more professional staff with a background in the private seed sector and intellectual property. This person would report to the Executive Officer, but should be given full responsibility to manage specific parts of STAK's domestic and regional policy agenda portfolio. The portfolio could include areas such as plant breeder's rights, certification protocol, variety lists, and release protocols. This would allow the Executive Office to focus on other issues and would improve task continuity (in comparison to relying on a one time short-term consultant).

Another way that STAK can build capacity is to request a US Peace Corps Volunteer to be assigned to STAK's main office. This person would most likely have a background in agriculture and the seed industry. The PCV could support the Executive Officer on technical, policy and sustainability issues.

Developing a sustainable organization: It is estimated that there are currently about 35 seed companies operating in Kenya. In 2003, STAK had about 70,000 USD in direct operating expenses (salaries, office rent, overhead, legal, auto, etc). Assuming that all 35 seed companies joined STAK, they would need to contribute 2000 USD per firm to cover STAK's annual costs. This is not a significant sum for larger firms like KSC, Pannar Ltd. or Pioneer, but it is a significant cost to smaller firms. The 70,000 USD does not include the costs for domestic or international expert consultants, nor does it cover travel to regional counterpart seed associations in other regional countries.

As long as STAK is involved in regional policy harmonization and capacity building through the use of international experts, it will have to rely on some support from donors (be it foreign governments, multi-lateral organizations or NGO's). USAID should develop a plan in concert with STAK's leadership to slowly withdraw funding. Although funds may be kept at the current level for several years, STAK should understand that someday (and the date should be clear) USAID expects STAK to take on a greater role in its own financial support. USAID needs to give STAK time to plan and test its business model and this is why USAID should start discussing these matters with STAK as soon as possible.

Given the fact that small firms have limited funds and can't afford the current annual fees, STAK should consider making a member category for small companies based on turnover. For example, firms with less than 100,000 KS in seed sales could be non-voting members for 2000 KS. This is small money, but it would get the small firms involved in the organization (to everyone's benefit).

STAK should also think about other ways it can generate income. If USAID provides funding for a full time staff person with a background in seed sector IP, this person may be able to generate some consulting income for STAK by working with the private sector in regional countries. STAK should also look for ways to generate funds through services to the domestic industry, such as providing licensed inspectors for seed certified seed production, or having fund raising events where guest pay to attend. One issue that may need to be looked at is "project generated income" (PGI). STAK will need to be careful to stay within the USAID regulations on PGI as it tries to reduce its dependence on USAID support.

4.5 The STAK, KEPHIS and MOA Relationship in Formulating Seed Sector Policy

In 1999, the STAK, KEPHIS and the MOA formed a working group to update seed sector policy in Kenya. Specifically, the group focused on The Seeds and

Plant Varieties Act CAP 319, 324, and 326. During 1999 and 2000, the working group developed a set of suggested changes to the Act. These changes consisted mainly of a fine-tuning of laws and regulations that were current at that time. At some point after 2000, the GOK (without industry input) started work on a major redrafting of The Seeds and Plant Varieties Act. The redraft included new laws and regulations in the areas of 1) seed and plant variety protection, 2) plant breeders' rights, 3) plant health & phytosanitation, and 4) KEPHIS.

The redrafted Act was provided to the seed industry for review in mid-2003. The reaction of the industry was that the redrafted Act was a step backwards in a policy sense. STAK, along with individual seed companies, requested the GOK to drop its plans to have Parliament approve the redrafted Act and in its place, fine-tune the existing Act with the suggested changes that were developed in 1999-2000 and added to later in 2003.

At the time this report was prepared, it appeared that STAK and KEPHIS were in agreement that the fine-tuning approach to existing regulations is better than the full scale redrafting of the Act. It appears that the GOK also agrees with this approach, but there is still much uncertainty in the industry on what the GOK will ultimately do - adopt the fine-tuning approach or the proposed major redraft.

A few examples of the proposed changes under the fine-tuning plan include:

A defining of the term Accreditation, meaning “the authority by the minister to a person or institution to carry out specific functions such as field inspections, supervision of process, or testing for the purposes of seed certification.”

This proposed change is important in that, if enacted, it will allow KEPHIS to license private seed field and seed processing inspectors. This will greatly streamline the process of seed certification by reducing the time, money and business risk associated with certified seed production relative to the current certification system. If the accreditation regulation is accepted by the GOK, KEPHIS can license accredited seed production inspectors in key regions throughout Kenya. This will make inspectors more accessible to the industry than the current system allows. The fact that the inspectors will be private service providers rather than government employees will help reduce costs within KEPHIS and make the certification more efficient.

The proposed regulations also include significant changes to the makeup and function of the Seed Regulation Committee, application for consideration as seed grower, registration of seed merchants, seed certification and inspection, seed processing, seed sampling, packaging and labeling, validity certification and quality declaration, seed import/export and protection from liability in certain cases¹².

¹² The proposed changes in regulations in the area of protection from liability in certain cases allows for GOK officers to be held liable in cases of negligence or malice leading to financial losses to the seed grower.

Other changes in the GOK regulations include redefining terms such as “basic seed, standard seed, and commercial check”. All of these text changes in the regulations are small but important steps to developing a transparent regulatory environment under which both seed companies and farmers will benefit.

5.0 KEPHIS’ Contribution to Project Goals & Objectives

5.1 The KEPHIS Role in Increased Plant Variety Protection

Box 3: Plant Breeder’s Protection

In Kenya, a plant can be protected when it is shown to express one or more characteristics that are unique to that genotype. The characteristic(s) must be distinct, stable over generations, uniform and novel. When a plant material is granted protection, it cannot be used for commercial purposes without the consent of its owner. The proprietary rights for trees and vines are granted for 18 years and for all other cases 15 years. Once protected, a variety can be trademarked or trade named, which allows for further legal protection.

If a plant material has been sold or marketed in Kenya with the owner’s consent for a period of one year (or outside of Kenya for 4 years) without official protection under plant breeder’s rights regulations, then these rights will not be granted.

The current laws and regulations governing plant variety protection in Kenya were set in November 1994 under the Seeds and Plant Act (Cap 326). The administration of the Act and its regulations is carried out by KEPHIS.

KEPHIS documents reviewed by the ADSP Evaluation Team indicated that as of June 2003, 591 plant varieties have been submitted for variety protection under GOK plant protection regulations (46% local and 54% foreign). Of these 591 applications, 90 have been granted plant breeder’s rights.

The majority (58% of applications) of plant materials submitted for registration have been horticultural, mainly flowers. KEPHIS’s MD reports that on average, it takes about 12 months for an application to be processed; this assumes all the paper work is complete when the application is submitted. The

process can be faster for plant materials already registered in other countries. If the material is not already registered outside of Kenya, distinctness, uniformity and stability (DUS) testing is required. The DUS testing takes a minimum of two seasons.

If the new STAK – KEPHIS proposed changes in regulations are adopted by the GOK, the process and regulations will provide reasonable protection to the plant breeder and owner of proprietary materials. KEPHIS expects that these new regulations will be in place by end 2004.

5.2 The Processing of Plant Breeders' Rights

Box 4: Allowing the Market to Control the Quality of New Varieties

In a self-regulated market model, seed companies test and release new lines whenever they feel that the new line can compete effectively in the marketplace. In this case, there is no need for government permission to sell a new variety. This system has allowed North and South American farmers to stay ahead of many nations in advances in germplasm quality. History has shown that farmers who adopt a new technology first will benefit most from it and farmers who adopt the same technology later may not benefit, as the new technology has already become the industry standard and must be employed just to stay competitive.

The time in which breeder's rights applications are processed was not among the key issues of concern for most of ADSP's partners. However, private sector breeders interviewed as part of the Evaluation Team's research saw this as a high priority area.

Plant protection applications are submitted by a number of different organizations. Figure 1 examines the number of applications KEPHIS has considered from a variety of sources.

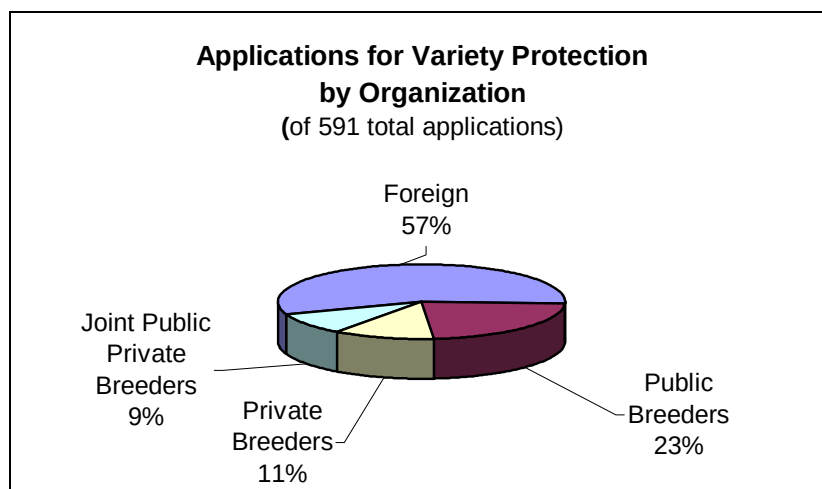


Figure 1, Source: KEPHIS

Since plant breeders have large sunk costs in developing new products, they are naturally in a hurry to complete the registration process as soon as possible. This process is easier for materials developed and registered outside of Kenya, but for small private firms operating in Kenya, the three seasons required to complete the process is burdensome. In an ideal environment, KEPHIS would make every effort to facilitate the registration process by transferring (as much as possible under UPOV regulations) the responsibilities for DUS testing to the breeders.

Plant breeders do not trust the DUS trial system because in some cases it requires the breeder to supply parent lines to KEPHIS as part of the testing process. This

is a constraint for the private sector. The private sector must above all other issues be satisfied that their parent lines are secure (cannot be stolen).

In 2001 and 2002, KEPHIS did not grant any plant variety protection rights to applicants¹³. However, by the end of 2003, they had granted protection to 90 applicants and approved (but not yet granted) an additional 80. Although 2001 and 2002 were very frustrating years for applicants, by end 2003, KEPHIS finally had begun moving protection applications through their pipeline.

As of June 2003, 85 varieties gazetted by the GOK have been contested by outside parties. When a contest to protection is raised, the processing period to consider granting breeder's right can be increased significantly. Figure 2 examines the number of contests submitted for selected crops.

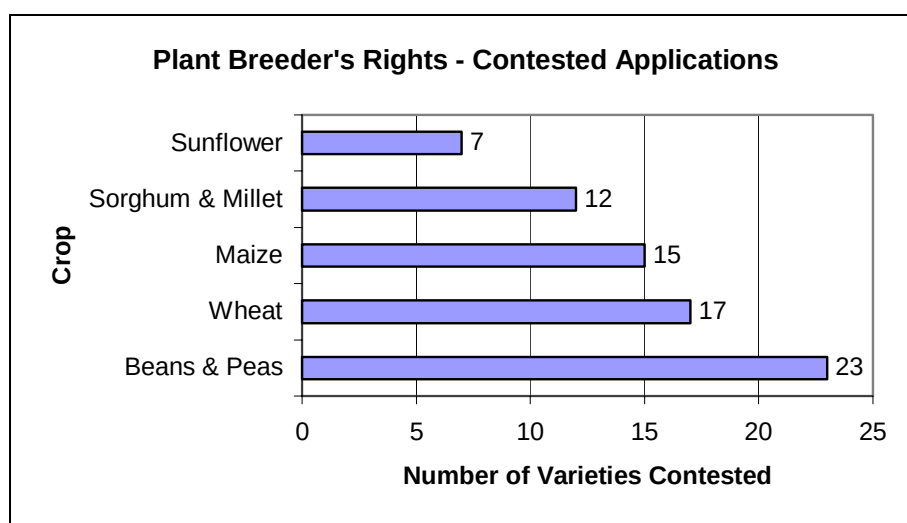


Figure 2. Source: KEPHIS

5.3 Shifting Responsibilities to the Private Sector Seed Companies

Before a plant material can be sold in Kenya, it must be certified by KEPHIS and placed on an official list of seeds approved for sale by the GOK. This policy was inherited from European seed law and to this day, most European nations still require 2-3 years of testing for new varieties against benchmark varieties (standard varieties) before the material can legally be sold. In most countries of the Americas, government regulators do not control new releases into the market. Rather, market forces are relied on to weed out any poor performing product. This policy has worked very well, allowing seed companies to transfer new material to farmers quickly and efficiently. By comparison, the Kenya model for seed certification is slow and expensive.

KEPHIS has been working to streamline the process of seed certification¹⁴. Today KEPHIS is responsible for running the National Performance Trials

¹³ Source: KEPHIS – USAID ADSP Monitoring and Evaluation Performance document, undated

¹⁴ Making a more efficient plant breeder's rights application process was part of the STAK's policy agenda and they should be given credit for many of the positive changes in this regulatory area.

(NPT). These tests must take place at a KEPHIS approved facility (not the breeder's farm).

Box 5: Improved Nutrition Profiles in Sorghums

When there is not enough rainfall to grow corn, sorghum is the best alternative. Farmers in Kansas (using sorghum hybrids, no-till practices and no irrigation) report yields of 9 MT/HA with 300-400 mm of rainfall. The new sorghum hybrids have equal feed value as grain corn for beef, pork and poultry. For human consumption, corn is usually preferred over sorghum by most Kenyans; but in geographies where rainfall is limited or uneven, sorghum is a good alternative to corn for both the human diet, as well as for livestock. Given its low water requirements, it can be incorporated into a dryland-cropping pattern, providing a level income and food security to farmers (particularly in food crisis areas).

Before seed technologies like improved nutrition profile sorghums can be produced in Kenya, they must first be certified. A streamlining of the process by KEPHIS would be a major contribution to Kenya's food security system.

One important (proposed) step that the KEPHIS is taking to speed up variety releases is to allow seed companies to undertake variety evaluations themselves and have KEPHIS confirm and validate the results of the data from these trials. Data from these tests must include results from different agri-ecological zones within Kenya, thus seed companies are required to run multiple tests.

KEPHIS has also recently changed NPT regulations so that DUS testing of potential seed lines only need to be run for one season.

KEPHIS worked to streamline the bureaucratic process involved in variety release. Under the old system, a new plant material would need to be approved by 3 committees before being released. The committees included the National Performance Trials Committee, the Specialist Variety Release Committee and National Variety Release Committee. Under the new (proposed) regulations, the Specialist Variety Release Committee input has been dropped and the National Performance Trial Committee and the National Variety Release Committee only need approve applications.

In 2002, 11 varieties from 4 companies were released and in 2003, this number increased to 22 varieties submitted by 7 companies. KEPHIS should continue to work at lowering the barriers to entry for new genetic material by developing a more efficient release system. By imposing a time-consuming and costly release system, it is slowing technology transfer to farmers and making its entire agricultural sector less competitive.

5.4 The Success in Building Public and Private Capacity

Since KEPHIS began working with ADSP, its M&E documents show that 3181 seed stockist training sessions have been provided in areas such as seed handling, storage, quality assurance, seed regulations, the role of the stockists in providing information to farmers as well as several other relevant areas, see Figure 3 below.

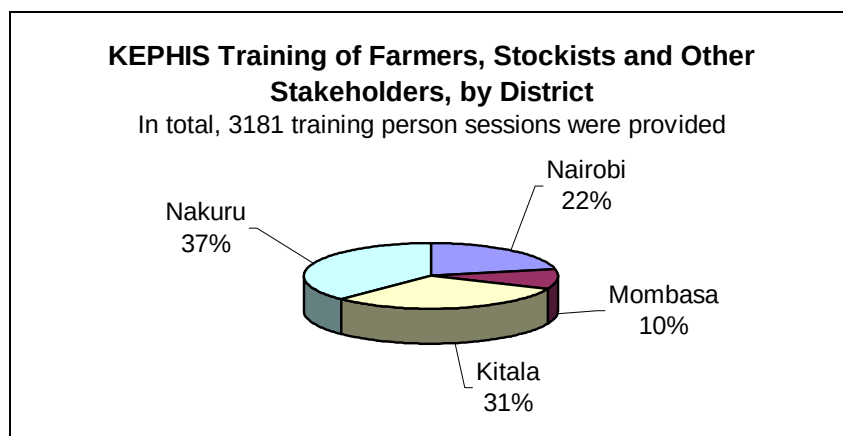


Figure 3, Source: KEPHIS ADSP M&E document (undated)

In addition to training stockists, KEPHIS has provided training in the areas of seed quality, seed sampling, seed testing, laboratory systems, computer software, and management totaling 101 person-training sessions to its staff and individuals from local seed companies. In 2003, KEPHIS staff also traveled to Holland, Germany, South Africa, Uganda and Zimbabwe to receive specialized training in potato seed production and certification, as well as seed sampling and analysis. A total of 13 international person-training sessions were provided by KEPHIS under the ADSP activity.

Box 6:

“KEPHIS is like a kid with a whistle”

- The response of an anonymous NGO manager when asked to describe the effectiveness of KEPHIS as an institution.

In the area of publications, KEPHIS created a training manual for seed sampling, which can be used both by KEPHIS staff as well as the industry. The manual will also assist private firms in achieving accreditations of seed company processing and storage facilities.

KEPHIS has worked to build its own capacity; it has a clear

understanding of the important role it plays in the industry and for this it should be commended. There is, however, a strong feeling by many private sector firms that KEPHIS is at times overzealous in enforcement of regulations and can be slow to respond to the needs of the private sector, particularly in the areas of seed field inspection and seed certification. It is likely that part of this problem can be remedied with the planned licensing of private field inspectors.

In the area of professional capacity within KEPHIS, private sector firms have complained about the lack of trained plant breeders in the departments of Seed Certification, Breeder's Rights and Phytosanitation. To build capacity, KEPHIS should add high performing MS or PhD graduates to senior management positions in these departments. The Evaluation Team agrees with seed industry, that higher staff and management skill levels in KEPHIS will benefit the GOK, industry and the farmer; it is a step in the right direction.

Another area where industry appeared to be concerned with the role of KEPHIS is in policy development matters. Some firms believe that KEPHIS moved ahead on developing seed sector policy without consultation and input from the private sector. This may have been the case in 2002, when KEPHIS contributed to drafting a new set of laws to govern the seed sector, but following discussions with the industry and the MOA in late 2003, it appears that KEPHIS is now doing a better job of working in concert with the private sector rather than taking a “go it alone” attitude. Donors need to continue to monitor the KEPHIS – private sector relationship. Some officials in the GOK may view KEPHIS as the policeman overseeing the seed sector. The organization has a very important role to play in the industry, but it would help if more people in government view it as a referee – insuring that the game is played by the rules and doing everything in their power to help the sector operate more efficiently in collaborative effort with STAK, private firms and the GOK.

5.5 Success in Establishing Seed Sector Regulation Framework

The jury is still out on the key issues involving the fine-tuning of the Seed Varieties Act (CAP 319,324, 326); however, at this point in time (early 2004) KEPHIS and STAK appear to be in agreement on most of the regulatory changes and both organizations are optimistic that their joint efforts will result in a positive outcome. A positive outcome in this case means the GOK adopting the suggested changes to the current Seed Varieties Act rather than adopting a more radical redrafted version prepared by KEPHIS and the GOK in 2002/3. If the fine-tuning language is adopted, KEPHIS and STAK can take credit for facilitating the establishing of an appropriate seed sector regulation framework. If the MD at KEPHIS is correct, the jury will have delivered its verdict before the end of 2004.

KEPHIS stands ready to improve the regulatory process, particularly at the field level. It has good top-leadership that has a clear understanding of the important role the organization plays in the industry. If successful with the planned licensing of field inspectors and a continuation of its field training programs for stockists, seed companies and other stakeholders, KEPHIS will help move Kenya’s regulatory environment forward and contribute to an increase in regulatory compliance. However, to achieve these goals, KEPHIS needs to build capacity at the department level and adopt a “corporate-culture” that is focused on customer service.

6.0 Linkage and the Winrock Consortium Contribution to ADSP

In order to achieve the Project purpose, Winrock focused its implementation activities on training smallholder farmers and stockists in western and eastern Kenya. This training was carried out by the Winrock consortium members, which included: Winrock International, Technoserve and Lagrotech (hereafter referred to as Winrock). Winrock International’s component was the largest of the three groups with approximately 2.18 million USD in funding; Lagrotech funding was about 500,000 USD and Technoserve had approximately 318,000 USD in funding. Technoserve completed its work on the Project in December

2002, and Lagrotech continued to provide training and extension services to Project clients through March 2003. Winrock International, operating under a cooperative agreement no-cost extension, is expected to complete its work on ADSP by mid-February 2004.

6.1 Developing and Strengthening Public-Private-NGO Partnerships

One of the main focus areas of Winrock was to train CBO's to become skilled commercial seed producers. To achieve this objective, Winrock provide training to about 60 farmer groups. The training consisted of workshops and in-field hands-on demonstrations. The training was divided into subject areas such as seed crop production, harvesting and post harvest handing, seed quality, business skill, gender and environmental-IPM. Figure 4 illustrates the number of persons attending the Winrock training sessions over the Project period.

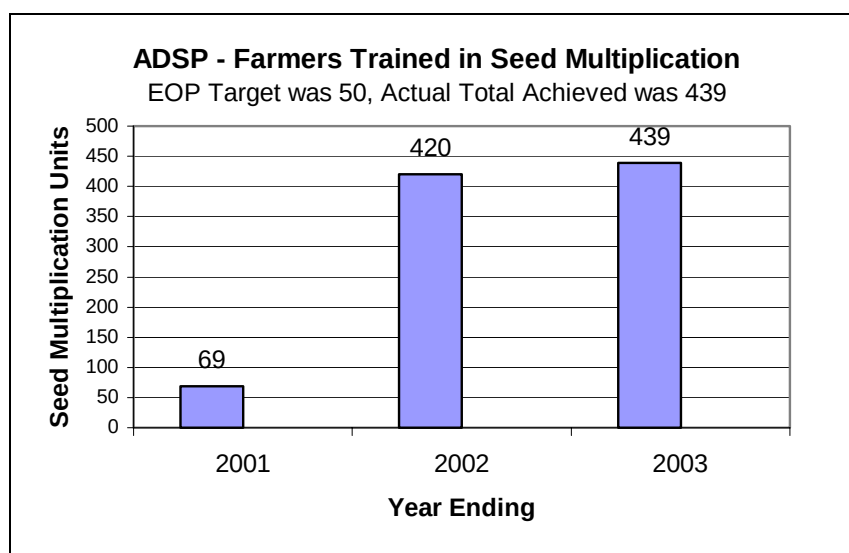


Figure 4, Source: Winrock International

Of the 60 farmer groups trained in seed multiplication, about 11 groups (18%) developed skill levels that would allow them to produce and sell commercial quality seed. Since the farmer groups had no seed marketing experience, Winrock linked the best 4 or 5 farmer groups (CBO's) with seed companies and stockists that could assist them in marketing their product. In one case, the Ing'ola CBO linked with KARI's Masongolani seed multiplication unit. In 2003, the Ing'ola CBO produced OPV maize seed, but in the coming season, KARI's management stated that they plan to contract with the CBO to produce hybrid parent lines.

Given the lack of marketing skills and resources available to the CBO's, as well as the unique nature of the OPV market, the best path forward for the CBO's that wish to stay in the seed production business is to link these groups with licensed seed companies. The CBO's can then produce seed under contract and the licensed seed company will be responsible for marketing the seed. There is strong interest in this type of relationship by both seed CBO's and commercial firms. Given the complexity of operating a viable commercial seed company, it is unlikely that any of the CBO's are ready at this time to become fully licensed

producers and marketers of seed themselves; a more realistic relationship is to work a licensed company under contract to produce seed.

6.2 ADSP's Success in Technology Development and Transfer

The majority of Winrock's budget was targeted at training. This training was designed to provide small farmers and stockists with the skills necessary to operate and grow their businesses.

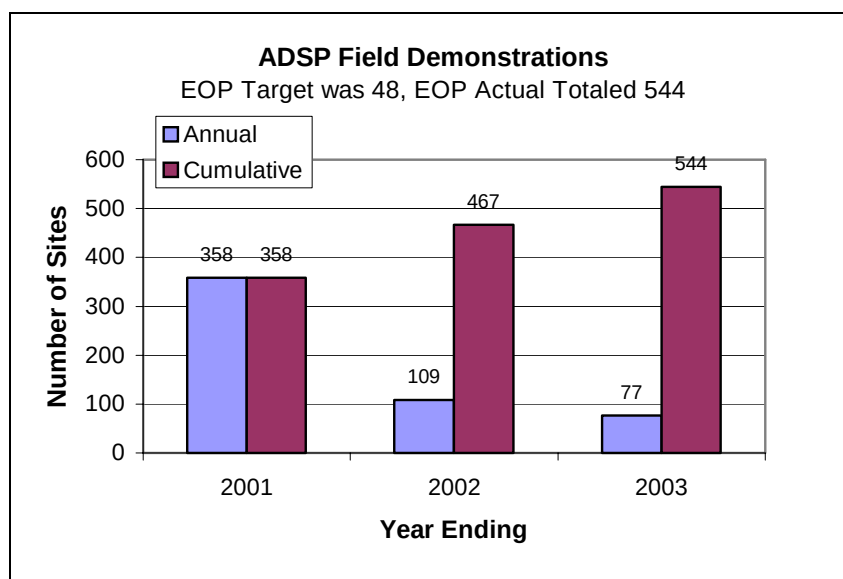


Figure 5 Source: Winrock International

Field demonstrations are a proven way to transfer agricultural skills. As can be noted in Figure 5, Winrock used a large number of field demonstrations. By EOP, the Project had passed its projected target of 48 demonstrations by over 11-fold.

Box 7: The Right Mix of Nutrients & Water

No two soils are exactly alike in their fertility profile, and this is why farmers in high production countries take soil samples on a regular basis to fine-tune their fertilization programs, relative to residual available nutrients.

Even if a crop has sufficient nutrients to reach its genetic potential, if water is limited, high yields cannot be achieved. Corn needs 25.4-mm (1 inch) of water per week from knee-high through flowering and to milk stage of the kernels. This can be achieved by rainfall or irrigation, and would total about 150-200 mm during this most critical period. An additional 50-mm of water is required on each side of germination /emergence and final development. With good soil and cooperative rainfall patterns, a farmer can produce a corn crop with a minimum 300-mm of effective rainfall. On the good soils in Eastern Europe, there are corn yields as high as 6-8 MT/HA with only 350-mm annual rainfall, at populations of 60,000 plants /HA. Under dryland systems in Iowa, USA, corn often yields 9.5 MT/HA. The soils and rainfall patterns in Kenya are very different than Eastern Europe or Iowa, but with good agronomic practices (such as those provided by Winrock), yields in Kenya can be improved.

The ADSP Project target for training days (or training sessions) provided to clients was 1200, as shown in Figure 6. By EOP, actual number of training days was 7344. It is interesting to compare the trends in Figure 5 and 6. At the start, the number of farmers attending each demonstration session was small but as the Project matured, the attendance was high (on average, near 63 persons per session in 2003).

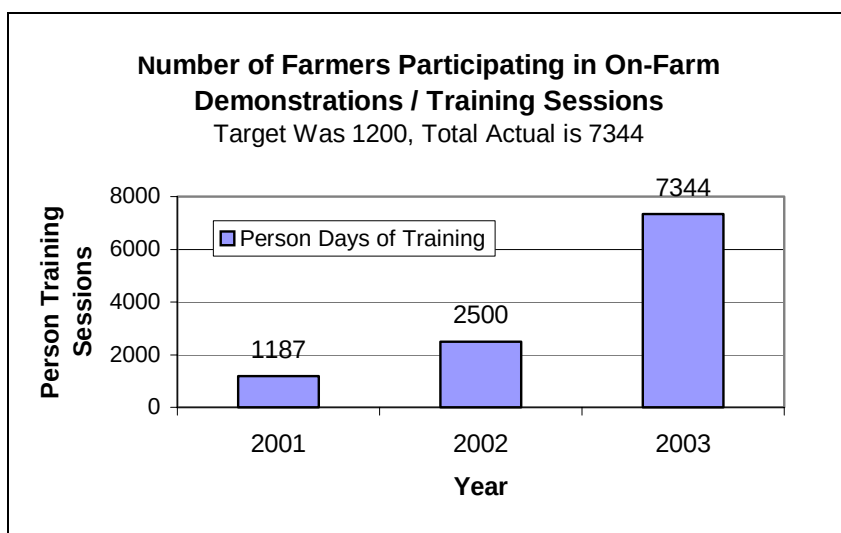


Figure 6, Source: Winrock International

Most of the demonstration work was carried out early in the Project live cycle but as the pool of focused CBO's emerged Project management scaled back the number of demonstrations and instead focused its resource on the CBO, which showed the greatest interest in becoming skilled seed producers.

Box 8: You Can't Control the Weather, but You Can Control Your Seed Varieties

Often, seed is one of the few variables a farmer really has control over, unlike so many other variables in farming. From the rice paddies of Asia to the soybean fields of Brazil and the vegetable farms of California, improvements in plant genetics have been the leading force behind increased yields over the past twenty years. An example is the California processing tomato industry. In the mid 1970's, average yields were 55 mt/ha; over the last 20 years, average yield has increased to its current level of about 80 mt/ha, (better than a 1% increase per year). The basic cultural practices in the California tomato industry have not changed much in the past 20 years. Today, growers still prepare the planting beds, fertilize, irrigate and control pests much as they did in the 1970's. There have been improvements in equipment design, use and types of pesticides, but the greatest factor effecting change of yield has been better plant genetics.

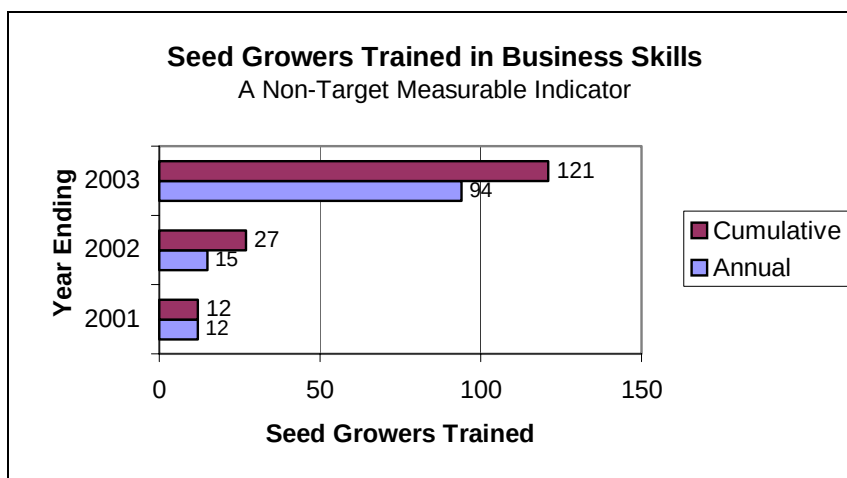


Figure 7, Source: Winrock International

Training CBO seed producers in business skills was not part of Winrock's original Project target outputs (see Figure 7). Nevertheless, it may be one of the ADSP lessons learned. By EOP, it becomes clear that CBO could produce more quality OPV seed than they could sell. In hindsight, more training in business skills may have helped CBO's to form marketing plans and allowed them to sell more products. To keep this in perspective, one should remember just how basic the business skills are in CBO's, even after training. When one compares CBO business skill after training to the business skills required to operate a profitable seed company in Kenya, the knowledge gap is quite apparent.

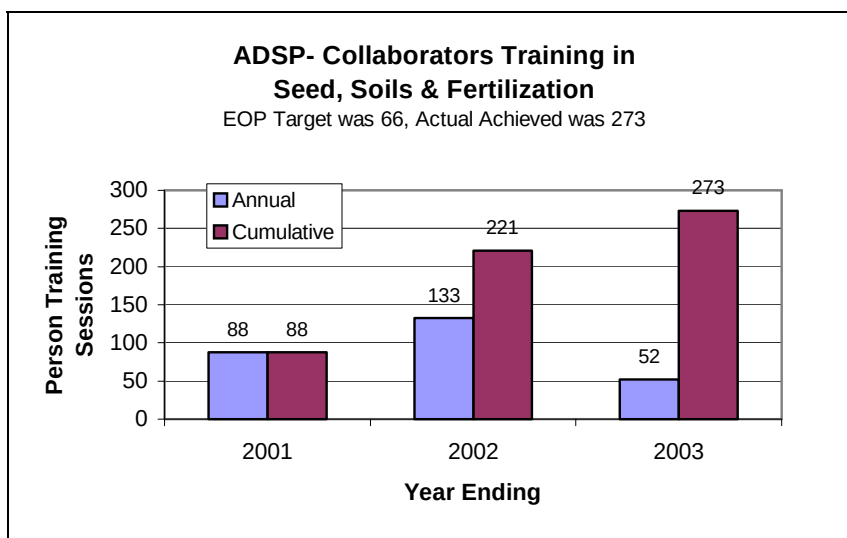


Figure 8, Source: Winrock International

In corn nutrition, there is a general rule of thumb regarding the relationship between nitrogen requirement and yield. The rule is that to produce 1 MT of shelled corn, the crop requires 11.56 kg of nitrogen. In some parts of Kenya, farmers believe that adding fertilizer to a crop will damage the soil. Winrock

worked with farmers to train them in a variety of agronomic skills. Figure 8 demonstrates the number of person training sessions (person training days) held under ADSP. At Project start up, the training target for agronomic skills was set at 66 person days (or sessions); by EOP, ADSP had provided 273.

Technoserve and Winrock developed a number of extension materials for client farmers and stockists. These included posters, and brochures on subjects such as dry-land bean production, maize production, sorghum crop management, small scale seed processing, seed regulations and control of crop pests and pathogens.

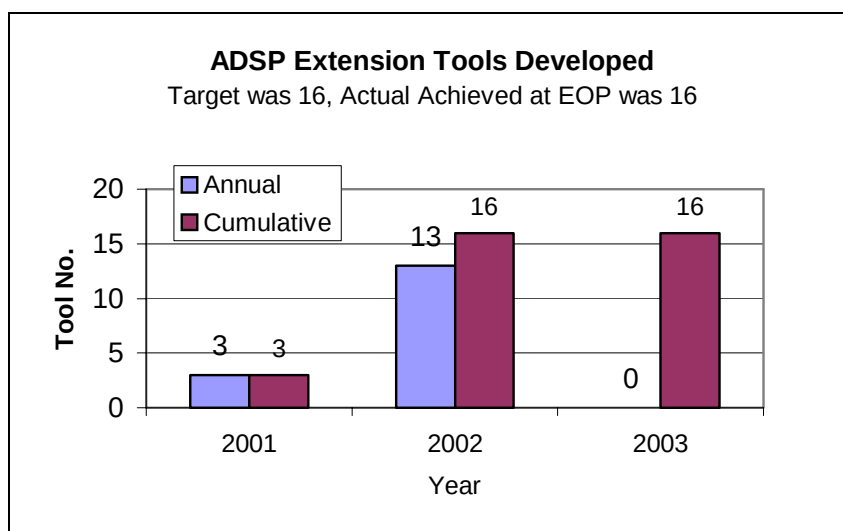


Figure 9, Source: Winrock International

At startup, it was planned that the ADSP would develop 16 extension tools. This would be made available as handouts to farmers and stockists. By the second year of the Project, the target had been met, see Figure 9.

Posters developed for stockist shops were a particularly good way of conveying information to farmers. The Evaluation Team noted several posters in shops visited.

Stockist Training: Stockists are a key link in the flow of information to farmers. The local farm supply shop (or agro-vet) is in a good position to transfer skills and know-how to farmers. It is also in the stockists' self-interest to have a well-informed clientele. In developed nations such as the US, Canada and the EU, farmers get most of their agronomic information about new products, services, etc., from their local chemical dealer/ stockists. These regions also have good extension services, but on a day-to-day basis, the farm supply shop has more contact with their customers and thus provides a key link on technology transfer.

Winrock linked ADSP's technology transfer with local stockists. To do this, the Project provided 453 person-training days (or training sessions) by EOP, see Figure 10.

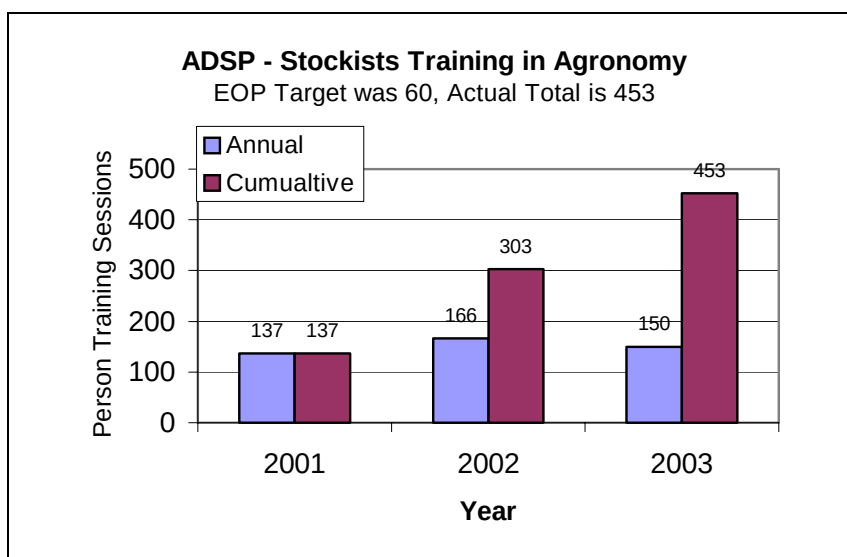


Figure 10, Source: Winrock International

In an effort to improve the types of products, services and information available to the farmer through the stockists, Winrock trained stockists in a wide range of business skills including; bookkeeping, cash flow management, inventory control, purchasing and custom service, see Figure 11. One of the most productive training sessions provided to stockists was showing them how to mix and re-bag fertilizer into small 2 kg bags, rather than 50 kg bags which were commonly sold before ADSP training. One stockist in western Kenya reported that his sales for fertilizer increased from 2.2 MT annual to 10.2 MT in one year, a growth rate of over 400%.

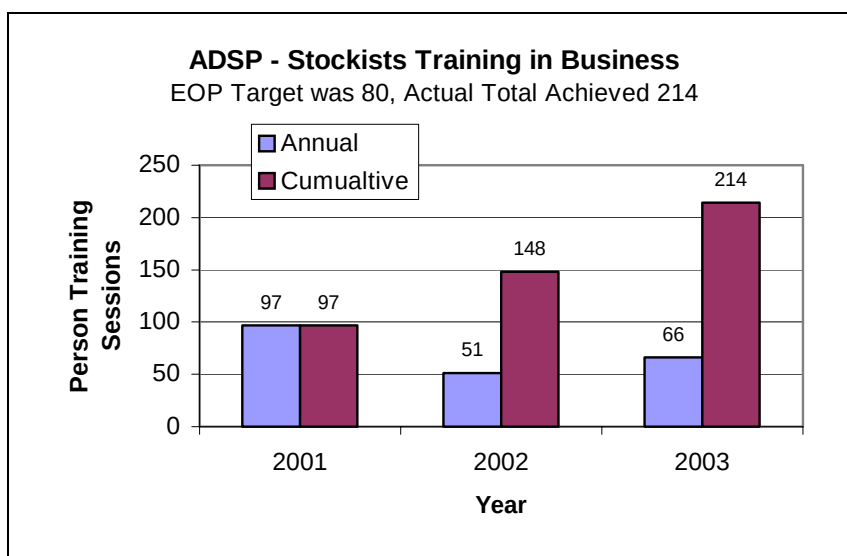


Figure 11, Source: Winrock International

6.3 ADSP's Targets and Impact

Seed production by area and weight were not part of the original Project target set. Nonetheless, it worth reviewing this data as a precursor to other targets such as CBO gross sales, revenue and estimated changes in household income.

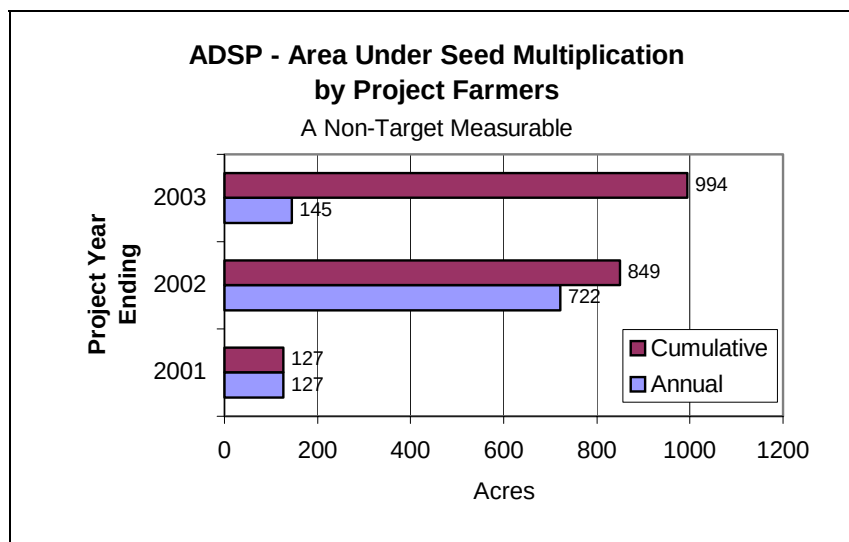


Figure 12, Source: Winrock International

By EOP, the aggregate area for seed production by the CBO's reached 994 acres, see Figure 12. Year Two of the Project was by far the most active farming year in area terms. In that year alone, 77% of the aggregate area was in cultivation. The most likely reason for the reduction in planted area in Project Year Three (2003) was the unsold carryover inventory, which was still in the CBO warehouses at the start of the 2003 production season.

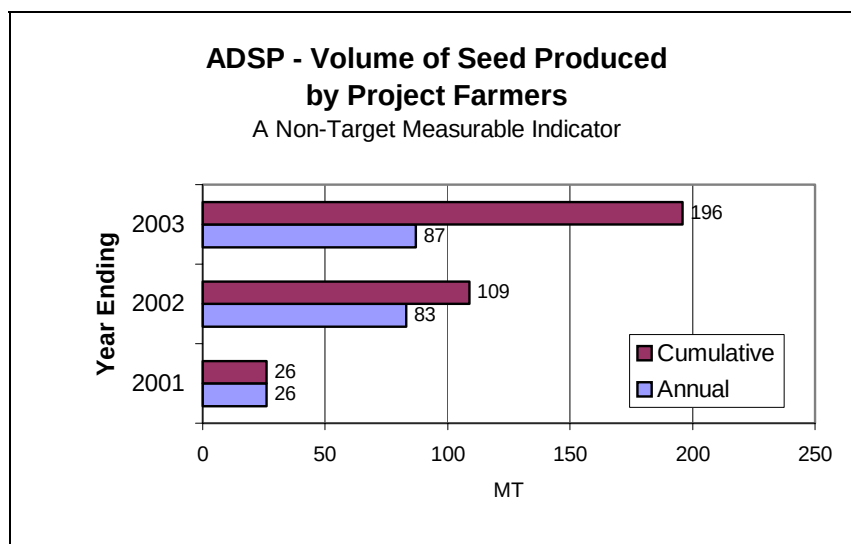


Figure 13, Source: Winrock International

In terms of MT sales volume, there was very little difference between 2002 and 2003, see Figure B. This was the result of a change in cropping patterns, shifting from maize in 2002 to an emphasis on beans in 2003.

Farmgate gross income was one of ADSP's targets. The Project's objective was to generate 1.6 million KS in sales revenue. As can be seen in Figure 14, the aggregate farmgate income at EOP was 2.97 million KS. It is interesting to note that sales volume (MT) between 2002 and 2003 increased by about 4% (see Figure 13), but the farmgate sales revenue for the sale period increased by over 75% (see Figure 14).

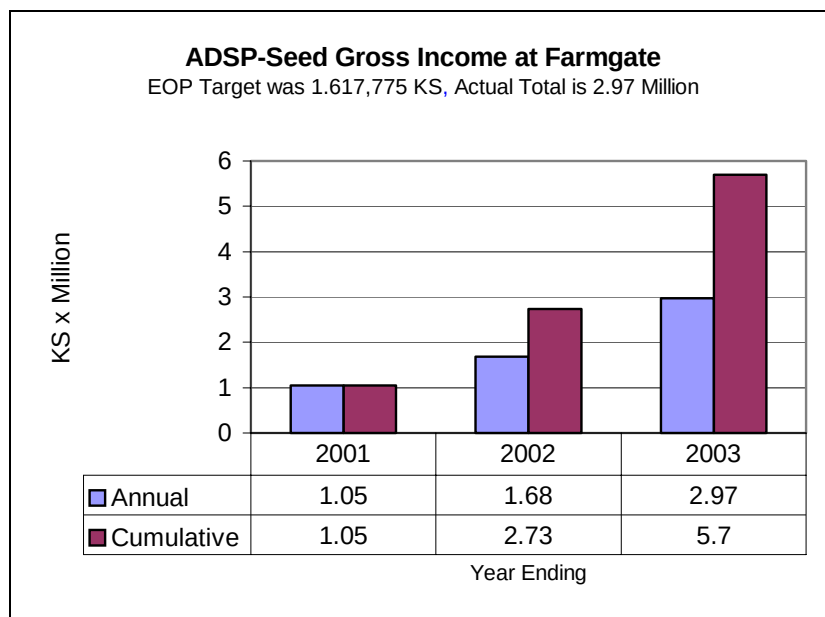


Figure 14, Source: Winrock International

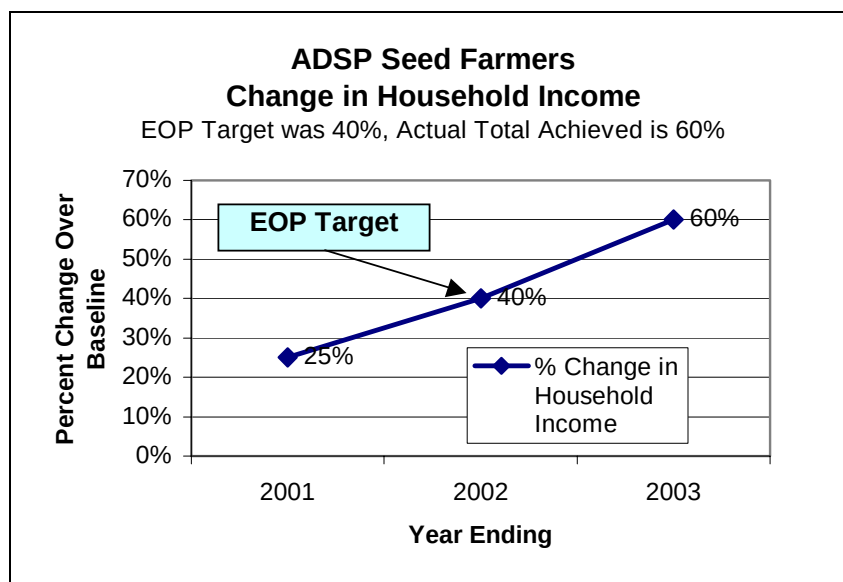


Figure 15, Source: Winrock International

At the household level, ADSP has made a significant positive change in gross income, as presented in Figure 15. The Project had set a target of increasing household income of 40% over baseline. Winrock's project monitoring data shows that by EOP, household income had increased by 60% over baseline.

Measuring the impact of seed sales by stockists is one of the Project's main target indicators. As illustrated in Figure 16, bean sales rocketed up from just 4.6 MT in 2001 to 73 MT in 2003. Part of this increase was from a larger pool of stockists selling beans (this is not same store sales data). ADSP stockists' maize seed sales were also up a respectable 70% over the same period.

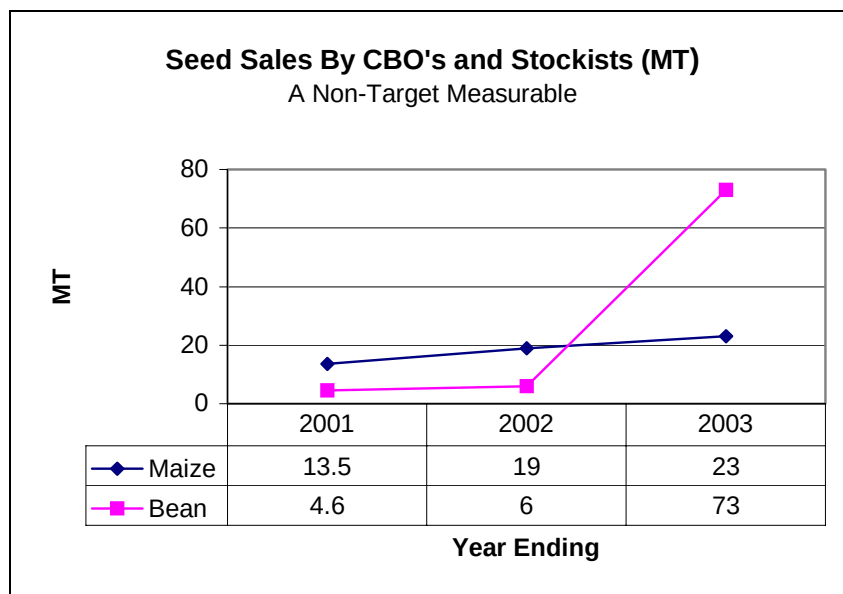


Figure 16, Source: Winrock International

6.4 The CBO's Ability to Operate After The End of USAID Funding

Project monitoring reports show that the adoptions rates by farmers of new agronomic technology were 55% by EOP, see Figure 17. This is well above the Winrock target of 17%. Regardless, if Project farmers continue to grow seed, they will most likely retain the improved skills they learned from ADSP and carry this knowledge with them for years to come.

As stated in other sections of this document, the most likely path forward for the ADSP and CBO's is to link with existing licensed seed companies and stockists that have the technical and management skills to become licensed seed merchants in the near future. These commercial seed companies can contract directly with the CBO's to produce small volumes of niche market seed. This will allow the seed companies to focus on the core products (such as hybrid maize) but still have a broad product mix to offer their clients.

Several commercial seed companies have already expressed interest in this type of contracting. To insure that it will happen, USAID should ask one of the

NGO's working in the ADSP Project area to set up the contacts between the CBO's and several commercial seed companies.

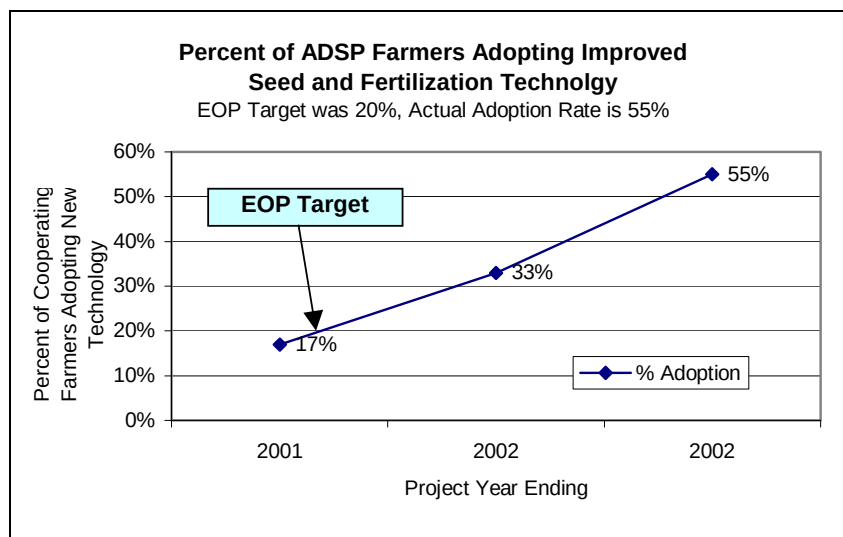


Figure 17, Source: Winrock International

A second fact that will assist most of the CBO's involved in ADSP to continue after Project funding has ended is that most are collaborating with multiple NGO's on community development, income generation and health projects. Some of the other donors and NGO's currently working with the ADSP CBO's include: GTZ, CARE, Family Life Education, the EU, World Vision, UNDP, CRS, and others. Most of the Project's CBO's were operating as community self-help groups before ADSP was born, and most will continue their self-help activities after ADSP is closed.

7.0 Sustainability and Institutional Capacity

The focus of this section is upon the sustainability of research and technology transfer activities and processes supported through ADSP. In an important sense, sustainability is a function of institutional capacity that features human and financial resources, as well as infrastructure. The extent to which ADSP has contributed to institutional capacity has been highlighted in other sections of this report, as well as the progress reports and impact assessments of the implementing agencies. Institutional capacity is addressed in this section primarily through its close relationship to prospects for sustainability.

7.1 Technology Development

The prospects for the continued availability of yield enhancing services with the conclusion of ADSP is somewhat mixed. Continuity of services is critical to sustain the progress that has been made to date through the maintenance of the linkages between the sources of pure planting materials and the organizations multiplying and marketing improved materials. But this is not enough. There must be a continuing flow of productivity-enhancing technologies from research

agencies to input producers and distributors to sustain these markets/commercial operations and agricultural growth in the country generally. The flow of technologies is a function of the size and continuity of resources available for research, as well as the policies of the governments, donors and research organizations. This section focuses on the near and medium term prospects for research funding and institutional capacity in relation to the prospective demands that will be placed on KARI and other research agencies. The sections that follow examine the sustainability of the set of technology transfer activities associated with the Project, notably the services of stockists, and input producers. Section 7.4 looks at the prospects for up-scaling the ADSP model.

Research funding: The performance of the research system has been seriously hampered by discontinuities in funding for research agencies in the past decade. This problem has frequently been compounded by shortcomings in financial management by the agencies involved. During the initial years of ADSP, the situation in KARI can be characterized as critical as the level of support for operational research expenses reached dangerously low levels (Mid Term Review for NARP II, 2000). ADSP funding was valuable in maintaining the required continuity in cash flow for KSU in particular. The situation for KARI has improved significantly in recent years with a strengthening in financial management. However, resources remain tight as evidenced by accounts in recent ADSP/KARI Quarterly Reports¹⁵.

USAID funding for selected components, notably horticulture, maize and socio-economics will continue through the new set of projects, but the initial geographic focus of efforts will shift from the current districts located in the medium to low potential zones to the higher potential regions. The activities under the new project may be progressively extended to other areas, possibly including some of the districts covered by ADSP, but there will a gap of at least 2-3 years in terms of USAID funding. There is a fair possibility that support from other sources, including KAPP, will pick up at least some of the field activities supported by ADSP. However, KAPP is just now being finalized and formal commencement of activities will not start until mid 2004.

GOK continues to contribute to KARI's core budget, but the subventions have been declining in real terms and cover little more than staff salaries. Given the present and prospective financial situation of the GOK, the chances of improvements in government contributions to KARI in the medium term appear rather dim, despite the fact that KARI enjoys a more positive image than a few years back and the importance with agricultural growth must play in achieving the government's policy objectives in the areas of food security and poverty reduction.

With strong encouragement from the GOK and major donors, KARI is attempting to improve its ability to generate income from its research and technology transfer activities. A special unit, ARIS, has been established recently

¹⁵ The ADSP/KARI Quarterly Report for April-June 2003 indicated that outreach activities for some horticultural commodities were curtailed or suspended during the reporting period due to shortages of funds.

and income-producing activities will feature in the KAPP. There is considerable scope for KARI to enhance income from its activities, including many of those supported through ADSP and to make portions of these activities at least self supporting in the process. Though the development of protected intellectual property rights, KARI can provide incentives for individual scientists to produce technologies that are attractive to clients, as well as being a source of income for KARI.

There are obvious concerns that need to be addressed here if KARI services to the majority of small-scale producers throughout the country are to continue and hopefully improve in the future. First, income-earning considerations could skew decisions about allocation of research resources away from small holders in marginal areas and towards meeting the requirements of commercial agricultural enterprises in the higher potential zones. The new USAID projects move strongly in this direction. There may well be valid reasons from national economic and environmental perspectives for allowing this to happen, at least to some degree, but at first glance it is difficult to reconcile these trends with concerns for poverty alleviation and food security. A greater focus on technologies that can be easily commercialized in the near to medium term could divert attention away from longer-term productivity and environmental issues. More generally, the quality and quantity of services available to clients from KARI in the ADSP Project areas could suffer as a consequence.

Second, KARI's focus on income generation for its own sustainability will influence its decisions on research, development production and marketing of technologies. As a public sector institution, KARI possesses strong advantages over private sector firms. KARI may enter into exclusive licensing agreements or cross-licensing contracts. This is good business, so long as the interests of KARI and its private sector partners are not placed above that of the public good. KARI would like to have it both ways, compete with the private sector in marketing certified seed and at the same time enjoy the benefits of donor and government funding. KARI needs to develop a business model whereby it is not in head-to-head competition with private seed companies. Rather, it needs to make money by using its core strengths of research and development and leave certified seed production and marketing to the private sector.

While these concerns are real, KARI's mandate to serve the needs of all farmers together with a continuing need to respond to the GOK policy priorities and the concerns of major donor agencies are expected to keep KARI's research activities focused primarily on the needs of the majority of small farmers throughout the country.

Institutional capacity: The concern for the future is that the flow of technologies will not keep pace with the requirements of a changing environment. ADSP and other projects in recent years have focused on dissemination with the assumption that good technologies existed and merely needed to be transferred to farmers. There was also the overriding concern that progress in alleviating poverty and improving food security in Kenya and elsewhere in the region was seriously inadequate. The shift of attention of KARI and other research agencies from

research (generating new technologies) to technology transfer is understandable under these circumstances, but has potentially grave implications for the future. As farmers and input merchants are making better use of available technologies and economic conditions improve, they will certainly be looking for more technologies to move to the next level and to address new sets of problems (diseases, pest, etc). The research tasks will become progressively more demanding, just as institutional capacities in research organizations in the region generally are stagnant or declining. KARI's ability to make better choices on technologies and disseminate them in collaboration with others may continue to improve, but will there be the capacity to produce the technologies that are needed?¹⁶ The assumption that some combination of the private sector, regional and international agencies and research organizations in developed countries will somehow pick up the slack is questionable at best.

7.2 Sustainability of Private Seed Producers, Merchants and Stockists

The Project has been instrumental, directly and indirectly, in expanding the number of private organizations producing and distributing seed, some of whom have been formally registered as seed companies and seed traders. Most of the certified seed production associated with the Project has been by CBO's operating under the umbrella of KARI/ KSU's license to produce seed and largely using lines supplied (and replenished) by KSU. KARI authorized this arrangement because it was unable to produce and market OPV seeds in significant quantities economically and because it had confidence that the Winrock Consortium would ensure that quality standards required for certification were observed by the approximately 60 participating CBO's. The initial concept was that at least some of the CBO's and stockists would eventually qualify to become seed companies in their own right.

The participating CBO's have featured prominently in the production of certified OPV seed in Project areas. The initial focus was upon OPV maize, but this has been broadened to include other grains, beans and legumes, as the market for certified maize seed became saturated. Members of the Winrock consortium have sought to assist CBO seed producers by locating markets for their production, including seed companies, stockists and NGOs. The stockists as a group have been the most promising of these outlets and in some instances, direct contracts have been made between stockists and CBO seed producers to supply certified seed. In addition, efforts (albeit somewhat belated) have been made to connect the most promising CBO's with licensed seed companies to enable them to continue to produce certified seed. This is especially important since KARI has indicated that it will withdraw the umbrella of its license with the conclusion of the Project. However, KSU is entering into contractual agreements with selected private seed producers to produce seed to maintain breeding lines and supply

¹⁶ The question of the emphasis that organizations such as KARI should place on research as opposed to the array of technology transfer activities is part of a larger set of issues that is referred to as the NARS reform agenda. The new World Bank project in which KARI is participating (KAPP), incorporates the central features of the reform agenda. The efficacy of this approach is examined in a recent ISNAR/ASARECA study (Roseboom et al, 2004).

hybrid parents. Some of these may be former participating CBO's associated with ADSP.

At least one CBO (Nyacoda) and one stockist (K.K Mkulima Stores) have applied for licenses as certified seed producers. For reasons discussed earlier, none of these has been approved at the time of the final evaluation. However, indications are that as many as three of the applications might be approved. The stringent entry requirements together with the licensing fees (Ks 75,000) make it difficult/impossible for most CBO's to qualify. Indeed, there is serious question whether many more would be able to successfully compete in what is rapidly becoming an extremely competitive market. The requirements of successfully marketing seed outside local areas in the immediate vicinity of the seed production locations are extremely demanding, requiring advertising budgets and communications facilities which the CBO's do not possess. In short, the successful establishment of CBO-based seed enterprises that can stand alone appears to be an unrealistic expectation in all but a relatively few instances.

7.3 Range of Commodities and Practices Handled by Stockists

Input Producers: The range of commodities handled by input producers assisted through ADSP has definitely expanded and changed in the face of market conditions and a growth in capacity. Most CBO seed enterprises focus on one or perhaps two commodities/varieties at a time. This makes sense in view of the need to produce seeds in sufficient quantities to realize economies in inspecting, market and related services. However, the commodities have changed over time in response to the oversupply of some seeds varieties (maize) and the emergence of new opportunities (groundnuts, sorghum and beans). The challenge for CBO's producing improved planting materials is definitely one of staying ahead of the game by anticipating what the market is likely to require several months from now. This effort may require changing varieties or commodities rather than trying to handle a broader range of commodities simultaneously. Facilitation by the Winrock Consortium has been critical in making these adjustments and it is not clear how well this service will be provided with the conclusion of the Project. The determination of what and how much to produce among the commodities currently on the market is perhaps best made by stockists and seed companies. The former may be constrained by their access to information on new technologies recently released from research organizations and their ability to match that information with the changing requirements of their customers. In time, the supply of appropriate technologies could also become a constraint, as discussed above in section 7.1.

Stockists: Winrock, KARI and other research partners, notably ICRISAT, have facilitated an expansion in the range of commodities and practices handled by stockists. As noted in Section 7.1, Project efforts initially focused mainly on OPV maize seed, but this has expanded to include sorghum, beans, grams and other commodities. Stockists were already handling fertilizer, but assistance from the Winrock Consortium made it more convenient for stockists to blend fertilizer to better meet local requirements and to retail in more affordable and convenient 2 KG packages. In general, stockists were already well ahead of the game in terms

of the range of commodities they handled and required little encouragement from the Project to pursue additional opportunities. There is a danger (be it small) that some stockists could overextend themselves by diversifying into areas where they have limited expertise. However, there is a clear need to handle a range of commodities and services that can best ensure a degree of continuity in business operations throughout the year. The markets for farm inputs associated with the technologies promoted through ADSP are very seasonal, especially in the semi-arid areas targeted by the Project.

7.4 Sustaining and Expanding the ADSP Seed Production Model

The ADSP emphasis on the commercialization of improved technologies, especially those that are essentially public goods, represents an innovative approach that improves upon more conventional technology transfer methods in terms of potential impacts and sustainability. Further, the experience suggests ways in which KARI in particular can “market” its technologies more effectively in collaboration with public and private agencies. ADSP represents a somewhat unique partnership among a rather diverse set of organization partners, notably KARI, KSU, the Winrock Consortium, KEPHIS, CBO’s and stockists. The partnership was sustained by a strong convergence of interests that served to overcome significant differences in organizational cultures and mandates, not to mention personalities. Replication of such a partnership seems difficult, but by no means impossible.

As discussed in Sections 2.4 and 2.5.2, the successful participation of CBO’s in the production of certified planting materials is likely to remain limited and require extensive facilitation by projects such as ADSP or links with established commercial concerns (traders and seed companies). Experiences in ADSP, as well as other projects in the region, strongly suggest that spontaneous replication to additional CBO’s, even in nearby communities is unlikely. The timeframe and level of effort required might be substantially reduced through the careful selection of CBO’s with established track records of working effectively with projects, NGOs and programs such as ATIRI. Attention needs to be given from the onset to connecting selected CBO’s to stockists and established seed enterprises with a view to the initiation of formal contractual arrangements among these parties well prior to the conclusion of a project.

Of all the components of ADSP, the assistance to stockists appears most likely to result in sustainable progress and spread to non-project areas. This is already happening. In retrospect, the focus of the Project might have been shifted more to this group and somewhat away from CBO production of inputs.

8.0 Environmental Compliance

In the case of the improved planting materials that have been developed or screened by KARI, environmental considerations have been adequately taken into account. Fertilizers and other agro-chemicals used have been approved under IEE and there have not been any new chemicals introduced. In East and West Project areas for OPVs, interviews with farmers during field interviews

show that farmers are increasing awareness of the need for good environmental maintenance through use of organic manure, water harvesting especially in dry areas in the east, safe use of chemicals through various training and demonstrations and integrated pest management.

In horticultural areas where technology has been transferred by KARI, training on environmentally friendly technologies, including TC bananas and passion fruit varieties resistant to black spot, has been a major component of the Project. Introduction of Tigon and Asante varieties of potatoes has reduced the usage of fungicides, as they are more disease-tolerant. The need to use chemicals for commercial production has declined. More attention is being given to recycling of wastes through feeding crop residues to livestock and composting. The introduction of post-harvest technologies in transportation and ripening has reduced wastage.

In the vegetable and flower sub-sectors, apart from the methods observed during the mid-term evaluation, there are new methods in introduction of environmentally friendly bio-chemicals (e.g. thuricides), more training on European Union requirements on Minimum Residue Levels (MRLs) and training on issues of traceability from production to marketing, as institutionalized under the European Union Retailers Protocol on Good Agricultural Practices (EUREPGAP) and British Retailers Consortium (BRC).

A new environmentally friendly technology which is being introduced in the west Project area affected by the parasitic striga weed is the Kakamega Striga Tolerant Product (KSTP), which does well in striga infected areas and does not require the excessive use of chemicals to control the weed. The multiplication of KSTP maize has started in the Western Project area under Lagrotech and Siaya Farmers center and will be available to farmers during the year.

One area that would complement ADSP work on client farmers' environmental awareness is in area of biodiversity training. CBO groups were asked by the Evaluation Team if they had received any training on diversity and the answer was no. This subject can easily be incorporated into IPM training and/or soil fertility, etc. In the future, the GOK and USAID should consider including biodiversity training as a regular part of their work in IPM and general crop production.

From January 2005, all products entering the European Union will be subjected to tractability as underlined by EUREPGAP and BRC. Although KARI and other private trainers have started to address this issue, there is need for more training of farmers, especially smallholders who produce for export, as products may be rejected in the export market.

9.0 Gender Issues

Gender considerations encompass the roles of men and women and how these are affected by the Project activities. As such, the focus is not exclusively upon women's roles. Increasingly, consideration is being given to a broader range of

social equity issues, including generational differences, where certain groups may be disadvantaged in terms of access to resources and services provided by projects such as ADSP.

The SOW for the evaluation focuses on the extent of participation of women in the Project and differences between male and female-headed households. Additional questions and issues in this area were raised by USAID (Beatrice Wamalwa) and an effort has been made to address these as much as possible in the time available.

9.1 Participation of Women

Women constitute the majority of active participants in the two primary project areas served by the Winrock Consortium. Women represent seventy five percent of the approximately 400 households participating in the production of certified seed. Although the Project did not require a primary focus on women, this happened to a fair degree by virtue of the fact that a number of women's groups were selected as participating CBO's. Virtually all the participating groups have women members and in many instances, they are in the majority and have prominent roles in the organizations. In contrast, nearly all of the stockists participating in the Project are men. However, the majority of their customers are women. In a number of cases, men joined participating groups that were previously all female, possibly attracted by the assistance offered by the Project. This undoubtedly affected group dynamics and there is also the danger that the agenda of a CBO will be adversely affected, but judging from the limited exposure possible in the course of field visits, the results appear to be generally positive. Male members have participated in the gender sensitization training and are reportedly sharing in a range of seed production responsibilities.

Many of the horticultural outreach activities supported by ADSP were on-going at the time of the initiation of the project. Although some of organizations participating in the horticultural activities are groups, many of the most active on a continuing basis are individual farm household enterprises. KARI's End of Project Report on achievements and impacts has breakdowns of participation by gender, which varies significantly from commodity to commodity for the horticultural crops. In most instances, the input production enterprises are managed by men (notably for TC bananas, and Irish potatoes), although women definitely participate and probably do much of the fieldwork. Women are prominent among the current and potential beneficiaries of many, if not most of the improved horticultural technologies, at least as far as production for home consumption and local sale are concerned. Women are also significant among contract farmers producing flowers, notably gladiolas and lilies in the Central Province and antheriums in the Coastal Province.

9.2 Character of Gender Benefits from Project Activities

Box 9: KARI GENDER APPROACH FOR ADSP ACTIVITIES

- Gender sensitization of the scientists involved in the Project
- Participation of gender experts was ensured during all Project forums
- Gender participation and gender sensitive reporting was achieved in the Project activities as shown by Project reports
- Gender impact assessment

From INSTITUTIONALISING GENDER CONCERNS IN KENYA AGRICULTURAL RESEARCH INSTITUTE AND THE ADSP PROJECT, paper presented in ADSP Workshop, KARI Jan. 2003 by J. NGUGI, Gender Coordinator KARI

In the case of the primary Project areas, women are responsible for much of the seed production associated with the Project. As such, they benefited directly from the training, grants and other assistance, as well as receiving a significant portion of the proceeds from the sale of certified seed. Women farmers definitely benefited from better access to improved inputs that were facilitated by the Project in the Eastern and Western target districts. The Winrock Consortium also provided gender training/sensitization to all the participating groups. This training appears to have been generally well received and internalized. Although the project did not routinely collect information that would measure the project's effects on household gender relations, there is reportedly a much greater sharing of responsibilities at the household and group levels, judging from the results of the results of the Winrock Impact Assessment (Odiambo, 2004).

KARI has a policy of gender mainstreaming in all its activities which involves giving attention to gender consideration in the design and implementation in its research and outreach activities¹⁷. (See Box 9).

In the case of horticultural activities supported by ADSP, the attention given to gender consideration appears to be rather limited, due primarily to staff and resource constraints. The technical reports include gender-disaggregated data and give some gender-related information. However, no gender analysis was done for most of the sub-projects. Some of the studies covering specific areas and/or commodities have focused on gender issues, but there was no systematic effort to assess the status of gender relations of participants or to provide training in

¹⁷ See "Institutionalizing Gender in Agricultural Technology Development and Transfer: The Case of the Kenya Agricultural Research Institute" by Kooijman and Mbabu in *Institutionalizing Gender in Agricultural Research: Experiences from Kenya*, Proceedings of the Gender Conference, KARI, Nairobi, Kenya, Oct. 5-7 1998, J. Curry, M. Kooijman, and H. Recke, editors, KARI, 1998.

gender sensitization. One gender impact assessment was carried out and the results presented at the ADSP Workshop at KARI during the evaluation¹⁸.

The impact study of men and women producers of beans and tomatoes in Mwea and Kibirigwi by J. Nugui (op cit) found no significant differences between male-headed households and female headed/female managed households in terms of performance and benefits.

10.0 Findings and Recommendations

KARI

- KARI, KEPHIS and Lagrotech, as well as other private sector firms, should continue to explore ways by which performing CBO's can continue to produce certified OPV seed or otherwise utilize their skills in seed production.
- The private sector is increasingly participating in the multiplication of improved planting materials and if KARI opts to continue in this area, this will place it in direct competition with the private sector. KARI/ ARIS/ KSU needs to develop and implement a business model that complements the private sector rather than placing itself in direct completion with it. KARI (ARIS and KSU) should not compete in the provision of services and products that the private sector can provide.
- ARIS should review the set of activities of ADSP with a view to selectively continuing to promote of KARI technologies. ARIS should also assess the utility of the marketing studies carried out by KARI.
- Efforts by KARI, KEPHIS, STAK to streamline varietal release and certification procedures should continue, giving special attention to the training and licensing of private seed certification agents.
- Stockists should feature prominently in all future efforts to improve technology transfer in Kenya by providing them with additional skills, information services and links with extension service providers.
- Seed should not be distributed free under any circumstances, as this reduces farmer choices and undermines the private input supply system, particularly at the local retail level. Farmers should be provided with choices and vouchers or funds to purchase seed where it is deemed important to render such assistance.

¹⁸ Institutionalizing Gender Concerns In Kenya Agricultural Research Institute and the ADSP Project, paper presented in ADSP Workshop, KARI Jan. 2004 by J. Ngugi, Gender Coordinator, KARI

- KARI Socio-Economics Department should consider suspending the current set of marketing studies, as they are of limited utility to producers, participants in the market, policy makers and decisions on resource allocations in KARI.

KEPHIS

- KEPHIS has good top leadership, who understands the important role the organization plays in the agricultural sector and has the vision and leadership skills required to successfully reach the organization's objectives.
- KEPHIS should continue to work in concert with the MOA and private sector at lowering the barriers to entry for new genetic material by developing a more efficient certification system. By imposing a time-consuming and costly certification system, it is slowing technology transfer to farmers and making its entire agricultural sector less competitive.
- Certified Seed Production: KEPHIS recently changed regulations so that NPT's for new material can be run for a minimum of one season. This is a step in the right policy direction.
- Plant Variety Protection: Plant breeders do not trust the DUS trial system because it requires that in some cases the breeder supply hybrid parent lines to KEPHIS as part of the testing process. The private sector must above all other issues, be satisfied that their parent lines are secure (cannot be stolen). KEPHIS should develop regulations that allow breeders to conduct DUS testing on their own farms and KEPHIS will only be responsible (so far as is possible under UPVO guidelines) for confirmation of testing protocols and validate the resulting data. It is important to note that to date no breeder has reported that they have had material stolen, so in part this is a problem of perception of KEPHIS by the breeders.
- One important (proposed) step that KEPHIS is taking to speed up seed certification is to allow seed companies to run NPT plots themselves and then have KEPHIS confirm and validate the data resulting from these trials. This would save industry and government time and money and is supported by the Evaluation Team.
- KEPHIS has worked to streamline the bureaucratic process involved in certification of seed. Under the old system, a new plant material would need to be approved by 3 committees before being granted certification. The committees included the National Performance Trial Committee, the Specialist Variety Release Committee and National Variety Release Committee. Under the new (proposed) regulations, the Specialist Variety Release Committee input has been dropped and applications only need be

approved by the National Performance Trial Committee and the National Variety Release Committee.

- Donors need to continue to monitor the KEPHIS – private sector relationship. Some officials in the GOK may view KEPHIS as the policeman overseeing the seed sector. The organization has a very important role to play in the industry, but it would help if more people in government viewed it as a referee – insuring that the game is played by the rules and doing everything in its power to help the sector operate more efficiently in collaborative effort with STAK, private firms and the GOK.
- The private seed sector has suggested that to strengthen its institutional capacity, KEPHIS should increase the number of MS and PhD level plant breeders in the organization. These new managers should be placed in the departments of: Plant Variety Protection, Seed Certification and Phytosanitation. The Evaluation Team agrees in principle that a more skilled workforce would benefit the industry but before new staff is added, a review of the roles and responsibilities of the current KEPHIS management team should be completed.

STAK

- The Evaluation Team supports the idea that the GOK should adopt the changes in seed industry regulations as proposed by STAK. These changes are a fine-tuning of current regulations and will not require action by Parliament; this is the fastest and most efficient way forward to streamlining the sector's policy environment.
- It is also recommended that KEPHIS, STAK and the MOA continue to cooperate through an ongoing working group that allows for regular dialog between the parties and addresses issues as they develop rather than waiting until a crisis develops before action is taken.
- STAK capacity is limited; with only one full-time professional staff it's not realistic to think about building breadth and depth of institutional capacity. It would be beneficial to STAK as an institution to build in additional capacity through the hiring of one or more professional staff with a background in the private seed sector and intellectual property/law. This person could be junior to the Executive Officer, but should be given full responsibility to manage specific parts of STAK's domestic and/or regional policy agenda portfolio. The portfolio could include areas such as plant breeder's rights, certification protocol, variety lists, and release protocols. This would allow the Executive Officer to focus on other issues and would improve task continuity.
- On or about end 2003, STAK's Executive Officer was appointed to a Board of Director's position at Kenya Seed Company. This appointment was made by an official of the GOK. The GOK owns a controlling interest in the Kenya Seed Company. Historically, there has been a very

close link between STAK and Kenya Seed Company, however this link has weakened over time. In order for STAK to be viewed as independent and free of special interest by its membership as well as the domestic and regional agribusiness community, it must have leadership that is unquestionably independent and free of any hint of bias or prejudice. This matter cuts to the core of STAK's effectiveness as an organization, as well as its sustainability.

- STAK's role in improving access to KARI seed materials: As Kenya's leading private sector seed organization, STAK can play a key role in working with KARI to overcome bottlenecks that have developed in the transfer of KARI seed material to private sector breeders. The current impasse between KARI and some of Kenya's private seed companies over the use or licensing of breeder lines needs immediate attention. The current deadlock is slowing the transfer of technology to farmers. STAK considers this an important issue on its agenda and the Evaluation Team supports the efforts for both STAK and KARI to resolve this matter as soon as possible.

The Winrock Consortium

- As a follow-up to Winrock's work with the CBO's, USAID should identify an association or NGO involved in the seed or broader agricultural sector that can serve as a link between the seed producing CBO and commercial seed companies. An NGO (involved in the seed sector) or STAK could take up this role, as these organizations already have contacts with most of the private seed companies that operate in Kenya. Once the CBO's are linked with seed companies, it will be up to them to negotiate and renew their seed production contracts on an annual basis.

Sustainability

- The Evaluation Team endorses KARI's efforts to generate income from the sale of intellectual property rights, breeder seed, pre-basic and basic seed. KARI and its subsidiaries should refrain from engaging in the wholesale or retail selling of certified seed. The activity of selling certified seed should be left to the private sector.
- KARI should focus its sales of horticultural products to commercial nurseries rather than competing in the retail horticultural sector. Closer linkage should be forged with commercial nurseries so that KARI can concentrate efforts on supplying them with mother trees, rootstock, grafting material and, in some cases, wholesale seedlings.
- KARI needs to develop a business model whereby it is not in head-to-head competition with private sector companies. Rather, it needs to make money by using its core strengths of research and development and leave certified seed production and marketing to the private sector.

- KARI should continue to assist other service providers with technology transfer, but take special care to conserve its capacity to continue to generate the technologies that will be needed to meet the future needs of farmers.

Gender

- Social equity, food security and poverty alleviation considerations should all feature in efforts to commercialize the dissemination of improved agricultural technologies, but the standards required for the success of these efforts should not be seriously compromised in the process.

ANNEXES

Annex A: Contact List of Persons Interviewed

Annex B: Evaluation SOW

Annex C: Preparing for Change in Kenya's Seed Industry

Annex D: The Seed Industry Requires an Efficient IP Regulator Environment

Annex E: Variety Developing and Sales Under KARI & ADSP

Annex F: Increases in Crop Yields at Farm Level as a Result of Improved OPV Seeds

ADSP Final Evaluation Contact List

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56	Gladys M. Wabuke	Winrock - ADSP	C/o Winrock – ADSP
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Annex B

A.1 TITLE

END OF TERM EVALUATION OF AGRICULTURAL DEVELOPMENT SUPPORT PROJECT (ADSP) No. 615-0268

A.2 STATEMENT OF WORK

1. PURPOSE OF THE EVALUATION

USAID/Kenya wishes to contract a team of consultants to carry out an end of program evaluation of the Agribusiness Development Support Project (ADSP). ADSP has two components: Technology Development and Transfer, implemented by the Kenya Agricultural Research Institute (KARI), Winrock International, Kenya Plant Health Inspectorate Services (KEPHIS) and Seed Trade Association of Kenya (STAK) and; the Agricultural Policy Reform, implemented by Tegemeo Institute of Agricultural Policy and Development and the Department of Agricultural Economics of Michigan State University. Project Completion date for the Agricultural Technology Development and Transfer component is July 2004, and the Mission would like to have a final evaluation done before the Project is closed. While the Winrock Consortium activity will terminate within the Project end date, other elements implemented by KARI, KEPHIS and STAK will continue under the new strategic objective.

The Project's objective was to liberalize agricultural input markets and increase smallholder production beyond subsistence needs. The latter would result from increased use of high-yielding seeds and fertilizers. The key activity to achieve this was to enhance the national research system's capacity to develop and certify yield-enhancing technology packages and link the same to the private sector-led technology multiplication, extension and distribution system. The main purpose of this evaluation will be to assess: a) achievement of Project outputs and impacts outlined in the Project proposal and other documents; b) sustainability of Project impacts and institutional capacity of Seed Trade Association of Kenya (STAK); c) environmental and gender compliance.

2. BACKGROUND ON ADSP:

ADSP is a \$12 million USAID project whose goal is to strengthen and increase competitiveness of agricultural markets by increasing the supply of agricultural inputs to smallholders and improving efficiency of the market for smallholders' agricultural outputs. The Project's two main components are technology development and transfer, and agricultural marketing policy reforms.

The Technology Development and Transfer component strengthens the capacity of KARI to increase the use of commercially oriented technologies by smallholders and enhance agricultural productivity. This component focuses on KARI's Business Development and Socio-Economic Units. The functions of the Business Development Unit are to develop commercially oriented technological packages with smallholders, establish commercially viable seed production systems and identify appropriate technology uptake pathways through which the

improved production packages can easily and efficiently reach the smallholder farmer. The Socio-Economic Unit sets priorities, assesses impacts of technology adoption, develops post-harvest technologies in horticulture and promotes intellectual property rights protection.

Winrock International, Lagrotech Consultants and Technoserve are implementing another element of the Technology Development and Transfer component known as the Private Sector Technology Transfer, in collaboration with the Kenya Plant Health Inspectorate Services (KEPHIS) and the Seed Trade Association of Kenya (STAK). This element promotes seed multiplication by non-governmental organizations (NGO's) and small-scale farmers, enhances input distribution to smallholders by private sector distributors and stockists and, promotes private sector technology transfer systems that complement extension services of the Ministry of Agriculture. KEPHIS facilitates private sector technology transfer through inspection and certification of seeds multiplied by farmers for onward sale. STAK, on the other hand, deals with seed policy issues. Activities of this component are expected to lead to enhanced availability and demand for yield-enhancing inputs.

The second component, Agricultural Market Policy Reform, implemented by Tegemeo and Michigan State University under the name of Tegemeo Agricultural Monitoring and Policy Analysis (TAMPA) II, collects household level and other data that it analyzes as an empirical basis for agricultural sector policy formulation, facilitates policy dialogue and outreach, enhances local research capacity and monitors rural household incomes. This component will not be part of this evaluation.

3. SPECIFIC TASKS

(a) Project Outputs and Impacts

Review the relevant Project documents and assess the extent to which the Project has achieved outputs and impacts originally envisaged in the documents. In particular, evaluate the following:

- If, and the extent to which, agricultural yields have increased at individual farmers' levels, as a result of availability of improved seeds in Project areas.
- If demand for and use of agricultural inputs increased in target areas due to the ADSP activities. What was the extent of increase, if any? Provide analyses to support the findings.
- The extent to which private sector participation in agricultural markets (supply of yield-enhancing inputs) increased in target areas due to ADSP interventions. Did the Project succeed in developing a vibrant and functional market for the yield-enhancing seeds and other agricultural inputs? Provide analysis to support the findings.
- To what extent has ADSP assisted and/or strengthened the private sector's role in agricultural markets? How far has KARI succeeded in transferring seed multiplication efforts to the private sector? To what extent has KEPHIS managed to devolve some of its responsibilities to the private sector seed

companies? How successful has the private sector been in responding to the market opportunities created by KARI and KEPHIS under the ADSP Project?

- Assess the extent to which the seed sector has been liberalized.
- How relevant and appropriate to the needs and demand of farmers have been the seeds developed and distributed through ADSP Project efforts? Were the technologies developed in response to farmer demand and eventually to the market demand? Were the crops and varieties developed and transferred the best choices to meet the needs of smallholders, as well as the demand in the market for the smallholder products?
- Was KARI successful in its efforts to release germ plasm of hybrid varieties and open pollinated varieties to private sector seed companies? To what extent have the new varieties been adopted by farmers?
- Has the Project been successful in encouraging capable CBO's to form regional associations and become licensed seed companies in their own right?
- Review the Project's success in developing and strengthening public-private-NGO partnerships to carry out technology development and transfer. Identify these partnerships, if any, and their overall impacts. How likely are these to continue after the end of USAID funding?
- Evaluate the usefulness of market assessments, if any, done to guide the research and technology transfer activities of KARI units and Centers.
- To what extent has KEPHIS increased plant variety protection? How efficient is the processing of Plant Breeders Rights applications?
- Assess STAK's policy agenda and evaluate the progress made to date and/or any achievements based on their policy agenda.

(b) Sustainability of Project impacts and institutional capacity issues

- What is the potential for continued availability of yield enhancing services and products in the areas of Project operations, after withdrawal of USAID funding?
- What is the spread effect likely to be and what are the chances that these activities will be replicated in non-project areas?
- How successful has KEPHIS been in building capacity of seed breeders, merchants and inspectors in legal framework, seed certification and plant breeders' rights? To what extent are the trained private seed inspectors and licensed seed merchants active in the seed market? What is the sustainability of the licensed seed merchants?
- Have KARI and the Winrock Consortium made efforts to expand the range of commodities and practices being handled by stockists and input producers in the existing Project areas? How successful have the efforts been?
- How successful has KEPHIS been in establishing an appropriate seed sector regulation framework? Assess the inputs of stakeholders in the drafting of seed acts/regulations.
- Evaluate the effectiveness of STAK in undertaking seed policy reform activities.
- Assess institutional capacity of STAK as an effective implementer of this USAID program.
- Describe and make recommendations on relationship between KEPHIS, Ministry of Agriculture and STAK regarding seed policy formulation issues.

(c) Gender and Environmental Compliance

- Have there been any efforts by KARI and the Winrock Consortium to identify technologies that are environmentally friendly? What stage have they reached in the development of these environment friendly technologies and what are the prospects of their being adopted.
- What is the proportion of women actively participating and benefiting from the Project? In what ways are women benefiting? Is there a difference in impact between female-headed households and women in male-headed households?

4. METHODS AND PROCEDURES:

The Evaluation Team shall meet with USAID/Kenya and ADSP Project partners. Within one week of the contract start date; the Team Leader will provide USAID with the team's suggested report outline and a work plan for the period of the evaluation through final report submission. After submitting a work plan acceptable to USAID, the consultants shall review relevant Project documents from USAID and the implementing partners. They will hold interviews with staff of USAID and implementing partners, as well as representatives of key stakeholders, including the Government of Kenya's Ministry of Agriculture, donors, private sector, farmers, input stockists/distributors and commodity traders. The team will hold regular meetings, as needed, with USAID to provide information on the Evaluation Team's progress.

5. TEAM COMPOSITION AND QUALIFICATIONS

This is a multidisciplinary program and its evaluation requires a team with expertise in many different disciplines, including agricultural research, private sector technology transfer, policy reforms, institutional development, project management and environmental/gender impact and compliance. It is therefore proposed to use a team of three persons, comprised of two international and one local expert. This combination will bring to the table international best practices, as well as knowledge of local situation and current government policies bearing on performance of the program. The team will consist of: a) Agricultural Economist/Team Leader; b) Agricultural Research and Technology Transfer Specialist; and c) Institutional Development Specialist.

(i) Agricultural Economist/The Team Leader:

The Team Leader will provide leadership to the Evaluation Team, be responsible for developing the work plan, ensuring effective teamwork and coordinating meetings and briefings with USAID management, implementing partners and stakeholders. He/she will also be responsible for preparing and submitting the evaluation report and any other specified deliverables.

The position requires an agricultural economist specialized in agricultural inputs and products marketing. He/she shall be responsible for assessing the effectiveness of the private sector input transfer system and its impact on the agricultural inputs and products markets in Kenya.

(ii) Agricultural Research and Technology Transfer Specialist:

This position requires an expert in the management of demand-driven agricultural research and agribusiness systems. He/she shall be responsible for assessing operations of the KARI research systems and procedures, including KARI's priority setting process and the commercialization of KARI's technology research products. He/she will also assess the functioning of the technology transfer system, especially how the linkage between KARI, KEPHIS, NGOs and the smallholder farmers have been made to work better.

iii) Institutional Development Specialist:

The position of Institutional Development Specialist requires a local agricultural economist with experience in institutional capacity assessment and development. He/she will be responsible for assessing the institutional relationships between implementing partners and between the public and private sector participants in the ADSP program. He/she will also review the institutional structure and capacity of STAK and its ability to carry out its mandate.

6. REPORTING AND RESPONSIBILITIES

The consultants shall report to the USAID/Kenya ADSP project officer. The consulting firm will submit the first draft reports to USAID/Kenya, by January 27, 2004 for USAID to review and provide comments. The team shall hold a debriefing meeting with USAID and implementing agencies one week before the task order end date. Three hard copies of the final report, with USAID's and the implementing agencies' comments incorporated, shall be submitted in both hard copy and Microsoft Word computer data file, to the Chief of the Agriculture, Business and Environment Office (ABEO) of USAID/Kenya by February 03, 2004. The final report shall have an executive summary, not exceeding five pages, containing a summary of purpose, methodology used, what was evaluated, findings and recommendations. There will be an Annex, which contains persons and organizations interviewed, Scope of Work for the evaluation and anything else the team deems important.

7. PERIOD OF PERFORMANCE

The period of performance of the tasks for this contract will be 28 days starting from January 05, 2004 through February 06, 2004. A six-day workweek is authorized without premium pay. All the team members shall be committed to work full time on this SOW for the entire performance period.

8. INSPECTION AND ACCEPTANCE

The final report, which shall meet the acceptable quality level, shall be reviewed and accepted by the Chief, ABEO, or her designee.

9. LOGISTICAL SUPPORT

No logistical support will be provided for this evaluation. The consulting firm shall be responsible for office space, secretarial services, hiring of computer, office supplies and arrange for travel to Kenya, in and outside of Nairobi.

10. DUTY STATION

Work shall be accomplished in Kenya.

A.4 REPORTS

The Contractor shall submit/deliver all reports and other deliverables pursuant to Section D of the contract, and the task order description/statement of work.

A.5 TECHNICAL DIRECTIONS

Technical Directions during the performance of this task order shall be provided by the Technical Officer (Mr. Pharesh Ratego) of office stated in Block 5 of the cover page pursuant to Section F of the contract.

A.6 TERM OF PERFORMANCE

a. Work shall commence on the date noted in Block 7 of the cover page. The estimated completion date is reflected in Block 8 of the cover page.

b. Subject to the ceiling price of this task order and the prior written approval of the Technical Officer (see Block No. 5 on the Cover Page), the contractor may extend the estimated completion date, provided that the extension does not cause the elapsed time for completion of the work, including the furnishing of all deliverables, to extend beyond 30 calendar days from the original estimated completion date. Prior to the original estimated completion date, the contractor shall provide a copy of the Technical Officer's written approval for any extension of the term of this task order to the Contracting Officer; in addition, the contractor shall attach a copy of the Technical Officer's approval to the final voucher submitted for payment.

c. It is the contractor's responsibility to ensure that the Technical Officer-approved adjustments to the original estimated completion date do not result in costs incurred that exceed the ceiling price of this task order. Under no circumstances shall such adjustments authorize the contractor to be paid any sum in excess of the task order.

d. Adjustments that will cause the elapsed time for completion of the work to exceed the original estimated completion date by more than 30 calendar days must be approved in advance by the Contracting Officer.

A.11 DUTY POST

The Duty Post for this task order is Nairobi, Kenya.

A.12 WORK WEEK

The contractor is authorized up to a 6-day workweek in the field with no premium pay.

A.13 AUTHORIZED GEOGRAPHIC CODE

The authorized geographic code for procurement of goods and services under this order is 935.

A.14 EXECUTIVE ORDER ON TERRORISM FINANCING

The Contractor/Recipient is reminded that U.S. Executive Orders and U.S. law prohibits transactions with, and the provision of resources and support to, individuals and organizations associated with terrorism. It is the legal responsibility of the contractor/recipient to ensure compliance with these Executive Orders and laws. This provision must be included in all subcontracts/sub awards issued under this contract/agreement.

A.15 FOREIGN GOVERNMENT DELEGATIONS TO INTERNATIONAL CONFERENCES

Funds in this contract may not be used to finance travel, per diem, hotel expenses, meals, conference fees or other conference costs for any member of a foreign government's delegation to an international conference sponsored by a public international organization, except as provided in ADS Mandatory Reference "Guidance on Funding Foreign Government Delegations to International Conferences" [<http://www.info.usaid.gov/pubs/ads/300/refindx3.htm>] or as approved by the [CO/AO/CTO].

Annex C

A Case for Change in Kenya's Seed Regulatory Environment

Seed companies can spend millions of dollars developing new and better hybrids and they cannot afford to risk selling anything but the highest quality. If they don't produce a quality product, the competition will take their market (customers) and leave the seed developer with only losses.

Farmers have not benefited from the high level of government control in the seed industry, and the question begs asking, who has benefited? The seed industry is rapidly changing and the ministries in charge need to look for ways to better prepare for the future.

Another common belief is that by restricting the flow of newly improved seed varieties into the country, the government is protecting the local seed industry from international competition. This maybe true in the short-run, but as the Kenya experience has shown, keeping out new ideas, technology, and economic competition leads to economic atrophy. Without competition, there is little incentive for a business to improve its products and customer service. Competition is good for an industry; it creates change in the form of new ideas, new and better products, lower prices and better customer service. To the farmer, this translates into lower seed prices, better quality seed and higher yields. Kenya's seed breeders have historically produced novel and industry relevant genetics. By continuing to liberalize and streamline the seed industry, these breeders and the institutions they work for will have the opportunity to work with international seed industry partners, rather than be isolated from them. This will benefit the local seed industry, local farmer and ultimately, the population of Kenya.

The late 1990's and early 2000's have been a period of change in the international seed industry. The industry is going through an evolution from one of mostly small to medium size independent companies with regional focus, to large international firms with complex inter-business relations and large scale spending on research and development programs. The seed industry is no longer a commodity business with all the players producing similar products year-in and year-out. Since the early 1990's, a large infusion of capital has flowed into the sector, and this, along with intellectual property law, has allowed firms worldwide to spend research money on the development of new hybrid and genetically engineered plant materials. The firms that make up the industry are no longer staffed by only plant breeders, seed production managers and sales staff. Alongside these old-line positions are molecular biologists, biochemists and armies of laboratory technicians. The industry has moved from being commodity driven (low cost producer focus) to being research driven (new innovative products) and focused on servicing specialty markets.

Several types of firms in the world economy have a strong strategic position to take advantage of the changes in the industry; these include, pharmaceutical firms

with their large product research and development teams and legal departments fluent in intellectual property management on an international scale. Additionally, large, well-capitalized specialty chemical firms and seed companies that have the cash to build high-tech research and development groups in-house.

The growth in the industry has also allowed hundreds of smaller firms to develop. Many of these smaller firms are led by a few creative people with new ideas on how to develop and market unique hybrid and genetically modified products.

The largest of these new generation seed companies are now familiar names to many farmers in Kenya. Pioneer is the largest seed company in the world (in sales revenue), with a product line in just four core crops: corn, sunflowers, sorghum and alfalfa. Looking to link with Pioneer's strong position in proprietary germplasm, DuPont, the US specialty chemical company, purchased Pioneer in the mid 1990's. By doing this, the firm joined DuPont's sound biotechnology research and development capabilities with Pioneer's germplasm resources.

Monsanto is a broad-based chemical and specialty products company with large investments in biotechnology and plant genetics. In August 1998, Monsanto announced it had purchased Cargill Seed, a major developer and marketer of corn and oilseeds worldwide. Earlier, Monsanto purchased Asgrow Seed (field crops division) and DeKalb Seed, the second largest corn seed company in the US and a tough competitor to Pioneer.

Maybe the most unlikely player in the international seed business is the Mexican tobacco firm Empresas LaModerna or ELM. Through its subsidiary Seminis, the company sells vegetable seed worldwide. In the later 1990's, ELM bought some of the best-known vegetable seed companies in the world, including Petoseed, Royal Sluis, Asgrow (vegetable seed division), Genecorp, Bruinsma and California Brands. Currently, ELM-Seminis has over 40% of the U.S. vegetable seed market and is the largest seller of vegetable seed in the world. The firm conducts research at 39 sites worldwide and is investing heavily in the development of new hybrids and biotechnology. The company, with its vast proprietary germplasm resources is a sought after partner by many biotechnology firms, which want to use Seminis' hybrids vegetables as a vehicle to deliver their genes to farmers.

All of these firms currently operate in Kenya, either directly through their representative offices or through a network of seed distributors. Unfortunately, the benefits that their billions of dollars of research have brought to farmers around the world are, for the most part, currently not available to Kenyan farmers. The primary reason for this has been the slow and costly bureaucratic process of the seed certification/ registration used in Kenya. The slow pace of government reform has, for the most part, kept farmers in the dark as to improvements in plant genetics, and prevented them from reaping the benefits of higher yields and increased disease resistance.

The long-term strategy for international seed companies is to develop new and useful genetic products for which they can receive patent protection and sell

these new products in markets around the world. The main reasons for the large number of mergers, buyout and cross-licensing agreements in the past several years have been the need to join together the hardware end of the business, (that is, the germplasm end of the seed industry) with the software end of the business, (the biotechnology end). Biotech developers of new genetic expressions need a germplasm to put their gene into, and the holders of germplasm patents need the new genes in their germplasm to stay competitive in the world market. This has led to the many new corporate marriages witnessed in the 1990's and early 2000's.

In addition to these marriages of germplasm and gene companies, there are also firms like Monsanto, which see new genes as a way of expanding markets for other products they make. An example is Monsanto's Roundup Ready Soybean. In this case, Monsanto developed a gene that, when implanted in a soybean plant, will make it resistant to the Monsanto herbicide Roundup. Roundup has been used around the world for decades and is a cost effective, environmentally friendly product, favored by farmers for its broad spectrum of weed control and low toxicity to people and animals. From a marketing standpoint, it's a clear winner. Monsanto gets to sell both its seed and herbicide to the farmer. Of course, this program would not work unless it is more cost effective than alternatives that competitors can provide. But, Monsanto has priced the seed and the herbicide at a level that makes it attractive to soybean farmers. The U.S. Environmental Protection Agency and U.S. Department of Agriculture both gave their approval to the Roundup Ready Soybean in the mid-1990's and since then farmers in the U.S, Canada, Latin America, Eastern Europe and others locations have used it along with other GM crops. To further develop the market for the Roundup Ready gene, Monsanto has licensed the gene to other seed companies. By doing this, Monsanto will draw revenue from both the license fees plus the sales of its Roundup herbicide.

Biotechnology and genetically modified organisms (GMO's) are words not yet part of the Kenyan farmer's vocabulary. In general terms, these words refer to organisms that have had their genetic code (DNA) changed in order to express a new trait that did not exist in the organism before the transformation event took place. In some cases, DNA from other organisms may be added to the DNA code of the target organism. In other cases, the organism's DNA is modified to change the expression of a gene already in the organism. This can be done in several ways. One way, for example, is to remove a specific section of DNA and replace it in reverse order; in this way, gene expression can be reduced. Agriculture is not the only industry to benefit from advances in this science, pharmaceutical manufacturers have developed whole new cases of drugs which are used to save the lives of people suffering from heart disease, stroke, liver disease and other serious health problems.

Bt corn is a good example of an agri-biotech product that may someday be available to Kenyan farmers. The benefit of Bt corn to farmers is a reduced need of insecticides, as Bt corn is resistant to European corn borer (a major pest in Kenya's low elevation production zones), corn earworm and other lepidopteran pests. The Bt gene comes from the *Bacillus thuringiensis* bacterium. This

bacterium carries a gene that makes a protein that is toxic to European corn borer and other worms of the lepidopteran family. The spore of the bacteria has been used on crops around the world for over twenty years (sold as DiPel DF, manufactured by Abbott Laboratories). The Bt bacteria is not toxic to humans, animals, fish, birds or plants; it has proven itself to be an environmentally sound alternative to chemical control of many worm pests. When Bt is used as a topical pesticide, its spores (in a powder form) are mixed with water and sprayed on the crop. Once eaten by a worm, the bacterium is taken into the gut of the worm, where the bacterial proteins disrupt the worm's digestive track. The worm stops feeding and dies.

Bt corn developers took the gene that makes the protein in the Bt bacteria and moved it to the corn plant. In this way, the corn has the built-in Bt protein protection against the worm. When a worm eats a Bt corn plant, it takes in a bit of the Bt protein that upsets the worm's GI system and causes it to stop feeding and die. In addition to Bt corn, Monsanto has also developed Bt potatoes (resistant to Colorado potato beetle) and Bt cotton, resistant to boll worm and other cotton pests. In the U.S., millions of hectares are now planted to Bt and other GM crops and this is helping farmers reduce their need to spray hundreds of millions of kilos of pest control chemicals.

The choices ahead are for Kenyans alone; they are the masters of their own future. The world's agriculture system is evolving quickly and the longer the nation deliberates change, the further behind it falls. If Kenya chooses a path of change, it needs to move ahead swiftly with streamlining and modernization of its legal, regulatory, and economic system to meet its own food needs and benefit from its place in the world market. Without forward-looking leadership, the nation's farmers and general population will continue to suffer and dreams of future prosperity could be lost.

Annex D

The Seed Industry Requires an Efficient IP Regulator Environment

As in all research driven business, the seed industry is rooted in the concepts of intellectual property rights and contract law. Without the confidence that their products are protected from theft, no company would be willing to spend the millions of dollars it takes to develop a new hybrid seed line or a genetically engineered agri-product. Intellectual property law is similar throughout the developed economies of the world. It is designed to protect companies and individuals willing to risk investment in unique and novel ideas, just as copyright law is designed to protect the author of a book.

Patents are one of the primary tools seed companies use to protect their products. When a seed company develops a plant variety that it feels is unique and has value, it registers the new variety with the government patent office or in Kenya's case KEPHIS. In doing this, the firm must show that the new variety is truly different than other varieties already under patent protection and prove that the new variety is different from other varieties already in the public domain. Once a variety has been patented (protected), no other firm or individual can produce it without the consent of the company that holds the patent. In the U.S., for example, new seed varieties are granted 17 years patent protection; in Kenya the law provides for 15 years of protection. After this time (in most cases), the variety can be reproduced and sold without the consent of the firm that held the patent (once protection ends, it is considered in the public domain). In the case of hybrid seed production, the company that developed the seed (usually) has the parent inbred lines and these are the property of the company, so just because the patent has expired does not mean that any farmers can start to grow their own F1 hybrids. The hybrids can only be produced if you have access to the inbred parent lines, which the seed companies try to protect.

Often, after a company patents a new plant variety or gene, it can license the right to use that variety or gene to another company. For the right to use the patented product, the company that is licensed, must pay the firm holding the patent a fee, or royalty. The amount of royalty is negotiated between the two firms and can be a fixed sum, a percent of sales or a combination of the two. Sometimes the two firms do a kind of genetic barter deal. That is, they agree to give each other the right to use selected materials that each hold patents on, this is called cross-licensing. For example, if one company has a patent on a gene for making high oil corn and a second company holds a patent on Bt corn, the two firms could cross-license, so that they could use each other's genes in their own corn varieties and sell them.

The ability to improve intellectual property law will be key in allowing foreign partners and foreign investment to flow into Kenya's seed industry. Once Kenya improves its intellectual property law, the local seed industry will benefit through the increased availability of new genetic material from sources worldwide. They can also benefit by joining with global partners that can sell novel Kenyan

genetic material to international markets and local firms will realize new revenue streams via royalty and licensing payments.

Before international companies are willing to share their genetic materials with Kenya's partner firms, they need to be confident that the local partners will not steal their products and sell them without consent. The only way this confidence can develop in Kenya, or any other country, is through the creation of solid legal protection through well-written patent law by the Parliament. At the present time, Kenya plant protection regulations are based on the 1978 UPOV (Union for the Protection of New Varieties of Plants) Convention. Although this provides a sound foundation, the GOK should consider updating its regulations to language found in the 1991 UPOV Convention.

The seed business is unique in that researchers all over the world have the opportunity to develop new and useful germplasm and move it rapidly into the world market through licensing agreements with international seed companies. Production of the product (hybrid seed) is decentralized and takes place throughout the world, so that both research and production can be done in the country where the final product is sold. This is unlike the agri-chemical business, for example, where production is centralized in a small number of manufacturing areas around the world but the markets are global.

Annex E
Variety Development and Sales Under KARI & ADSP

Table 10: Recent Releases Of Crop Varieties By Public Sector in Kenya			
Crop	Variety Name	Year of Release	Description
Maize	Muguga1	2002	Medium-maturity, streak virus resistant hybrid for mid-altitude ecologies.
	KKSyn1	2003	Medium-maturity, drought-tolerant OPV for mid-altitude ecologies.
	KKSyn2	2003	Full-season, drought-tolerant OPV for mid-altitude ecologies.
	KTSP94	2001	Striga-tolerant OPV for western Kenya.
	Emco	2001	Late-maturing OPV for mid-altitude ecologies.
	KH615A	2002	Medium-maturity hybrid for highland ecology.
	KH616A	2002	Full-season hybrid for highland ecology.
	KH633A	2002	Disease-resistant hybrid for transition zones.
Sorghum	KH634A	2002	Disease-resistant hybrid for transition zones.
	Mutama1	2002	White, palatable line for dryland ecologies.
	Gadam	2002	Disease-resistant red sorghum for moist, mid-altitude ecologies.
Beans	Kat B-1	2000	Palatable, green-seeded variety for dryland conditions.
	Kat B-9	2000	Maroon, market-type for dryland conditions.
Wheat	Kat -X-56	2002	Early-maturing, red type for dryland conditions.
	Duma	2000	Early-maturing, hard grain.
	Mbega	2000	Hi-yielding, late-maturity variety for wet ecologies.
	Kenya Heroe	2002	Durham bread wheat variety for dryland conditions.
Soybean	NAMSOY	2000	Disease-resistant soybean for mid-altitude and highland ecologies.

**Table11: Yield Improvement for Selected Commodities
Promoted Under ADSP**

COMMODITY	IMPROVED VARIETIES	LOCAL VARIETIES & PRACTICES	IMPROVED VARIETIES & PRACTICES
VEGETABLES			
Potatoes	Tigoni, Asante, Furaha	7t/ha	17 t/h
	Preleased (KP91301.10, KP90172.34, KP720097.1, KP90142.7		45t/h
Tomatoes	Cal J, Riogrande, Onyx	25t/ha	40t/ha
Cabbage	Gloria F1, Field Force, Fortuna and tris tar	25t/ha	50t/ha
French Beans	Julia, Paulista, Amy, Samantha, Teresa (R1515), Kutuleless, J12	2.1 t/ha	6t/ha
Snow peas	Oregon sugar pod 11,	1 t/ha	3.5t/ha
Onions	BGS95, BGS71, Flare F1, Tropicana hybrid, Red Creole	1 t/ha	6.5 t/ha
FRUITS			
Bananas	Grand nain, Williams, Chinese Cavendish, Uganda Green	10 t/ha	30 t/ha
Lilies	Prato, Brunello, Adelina Romano, White heaven Siberia, Stargazer	0stems/m ²	65stems/m ²
OTHERS			
Maize	KCB	200kg/acre	2000Kg/acre
Beans	KAT B1	200kg/acre	600-800Kg/acre
Sorghum	KARI MTAMA 1	100-150 kg/acre	1500kg/acre

Annex F
Increases in Crop Yields at Farm Level as a Result of Improved OPV Seeds

Level of Technology Use	Maize	Sorghum*	P/Millet	Beans	Cow Peas	Pigeon Peas*	Green Grams	Dolichos
Farmers Landraces Yields (kg/acre)	200-400	300-350	250-500	180-360	300-500	360-810	270-400	300-400
Research Yields Potential of OPV Seeds (kg/acre)	1000-1200	650-1500	900-1100	500-840	600-900	880-1200	450-650	1000-1600
Farmer Yields of Improved Varieties Without Inputs (kg/acre)	450-1000	450-700	450-600	360-490	360-500	450-650	360-450	450-900
Farmers Yields of Improved Seeds With Inputs	900-1150	900-1000	650-800	600-800	520-850	630-1150	450-600	900-1450
Improved Seeds Sold during the Project (kg)	11713	30543	6025	53181	33418	549	7949	938
Use of Improved Seeds before the Project	WA	L	L	L	L	L	L	L

Note: WA – Widely Available
L – Limited

*Sorghum and pigeon peas can be ratooned and upper limit includes the ratoon harvest.