Research Application Summary

Dissemination of agricultural technologies: A new approach for Uganda

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Abstract

Uganda with an estimated current population of 34 million has had many approaches to agricultural extension service delivery but has not realised its potential level of production and productivity in agriculture. One key gap in agricultural transformation has been the weak linkage between farmers, extension workers and research for effective technology transfer. The Government of Uganda in the National Development plan 2011/2015 identified this gap and a five year project, the Agricultural Technology and Agri-business Advisory Services (ATAAS) was formulated. The ATAAS project with five (5) components is being implemented by the National Agricultural Research Organisation (NARO) and National Agricultural Advisory Services (NAADS) which are agencies of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). Within the first year of implementation of ATAAS, stakeholders priorities were generated, a number of adaptive research trials set in response to stakeholders needs, multiplication of planting materials undertaken and appropriate Multi-stakeholders Innovations Platforms (MSIPs) established. With support from all stakeholders and effective monitoring and evaluation conducted, ATAAS is expected to transform the agricultural sector of Uganda. However, there is need to have stronger farmer, extension and research linkages for effective technology dissemination. Responsive adaptive research trials should be established with farmers actively participating and extension workers fully guided for better results. The establishment of functional Multistakeholders Innovations Platforms forms an effective tool in the value chain development of commodities and hence must be stressed. This will need to be underpinned by a strong human capital base to drive the process.

Key words: NAADS, research linkage, technology transfer, Uganda

Résumé

L'Ouganda, avec une population estimée à 34 millions, a eu de nombreuses approches pour la prestation de services de vulgarisation agricole, mais n'a pas réalisé son niveau potentiel

de la production et de la productivité dans l'agriculture. Une lacune importante dans la transformation agricole a été la faiblesse des liens entre les agriculteurs, les vulgarisateurs et la recherche pour le transfert efficace de technologie. Le gouvernement de l'Ouganda, dans son Plan National de Développement 2011/2015 a identifié cette lacune. Un projet de cinq ans, la Technologie agricole et les Services Consultatifs de l'Agro-business (ATAAS) a été élaboré. Le projet ATAAS avec cinq (5) composantes est mis en œuvre par l'Organisation Nationale de Recherche Agricole (NARO) et « le (NAADS) National Agricultural Advisory Services (Le Service National Consultatif Agricole » qui sont des organes du Ministère de l'Agriculture, de l'Industrie animale et de la Pêche (MAEP). Dans la première année de mise en œuvre de l'ATAAS, les priorités des parties prenantes ont été générées, un certain nombre d'essais de recherche adaptative a été défini en fonction des besoins des parties prenantes. La multiplication du matériel végétal a été entreprise et les Plates Formes d'Innovations Multi partenaires appropriées (MSIPs) ont été établies. Avec le soutien de toutes les parties prenantes et le suivi et l'évaluation efficace ont été menés. ATAAS devrait transformer le secteur agricole de l'Ouganda. Cependant, il y a besoin d'avoir des agriculteurs forts, des liens de vulgarisation et de recherche pour la diffusion efficace de la technologie. Des essais adaptatifs de recherche devraient être établis avec les agriculteurs qui participent activement, et les agents de vulgarisation entièrement bien guidés pour de meilleurs résultats. La mise en place de plates-formes multi-parties prenantes des innovations fonctionnelles constitue un outil efficace dans le développement de la chaîne de valeur des produits de base et, partant, doit être souligné. Celui-ci devra être étayé par une base solide de capital humain pour conduire le processus.

Mots clés: NAADS, la recherche d'assemblage, transfert de technologie, l'Ouganda

Background

Uganda is divided into ten agro-ecological zones basing on bio-physical and farming systems. The agro-ecologies include; the Kyoga Plains, Lake Victoria Crescent, Highland Ranges, Western Savannah Grasslands, Para-Savannahs, South Western Farmlands, North Eastern Drylands, North Eastern Savannah Grasslands, North Western Savannah Grasslands and the Pastoral Ranges.

The country currently has an estimated population of 34 Million. By 2005 agriculture employed 73% of the labour-force (UBOS, 2005) and it accounted for 23.7% of the total Gross Domestic Product (GDP) during the 2008/09 Financial Year (NDP, 2010).

Agriculture is still the most important source of employment, income and overall well-being of the people of Uganda.

Uganda's past and current medium term plan has been focused on modernizing agriculture as an engine for economic growth and poverty eradication. One of the intervention areas for investing public sector resources in agriculture is dissemination of agricultural technologies to end users through extension. This paper provides an overview of the on-going effort to strengthen the link between research-and extension-farmer platforms for effective transfer of agricultural technologies to end users.

Agricultural extension in Uganda

Over the past decades, Uganda has had many approaches to agricultural extension service delivery all intended to improve service delivery to the smallholder and resource constrained farmers. Between 1898 to 1956 the extension approach in the country was the "Extension by Compulsion". This was characterized by deliberate efforts to promote production of cash crops (Coffee, Cotton, Tobacco, Rubber, etc.) using coercion tendencies enforced by chiefs. This was to ensure the supply of raw materials to the then colonial power and other industries. From about 1956 to 1963 the country took on the extension through "progressive farmers approach". Under this progressive farmers were identified and trained by public extension workers to act as agents of change within their localities. Other farmers accessed agricultural technologies and management practices through the progressive farmers.

From 1964 to 1971 the approach changed to "Extension Education Methods". This emphasized professionalism through training and use of appropriate methods. Farmers were taught by public extension officers on why and how they ought to undertake better farming methods using demonstrations, trials and farmer field schools. The "Project Approach" came in between 1981 to 1991 after a period of political turmoil of 1971 to 1980. This was intended to rehabilitate and restore basic services using extension Rehabilitation Projects. Between 1992 to 1998, the "Unified Extension" Approach was adopted. This was to integrate and harmonise the use of scarce resources. A single extension worker was responsible for transfer of

knowledge and technologies in all fields to groups of farmers in a given geo-political area.

From 2001 to date the National Agriculture Advisory Services (NAADS) approach is taking lead in the provision of agricultural information, knowledge and technologies to farmers alongside the public extension structure that existed before. Under the NAADS approach farmers are the lead players in extension service delivery. They demand and manage services together with local governments. Government provides advisory services through contracted private service providers in line with farmers' needs.

The Gaps in Agricultural Extension

Though Uganda has used many approaches in agricultural extension very little progress has been registered in farm productivity and profitability. This has been attributed to many factors that includes; weak political support, low adoption rates by the end users of technologies and practices, disorganized farmers and marketing system and low capital for investment in agriculture (Lukwago, 2010).

At the same time funds have been injected into agricultural research resulting into the generation of a number of technologies. Empirical studies have shown that research and development has the greatest impact on labor productivity and poverty reduction compared to other investments in agriculture (Lukwago, 2010). Unfortunately transfer of the agricultural technologies generated by research to the end users, the farmers has not been very effective as expected yet many extension approaches have been used in Uganda.

Investments in extension services have the potential to improve agricultural productivity and increase farmers' incomes, especially in developing economies like Uganda (Anderson and Gershon, 2004). However the impact of extension on farm performance is varied reflecting on how extension services are delivered and the circumstances of the service recipients.

Ideas of NAADS and Principles

The NAADS Programme was introduced in 2001 in order to address shortcomings in the traditional agricultural extension approaches that failed to bring about increased productivity and expansion of agriculture, despite costly government interventions. The guiding principles of NAADS were to target the poor, empower farmers, deepen decentralization, promote specialization and commercialisation, market access, fostering

participatory processes, mainstreaming gender and HIV/AIDS, natural resources management, increasing institutional efficiency and private sector development.

The second phase of the NAADS programme is being funded within the framework of the Agricultural Technology and Agribusiness Advisory Services (ATAAS) project. Within the ATAAS framework, extension services provided by NAADS will be closely linked to agricultural research being undertaken by the National Agricultural Research Organisation (NARO). This linkage is expected not only to ensure effective generation and transfer of agricultural technologies to the end users, but also ensure active participation by all stakeholders including policy makers.

Achievements, Challenges and Opportunities for Designing of Phase 2

Findings from independent Mid-Term Evaluation of NAADS Phase I by NAADS, International Food Policy Research Institute (IFPRI) and Uganda Bureau of Statistics (UBOS) in 2004 showed improved technology adoption rates by farmers engaged in NAADS from 60-80% for seasonal crops. Farmers who had been involved in the programme for more than three (3) years have recorded significant increases in their household incomes. The evaluation also established that higher per capita incomes were being realized in NAADS sub-counties as compared to the non-NAADS Sub-counties (NAADS MTR, 2005). Despite the achievements registered under Phase I, the MTR identified weak interface between research, extension and farmers, resulting in limited capacity of farmers to drive the research and technology generation and development agenda and limited access to new knowledge and technologies. It was identified that in addition to the problems of access to quality and affordable inputs and markets, Ugandan farmers still lacked the capacity to participate in the value chain development. The design of NAADS Phase II addresses these weaknesses.

Agricultural Technology and Agribusiness Advisory Services (ATAAS)

This project is a five year project being implemented through the two agencies (NARO and NAADS) of the Ministry of Agriculture, Animal Industry and Fisheries. The project initiated during the Financial Year 2011/2012 has five components; Technology Generation, Partnership between NARO, NAADS and other stakeholders, Strengthening Agricultural Advisory Services, Support to Agribusiness Development and Management of the project implementation.

Substantial progress has been made during the first year of implementation of the project, especially under component 2 and 5, Partnership between NARO, NAADS and other stakeholders, and Programme Management. Component 2 activities are being implemented at the Zonal Agricultural Research and Development Institutes (ZARDIs). There are nine ZARDIs within the country targeting common agro-ecologies and geo-political demarcations as shown in Table 1. Three key processes have been undertaken:

a) Participatory planning processes. Priority enterprises were generated from stakeholders within each of the zone through participatory approaches from farmer group level, parishes, sub-counties and districts to guide project implementation. The district outputs were aggregated to generate the zonal priorities (Table1).

The Commodity Approach is currently guiding the implementation of ATAAS. Ten key commodities have been earmarked for support in addition to other zone specific commodities. These include; Banana, Cassava, Rice, Beans, Diary, Beef, Coffee, Tea, Fish and Maize.

b) Adaptive research, technology up-scaling and out scaling at ZARDIs. District Adaptive Research and Support Team (DARST) comprising of District Subject Matter Specialists (SMS) have been established in all the 112 districts of Uganda. Capacity development of DARSTs has been conducted in collaboration with ZARDIs and National Agricultural Research Institutes (NARIs) in conducting on farm farmer participatory evaluation of improved technologies as shown in Table 2. The ZARDIS team take the lead in adaptive research at the zone with the DARSTs providing a complementary role.

Under ATAAS, the end users of the technology first and foremost participate in identification of technologies that will address their production gap, but also will have an input when the technologies are being evaluated for adaptability to the various agro-ecologies of this country. Building the capacity of Local Government staffs to set and collect data on the adaptive research trials has been conducted by Research Scientists and NAADS staffs based at the ZARDIs.

Table 1. Districts under 9 ZARDIS and Priority enterprises by category.

ZARDI	Districts covered	Priority enterprises by sector			
		Crop	Livestock	Fisheries	Natural Resources
Ngetta	Agago, Alebtong, Amolatar, Amuru, Apac, Dokolo, Gulu, Kitgum, Kole, Lamwo, Lira, Nwoya, Otuke, Oyam, Pader	Cassava Beans Maize G/nuts Banana Rice	Piggery Poultry Apiary Goats Dairy cattle Beef cattle	Aquaculture Capture Fisheries Cage-culture	Soil Conservation. Mgt of water bodies Natural Forest Conservation Grassland Conservation Rangeland Conservation Wild Life Conservation
Nabuin	Amuria, Nakapiripirit, Napak, Kotido, Moroto, Soroti, Ngora, Kaberamaido, Kumi, Serere, Katakwi, Bukedea, Amudat, Kaabong, Abim	Citrus Cassava Groundnuts Maize Sorghum	Poultry Goats Cattle Apiary Piggery Sheep	Capture Fisheries Aquaculture	Soil Conservation. Mgt of water bodies Natural Forest Conservation Rangeland Conservation Wild Life Conservation
Buginyanya	Mbale, Sironko, Bulambuli, Manafwa, Bududa, Tororo, Pallisa, Jinja, Busia, Budaka, Kapchorwa, Kween, Iganga, Kamuli, Kaliro, Bukwo, Mayuge, Butalejja, Namutumba, Kibuku, Bujiri, Namayingo, Luka, Buyende.	Coffee Wheat BananasFruit Trees Mangoes Horticulture Irish Potatoes	Piggery Goats Dairy Apiary Poultry	Cage Farming Aquaculture Capture Fisheries	Soil Conservation Agro Forestry Water Management Wet Land paddy Agriculture
Mukono	Kampala, Mukono, Mpigi, Kalangala, Wakiso, Luwero, Buikwe, Kayunga, Buvuma, Kiboga, Kyankwanzi, Masaka, Nakasongola, Nakaseke, Mityana, Mubende, Bukomansimbi, Sembabule, Lwengo, Gomba, Butambala.	Bananas Coffee Maize Horticulture Beans Cassava	Dairy Cattle Piggery Poultry Goats Apiary	Capture Fisheries Aquaculture	Soil Conservation Mgt of water bodies Natural Forest Conservation Wild Life Conservation
Mbarara	Mbarara, Bushenyi, Ntungamo, Sheema, Mitoma, Rubirizi, Isingiro, Kiruhura, Ibanda, Buhweju, Lyantonde, Rakai, Sembabule	Banana Beans Tea Maize Coffee Fruit Trees	Dairy Cattle Beef Cattle Goats Poultry	Aquaculture Capture Fisheries	Soil Conservation. Mgt of water bodies Natural Forest Conservation Grassland Conservation Rangeland Conservation Wild Life Conservation

Table 1. Contd.

ZARDI	Districts covered	Priority enterprises by sector and rank			
		Crop	Livestock	Fisheries	Natural Resources
Kachwekano	Kabale, Kisoro, Kanungu, Rukungiri	Irish Potatoes Apples Tea Rice Cassava	Dairy cattle	**	Soil Conservation. Mgt of water bodies Natural Forest Conservation Rangeland Conservation Wild Life Conservation
Rwebitaba	Kabarole, Kyegegwa, Bundibugyo, Kamwenge, Kyenjojo, Ntoroko, Kasese	Cassava Beans Maize Banana Coffee Tea	Dairy Cattle Piggery Poultry Goats Apiary Beef Cattle	Aquaculture Capture Fisheries Cage-culture	Soil Conservation. Mgt of water bodies Natural Forest Conservation Grassland Conservation Rangeland Conservation Wild Life Conservation
Abii	Arua, Moyo, Yumbe, Koboko, Maraca, Nebbi, Adjumani and Zombo	Cassava Beans G/nuts Upland rice Fruit Trees Sorghum Coffee	Dairy cattle Goats Piggery Apiary Poultry Apiary	Aquaculture Cage fish farming	Soil Conservation. Mgt of water bodies Natural Forest Conservation Grassland Conservation Rangeland Conservation Wild Life Conservation
Bulindi	Masindi, Kiryandongo, Hoima, Bullisa and Kibaale	Bananas Rice Maize Beans Groundnuts Cassava	Beef Cattle Poultry Goats Piggery Apiary	Capture Fisheries Cage-Culture	Soil Conservation. Mgt of water bodies Natural Forest Conservation Grassland Conservation Rangeland Conservation Wild Life Conservation

** Fisheries activity is not important.

Source: Participatory planning process and priority setting during FY 2011/2012 conducted by NAADS/NARO ZARDI Teams.

Table 2. Adaptive Research Trials conducted under ATAAS.

ZARDI	Adaptive Research 1		Adaptive Resreash 2		Adaptive Research 3	
	Farmers constraint	Research response	Farmers constraint	Research response	Farmers constraint	Research response
Ngetta	Devastation of cassava by Cassava Brown Streak Disease (CBSD)	Evaluation of 8 new cassava varieties to CBSD in 6 districts	Reduction in yields of local bean varieties	Evaluation of yield potentials of three new bean varieties	Long maturity periods of local pigeon pea varieties	Evaluation of 3 pigeon pea lines for maturity period and resistance to major field pests
Nabuin	Pests and disease susceptibility of existing G. nuts varieties	Evaluation of 14 new G. nuts varieties for pest and disease resistance	Suscepbility of sorghum to pests	Trials of new sorghum varieties to establish level of pest attack		
Buginyaya	High costs of conventional weed control	Selection of herbicides for cost effective weed control in ground nuts, maize, rice	Disease susceptibility of banana coffee intercrop	Effective cultural control evaluation	Low farm income	Evaluation of apples for adaptability within the zone
Mukono*	-	-	-	-	-	-
Mbarara	Drought affecting maize production	Evaluation of three maize varieties for drought tolerance	High calf mortality	Control of tick borne diseases using hygiene and sanitation practices	Banana Bacterial Wilt	Evaluation of farmer practices in control of Banana Bacterial Wilt
Kachwekano	Lack varied food sources	Evaluation of performance upland rice varieties within the zone				

Table 2. Contd.

ZARDI	Adaptive Research 1		Adaptive Resreash 2		Adaptive Research 3	
	Farmers constraint	Research response	Farmers constraint	Research response	Farmers constraint	Research response
Rwebitaba**	-	-	-	-	-	-
Abii	Devastation of cassava by Cassava mosaic and Cassava Brown Streak Disease (CBSD)	Trials of 6 new cassava varieties in 5 districts	Low yields of local bean varieties	Adaptability of 14 new bean varieties within the Abii Zone	Low soil fertility	Evaluation of optimal levels of organic and inorganic fertilizers rates in maize
Bulindi	Devastation of cassava by Cassava mosaic and Cassava Brown Streak Disease (CBSD)	Trials of 6 new cassava varieties in 4 districts				

* Collaborative Adaptive Research yet to be initiated.
** This is a new ZARDI created 2011 Adaptive Research is yet to be initiated.
Source: Zonal NAADS Quarterly Reports.

In collaboration with research, improved technologies of priority crops have been identified and availed for multiplication within the zones. Several multiplication centres have been established to enhance farmer's access to quality agricultural technologies developed at the National Agricultural Research Institutions (NARIs). Some of the priority crops being multiplied includes cassava, rice and sweet potatoes. The DARST select farmer groups to multiply the technologies which are then accessed by other farmers within and outside the farmer groups. It is a requirement that these farmers are registered with the NAADS programme at their respective Sub-counties and have a track record on management of technologies. Identification and multiplication of planting materials for crops that lack viable commercial market has also been undertaken at the zone level.

Through the ZARDIs mapping of technologies have been conducted within the 9 zones, targeting cassava, rice and pasture establishments. Access to seeds of these crops have proved a problem and ATAAS in partnership with the Eastern Africa Agricultural Productivity Programme (EAAPP) is supporting seed multiplication.

c) Multi-Stakeholders Innovations Platform (MSIP) approach in enterprise development. Multi-stakeholders Innovations Platform (MSIP) is a new concept used in Agricultural Research for Development. It is the process of sharing knowledge and decision making whereby people and

A NAADS farmer tends to her citrus trees, an enterprise promoted and profitable.

institutions work together and maintain equal personal and institutional power (ICRA, 2010). The UN defines MSIP as a "voluntary and collaborative relationship between various parties, both State and non-State, in which all participants agree to work together to achieve a common purpose or undertake a specific task and to share risks and responsibilities, resources and benefits" (Adam, 2008).

A Multi-stakeholder Platform is, therefore, made up of different stakeholders or sectors, be they individuals, institutions, companies, who all are gaining or losing from a given issue (Warner, 2005).

Within the different Zones, districts and sub-counties of Uganda, MSIPs have been established basing on the need by the different stakeholders. The zonal MSIPs are formal with representatives while the district and sub-county MSIPs are ad hoc in nature. Lists of Zonal MSIPs established are indicated by zone in Table 3.

Development and Policy Implication

Uganda has tried many extension approaches with varied degrees of successes. Research Institutions have generated a number of technologies and are available on station. Effective extension system is necessary in order to disseminate it to farmers to adopt. Strong Farmer-Extension-Research linkage is necessary for effective technology dissemination and agricultural development (Butt, 2002). The ATAAS project provides a strong linkage between Research, Extension, farmers and other stakeholders. It is hoped that a number of technologies will be accessed by farmers at the end of the project period and productivity and production will increase resulting into increased household incomes and food security. However, there is need for political support at all levels and effective monitoring and evaluation system for the project to have the desired impact.

The participatory evaluation of new technologies is a feedback mechanism to Research Scientist for appropriate actions to refine the technologies to suit the demand of the consumer. The ATAAS Project in its design has provisions which ensure that the technology end users actively participate in constraint identification and technology evaluation. This is expected to enhance the flow of new technologies to farmers but also provide a feedback to research scientists on performance of the new technologies. The linkage between Farmers, Extension Workers based in Local Governments and Research Scientists

Table 3. Zonal MSIPs established under ATAAS.

Zone	Name of MSIP	Reason(s) for establishment
Ngetta	Lango-Acholi Rice Platform (LARIP)	For rice seed multiplication, production, processing and marketing
	Lango-Acholi Cassava Platform (LACIP)	Multiplication of cassava planting materials, production, processing and marketing
Nabuin	Citrus MSIP	Value addition and Marketing
Buginyanya	MSIP on Irrigation technologies on various crop	The prevalent problems on rain fed Agriculture to crops and livestock
	MSIPs on dairy, coffee, Wheat, Irish potatoes	Low production levels
Mukono	Coffee MSIP	Coordination of Marketing
	Dairy MSIP	Breeding
	Maize MSIP	Value addition and Marketing
	Pineapple MSIP	Value addition and Marketing
	Cassava MSIP	Multiplication of planting materials and value addition
Mbarara	Dairy MSIP	Marketing problems within the dairy industry
	Banana MSIP	Control of Banana Bacterial Wilt
Kachwekano	Dairy MSIP	Poor breeds of dairy cows and hence a need for stakeholders collaboration in Breed improvement
	Irish Potato MSIP	Low production, seed multiplication and processing
Rwebitaba	MSIP on banana	Improve on banana production and productivity in the western highlands agro-ecological zone
Abii	West Nile Cassava MSIP	Lack resistant varieties to CBSD, a need to multiply MM 96 4271
Bulindi	Rice MSIP	Value addition and Marketing
	Maize MSIP	Value addition and Marketing

based at the ZARDIs and NARIs need to be further strengthened for effective technology dissemination.

Adaptive research established for the purpose of evaluating new technologies on farmers fields ensures farmers participation in technology generation process. These sites should be fully utilized by extension workers to train farmers as well. Capacity building of extension workers need to be conducted on a routine basis for the officers to be updated on new technologies. Further still interpretation of the outcome of the adaptive research trials and reports to farmers should be conducted by Research Scientists working closely with extension workers so that farmers response and understanding are correctly interpreted and taken care of.

The MSIP approach encourages stakeholders to identify constraints to production, processing and marketing agricultural commodities. The MSIP approach needs to be emphasized to ensure value chain development for viable enterprises being undertaken by farmers. The active involvement of private sector players is key if the MSIPs are to be meaningful and contribute to value chain developments for the various commodities and also address pertinent issues identified.

Looking ahead a key challenge will be how to ensure adequate quality human resource to support the process. Thus, there will be need to strengthen research-extension-education linkage.

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