

**A CRITICAL REVIEW AND ANALYSIS OF
AGRICULTURAL EXTENSION IN AFRICA WITHIN A
SCIENCE AND INNOVATION SYSTEM CONTEXT**

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ACRONYMS

AASR	Africa Agriculture Status Report
ADC	Agricultural Development Centres
ADS	Agriculture Development Strategy
AEAS	Agricultural Extension and Advisory Services
AFAAS	African Forum for Agricultural Advisory Services
AGRA	Alliance for a Green Revolution in Africa
AIS	Agricultural Innovation Systems
ATMA	Agricultural Technology Management Agency
ATVET	Agricultural Technical and Vocational Education and Training
AUC	African Union Commission
CAADP	Comprehensive Africa Agriculture Development Programme
CBO	Community Based Organisation
CPD	Continuous Professional Development
DFID	Department for International Development
DRC	Democratic Republic of Congo
EU	European Union
FAAP	Framework for African Agricultural Productivity
FAO	Food and Agriculture Organisation
FARA	Forum for Agricultural Research in Africa
FBO	Faith Based Organisation
FFS	Farmer Field School
FSR/E	Farming Systems Research/Extension
FTC	Farmer Training Centre
GFRAS	Global Forum for Rural Advisory Services
ICT	Information and Communication Technology/ies
IDA	International Development Agency
IEG	Independent Evaluation Group
IFAD	International Fund for Agricultural Development
IMF	International Monetary Fund
NAADS	National Agricultural Advisory Services
NEPAD	New Partnership for African Development
NGOs	Non Governmental Organisations
PEA	Participatory Extension Approaches
PLWDs	People With Disabilities
PRSP	Poverty Reduction Strategy Paper
RDS	Rural Development Strategy
S3A	Science Agenda for Agriculture in Africa
SAP	Structural Adjustment Programme
SIDA	Swedish Agency for International Development
T&V	Training and Visit
ToT	Transfer of Technology
UFAAS	Uganda Forum for Agricultural Advisory Services
UKAID	United Kingdom Agency/Department for International Development
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

Introduction

The Forum for Agricultural Research in Africa (FARA) is the apex organization for agricultural research for development in Africa and the AUC/NEPAD mandated institution to lead implementation of Pillar IV of the Comprehensive Africa Agriculture Development Programme (CAADP) focusing on generation, dissemination and adoption of agricultural innovations. Under this mandate, FARA is leading the formulation of the Science Agenda for Agriculture in Africa (S3A) that will articulate the science, technology, extension, innovations, policy, and social learning Africa needs to apply in order to meet its agricultural and overall development goals. The S3A is one of the principal thrusts of CAADP's current strategic theme on knowledge and knowledge management.

FARA has already produced the S3A document which is due for ratification at the African Head of States Summit in June, 2014. FARA commissioned this study on agricultural extension and advisory services (AEAS) to deepen buy-in by AEAS stakeholders and to fill in information gaps on AEAS issues that need to be understood more fully if the AEAS are to effectively play their role in the S3A. This stems from recognition that AEAS have been poorly integrated in previous science agendas.

The general objective of the study was set by FARA as: *"To analyse agricultural extension services in Africa as an important element of the science agenda for agriculture in Africa"*.

The scope of the study was articulated as:

1. Take stock of agricultural extension and advisory systems and their current status and evolution in African member countries
2. Analyse how well AEAS are integrated into science and Africa's agricultural innovation system (AIS) and how this has affected their performance
3. Review effectiveness of agricultural extension service delivery in Africa.
4. Analyse challenges and opportunities for delivery of these services
5. Identify the changes needed to increase the contribution of Africa's extension systems towards improving the application and development impact of science in agriculture

The study was undertaken in partnership with the African Forum for Agricultural Advisory Services (AFAAS) which has the objective of facilitating the coming together of AEAS at national, regional and continental levels, and has the mandate - given to it by FARA - to spearhead issues of AEAS under CAADP. The assessment is entirely based on desk review of literature.

Methodology

Evolution of extension was analysed and assessed using a comparative framework that stratified the AEAS evolution periods as follows: (1) Colonial and early post-colonial period

[1940 – 1970]; (2) Structural adjustment period [1981-1994]; (3) Poverty reduction strategies period [1995 – 2005]; and (4) Current period [2006 – to date]. Within these periods the AEAS characteristics that were assessed in this study were: Goals and objectives, policies, extension approaches and methods, major actors, coordination linkages and partnerships, clientele, services rendered, and primary source of funding.

The assessment of integration of AEAS into science and AIS was undertaken using the conceptualisation of AIS by Arnold and Bell (2001). The integration of AEAS in science was assessed through analysis of the science content in the knowledge exchanges between the AEAS and the other aspects of the AIS.

Effectiveness was assessed by analysing the extent to which AEAS have achieved the objectives for which they were established but with an appreciation that there are preconditions and assumptions for AEAS to be effective. Hence the assessment includes a cursory analysis of the preconditions for performance of AEAS but did not delve into analysis of the assumptions for effectiveness.

The future challenges and opportunities for enhancing the effectiveness of AEAS delivery and the changes needed to increase the contribution of Africa's AEAS towards improving the application and development impact of science in agriculture were identified and analysed through the lens of the thrusts of the S3A. Effectively the S3A is seen, in this study, as the framework for integration of science and AEAS into interventions on agricultural innovation systems in the future. The analysis is therefore intended to gauge the alignment of the current thinking underlying the AEAS with the future aspirations for African science in agriculture, and to inform the design of interventions aimed at enhancing the integration of the AEAS into the S3A.

Evolution of AEAS and their integration into science and agricultural innovation systems

The AEAS have evolved along a path that has widened their scope in all aspects analysed in this study. The AEAS goals have retained enhancement of production and productivity at the core but the underlying rationale has been expanded from production for export during the colonial period to embracing food security, livelihood improvement and poverty reduction. The immediate objectives (AEAS impacts) through which the goals have been pursued have expanded from bringing about adoption of production and productivity enhancing technologies to addressing this in a way that also addresses systemic social, economic and in natural resource utilisation issues. Hence one of the early steps in reforming the AEAS was the introduction of Farming Systems Extension and Research approaches (FSE/R). This broadened the science base of the AEAS to include the farmers' own knowledge and other natural sciences – particularly those associated with sustainable natural resource use.

By themselves these FSE/R approaches did not bring about the needed enhancement in the adoption of technologies for attaining the goal. Analysis of the reasons why this was the case led to realisation that farmers needed to be active partners in the extension (and research processes). Therefore approaches and methods had to change from regimented coercive ways of engaging with farmers or patronising ways that assumed that the knowledge flow had to be one way from AEAS providers to farmers, to ways that put the farmers in the driving seat. The roles and services that AEAS providers rendered therefore changed from training farmers to facilitating farmers to make their own choices - from a comprehensive menu of technologies - according to their social and economic circumstances. The participatory extension approaches (PEA) that evolved introduced the social sciences in the AEAS. The sciences that underpin building institutions through which farmers acquire and exchange knowledge were significant elements in the sciences introduced. The integration of AEAS into agricultural innovation system was strengthened mainly from the perspective of enhanced farmer-extension-research linkages.

While the PEA approaches went some way in achieving the goal in which production and productivity were pursued for poverty reduction and food security, they were not sufficient. It was realised that benefits from enhanced production and productivity were determined by many off-farm factors, which the PEA approaches did not address. The next stage (which is the current one) in the evolution of AEAS approaches addressed this in several ways. First, value/ commodity chain approaches were introduced to address off-farm bottlenecks to profitability of agricultural production. Second, innovation system approaches started to emerge that went beyond addressing on-farm and value chain issues to looking at AEAS as integral elements in a complex system of innovation in which the AEAS had to play an intermediating role not only between farmers and research but also between the demanders of agricultural products (such as markets and policy makers), and institutions that support agriculture (such as financial institutions, professional networks, other development sectors). Third, and mainly as a result of a big surge in the use of modern ICT in Africa, approaches that utilise a wide range of ICTs – radio, mobile telephones and internet – are emerging. These approaches open the door for AEAS to be integrated into general science and to enhance the integration of the AEAS into agricultural innovation systems.

As the AEAS have evolved, the clients have become more diverse. Starting from the colonial and immediate post-colonial governments being the major clients, the AEAS have most significantly become increasingly more accountable to farmers and value chain actors. Furthermore, the farmers are no longer dealt with as a homogeneous category but as socially and economically differentiated categories – most notably by gender and poverty status – so that AEAS have to be rendered differently for the different categories. One of the challenges that have been faced in all the phases of AEAS evolution is ensuring equity in the

delivery of AEAS. All the approaches that were reviewed in this study appear to have fallen short in this regard.

The AEAS have evolved to deliver a diverse range of services by an equally expanding range of providers in addition to the public AEAS providers. They include, among others, non-government / community/ faith-based organisations and private sector service providers. Starting from a narrow focus on technology transfer, the services now include facilitation of interactions and networking/ collaboration/ partnership brokerage between value chain and innovation system actors. This has precipitated the related challenges of equipping the AEAS providers with the necessary knowledge and skills, keeping them updated and ensuring quality of service provision.

The increasing complexity in all dimensions of AEAS can no longer be supported by policies that are embedded into general agricultural development policies, as was the case in the early periods of AEAS evolution. Robust policies that address AEAS in a comprehensive manner have to be developed. Oladele (2011) found that only three out of twenty seven countries he studied had explicit AAS policies.

While the funding for the AEAS still remains largely from the public sector and donors, ways are being conceptualised for diversifying funding sources. Countries that have developed AEAS policies and strategies are explicit on the desire to gradually migrate to funding systems that bring on board private sector and commercial funding. The funding route through social investors and crowd-funding mechanisms is entering the discussions albeit not at the level of intensity that one would expect considering the potential that these mechanisms have for funding small projects such as those undertaken by small scale farmers and value chain actors.

Assessment of the effectiveness of AEAS in Africa

Empirical evidence suggests that agricultural production and productivity in Africa – the core goal of AEAS- lags considerably behind that of other continents and is below the region's potential. However, the results of impact evaluations of most agricultural extension programs reviewed in this study indicate that AEAS have had positive impact on targeted outcomes. Adoption of improved technologies and practices is a prerequisite for improving productivity. However data on adoption of improved agricultural technologies reveal low levels of adoption in Africa. The reasons for this contradiction lie in the failure to meet the preconditions for effectiveness. Most notable AEAS coverage in most countries is very poor, and the coverage is not inclusive of the segments of the population that would generate high impact i.e. the women and the youth. Literature suggests that the number of AEAS providers in Africa is inadequate and the ratio extensionist: a farmer is too wide. The governance and management of the AEAS is poor and the incentives for AEAS providers are

low. The budgets allocated for public extension services are inadequate and disbursed erratically. The knowledge and skills base of AEAS providers is weak and the majority of them do not have opportunities for continuous professional development in the light of a very dynamic and diverse demand on the AEAS.

Challenges and Opportunities

The challenges and opportunities were identified in the context of the S3A. The immediate priority of the S3A is implementation of CAADP. FARA has developed the Framework for African Agricultural Productivity (FAAP) as the tool to help stakeholders in implementing the CAADP Pillar IV. The FAAP lays out a number of guiding principles that articulate the best practices that should be employed to improve the performance of agricultural institutions – including AEAS. The FAAP principles are aligned with the thrusts of the S3A. Therefore the FAAP principles were used as the background for identification of the challenges and opportunities. Reviews were undertaken to assess the alignment with FAAP principles of (i) the national AEAS policies of eight countries, (ii) The national investment plans of ten countries, and (iii) The CAADP technical reviews of eleven countries.

Within the limitations of the small number of countries studied the trends that the analysis of the policies reveals is that the level of explicitness of the policies in addressing the FAAP Principles is generally good for countries – like Kenya - that have stand-alone extension policies or their equivalent. This is an opportunity that can be exploited. From the FAAP perspective, the challenging areas appear to be systematic utilization of improved management information systems and introduction of cost sharing with end users. Generally there will be a challenge in policy implementation in ways that build on past experiences. This challenge is currently most vividly evident in Uganda. The opportunity for addressing this is that AFAAS is facilitating national AEAS actors to come together to share experiences and lessons and to have a collective voice for policy advocacy.

The AEAS feature in all the country investment plans. The variation is in the emphasis and contextualization of the AEAS within the plans. Contextualising the plans from the S3A perspective is likely to be a challenge. However Ghana has a plan in which the AEAS are explicitly tethered to science. This can be used as an example for other countries. Generally there appears to be a challenge at the planning stage in dealing with the pre-conditions (especially poor capacity and low investment) and assumptions for effectiveness. The Ethiopia plan is an example of a plan in which capacity development for AEAS is highly emphasised. The opportunity that can be exploited generally is to utilise the capacity that AFAAS has built to support countries in CAADP investment planning processes.

The technical reviews reflect the extent to which the AEAS policies (where they exist) and FAAP principles are translated into actions in the investment plans. Unfortunately the

technical reviews were silent or not clear on many aspects of the FAAP in many of the plans - which suggests that the reviews are not systematically done with respect to the AEAS. This is a challenge that has to be addressed. The review of the Uganda plan noted that the research and extension programmes are: “.... *exemplary in Africa for the extent to which, in most respects, they are aligned with the principles advocated by the Framework for Pillar 4*”. At a conceptual level the Uganda Plan can be taken as an example of good practice in aligning AEAS plans with FAAP Principles.

Conclusions

The assessment of the evolution of AEAS points to the following as the defining characteristics of the status of the AEAS in Africa and therefore the launching pads for the S3A to engage with AEAS:

1. The goals of AEAS still maintain the core of increasing production and productivity but through impacts that do not only target technology adoption but also ways that address systemic social, economic and natural resource utilisation issues, engender farmer participation and ownership, and embed them in value chains and agricultural innovation systems;
2. The technical approaches and methods that are currently in use are the value chain, innovation systems and ICT-based approaches;
3. The expanded roles and services that AES providers have to offer open the door for AEAS to be integrated into science - not just agricultural science.
4. The roles and services that AEAS providers play have changed from technology transfer and training farmers to facilitating farmers to make their own choices.
5. The providers of AEAS have also become very diverse and now include non-public actors;
6. One of the challenges that has been faced in all the phases of AEAS evolution is ensuring equity in the delivery of AEAS to all client categories. All AEAS interventions have to be explicit in ways in which this challenge is to be addressed;
7. AEAS providers in pluralistic systems are not sufficiently equipped with the necessary knowledge and skills, and they are not updated to ensuring quality of service provision.
8. There is an increasing complexity in all dimensions of AEAS.
9. The desire of countries is to evolve funding mechanisms that include private sector and commercial funding. .
10. Effectiveness of AEAS is limited by low quantitative and qualitative capacity of AEAS workers as well as by institutional and organisational constraints.
11. Many countries do not have comprehensive AEAS policies that are aligned with FAAP principles while countries that have AEAS policies are facing challenges in implementing them.
12. AEAS stakeholders do not share experience and do not have a common voice – work in isolation and uncoordinated.

13. The preconditions of AEAS effectiveness are not adequately addressed in CAADP investment plans and the technical review of CAADP implementation do not cover the AEAS comprehensively.

Recommendations

In the implementation of AEAS interventions in the S3A, AFAAS is going to be the lynchpin at regional level but its actions are going to be largely expressed at national level. It is therefore recommended that:

1. AFAAS should endeavour to assist countries to develop AEAS policies in the way that Kenya, Liberia and South Africa have done;
2. A pool of African experts who have been engaged in AEAS policy formulation processes should be put in place (under AFAAS) to facilitate processes in other countries;
3. AFAAS should be supported to build the capacity it needs to develop, sustain and deploy an AEAS facilitation team for CAADP technical planning and review;
4. Within the framework of CAADP and the S3A, AFAAS should be supported to facilitate the emergence and institutional development of country fora that bring AEAS actors together with one of their objectives being to advocate for AEAS policy implementation;
5. In its capacity as the continental body that is mandated to spearhead the integration of AEAS within CAADP and S3A, AFAAS should develop a strong communication, information and knowledge management capacity to enable country-level AEAS actors to share lessons, exchange experiences, and have an audible voice in dialogue on policy processes;
6. The technical reviews of CAADP should disaggregate research from AEAS and review them separately;
7. A critical review of current AEAS approaches and methods – especially value chain, innovation systems and ICT-base approaches – should be undertaken to deepen the assessment of how well they have enabled AEAS to integrate science and to be integrated into agricultural innovation systems;
8. AFAAS should develop communities of practice around all the approaches and methods being used and facilitate them to share experiences and cross-fertilise each other;
9. The FAAP principles should be re-framed so that they are explicit about integration of science into AEAS and of AEAS into agricultural innovation systems;
10. AFAAS should commission a study on lesson learning from the Ethiopian experiences on accelerated human capacity development for AEAS;
11. AFAAS should spearhead the development of a strategy and framework for promoting use of ICT in extension with the objective of enhancing the reach of AEAS and of increasing the efficiency of utilisation of the limited AEAS capacities in most countries;
12. AFAAS should engage with CAADP to ensure that capacity building of AEAS providers is strongly addressed in CAADP's current strategic theme on knowledge and knowledge management. There is a need for training and capacity building of field extension staff in

active teaching, learning, problem-solving, facilitation skills, communication skills, behaviour change and decision-making, leadership and group dynamics, principles and approaches of extension, monitoring and evaluation of extension and community and rural development. AFAAS should strengthen the links with GFRAS and the Consortium on Extension Education and Training;

13. AFAAS should take stock of how the AEAS in different countries in Africa and elsewhere are professionalising their AEAS. It should also begin to increase the awareness of the country AEAS fora on the need to initiate processes that would lead to recognition of AEAS as a science-driven profession requiring registration of AEAS providers.
14. The establishment of a pluralistic and coordinated extension model or structure becomes essential and AFAAS to support country fora in exploring possible models/structures such as the ATMA model in India. What is needed is a model that is decentralised, demand-driven and that consist of institutional linkages and structures for participatory extension.
15. AFAAS to investigate the possibility to support countries in Africa to develop the existing but also the future extension landscape of the participating countries (The South African example), and the recognition of extension as a profession and the professional registration of extensionists as professionals (South Africa example).
16. The five key areas for mobilising the potential of AEAS are:
 - i) Focus on best-fit approaches;
 - ii) Embracing pluralism;
 - iii) Using participatory approaches;
 - iv) Developing capacity; and
 - v) Ensuring long-term institutional support.

1 INTRODUCTION

The Forum for Agricultural Research in Africa (FARA) is the apex organization for agricultural research for development in Africa and the AUC/NEPAD mandated institution to lead implementation of Pillar IV of the Comprehensive Africa Agriculture Development Programme (CAADP) focusing on generation, dissemination and adoption of agricultural innovations. Under this mandate, FARA is leading the formulation of the Science Agenda for Agriculture in Africa (referred to as the Science Agenda or S3A). The S3A will articulate the science, technology, extension, innovations, policy, and social learning Africa needs to apply in order to meet its agricultural and overall development goals. It will identify a suite of issues and options for increasing and deepening the contributions of science to agriculture in Africa, at the local, national, regional and continental level. It is further expected to provide a basis for the alignment of national, regional and international research providers in coordinating their actions to meet the demands of African agricultural stakeholders. The S3A is one of the principal thrusts of CAADP's current strategic theme on knowledge and knowledge management.

FARA has already produced the S3A document (FARA, 2014) which is due for ratification of at the African Head of States Summit in June, 2014. Prior to this it has put in place several activities to deepen buy-in and ownership as well as enrich the contents of the S3A for implementation. One of these activities is to commission studies that will, firstly, provide status update - especially on institutional and policy aspects - that are key to the successful implementation of the S3A and, secondly, in gaps in literature on some of the issues that need to be fully understood prior to implementing the S3A. The studies will also identify where the international research providers will align into the country process and into CAADP. FARA commissioned this study on agricultural extension and advisory services (AEAS) to address these objectives in recognition that the AEAS need to be integrated into Africa's agricultural innovation systems (AIS) if they are to effectively play their role of facilitating the conveyance of information from researchers to farmers and other actors in the AIS. In particular it is recognised that, hitherto, AEAS have been poorly integrated with research and education.

The general objective of the study was set by FARA as: *"To analyse agricultural extension services in Africa as an important element of the science agenda for agriculture in Africa"*. The scope of the study was articulated as:

6. Take stock of agricultural extension and advisory systems and their current status and evolution in African member countries
7. Analyse how well AEAS are integrated into science and Africa's agricultural innovation system and how this has affected their performance
8. Review effectiveness of agricultural extension service delivery in Africa.

9. Analyse challenges and opportunities for delivery of these services
10. Identify the changes needed to increase the contribution of Africa's extension systems towards improving the application and development impact of science in agriculture

Currently the African Forum for Agricultural Advisory Services (AFAAS) is facilitating the coming together of AEAS at national, regional and continental levels. FARA has given it the mandate to spearhead issues of AEAS under CAADP. For this reason this study was conducted under the umbrella of AFAAS.

2 METHODOLOGY: ASSESSMENT AND ANALYTICAL FRAMEWORKS

The assessment is entirely based on desk review of literature. Most of the documents reviewed were obtained from the AFAAS library, the Internet and the Authors' archives. The content review of the literature was undertaken using the assessment and analytical frameworks that were developed by the Authors. These are outlined and rationalised in the following sub-sections.

2.1 Evolution of Extension

A comparative framework used by Tossou and Zinnah (2005) to stratify the evolution periods of AEAS – with some modifications - as follows:

- Period 1: Colonial and early post-colonial period (1940 – 1970);
- Period 2: Structural adjustment period (1981-1994);
- Period 3: Poverty reduction strategies period (1995 - 2005) and
- Period 4: Current period (2006 – to date).

Within these periods the AEAS characteristics that were assessed in this study were: goals and objectives, policies, extension model/approaches¹, extension methods², major actors, coordination (linkages/ partnerships emphasized), clientele, services rendered, and primary source of funding.

2.2 Integration of AEAS into science and agricultural innovation systems

The assessment of integration of AEAS into science and AIS is undertaken on the foundation of the definition of AIS as being *“A set of interrelated agents, their interactions, and the institutions that condition their behavior with respect to the common objective of generating, diffusing, and utilizing knowledge and/or technology”* (Spielman, 2005) and the conceptualisation of AIS by Arnold and Bell (2001) depicted graphically in Figure 1. The AEAS

¹ Some authors make a distinction between extension models and extension approaches but in this study no distinction is made. In this study both terms mean the institutional rules that inform and guide the delivery of AEAS e.g. transfer of technology, training and visit, farming systems, participatory etc.

² Extension methods are the technical ways of delivering the AEAS e.g. demonstrations, farmer field schools, contact farmers, etc.

are positioned within the intermediary domain of the system and their integration can be said to be their inter-connectedness within that domain and intra-connectedness with the other domains. The strength of the institutional linkages and knowledge flow systems determine the level of the connectedness in either case. What makes the AIS a system is that the overall functioning of the system is determined by the functional capacities of all the elements. These points are emphasised upfront because, for example, the ineffectiveness of the AEAS may not be due to inherent failure of the AEAS themselves but due to failures elsewhere.

In this study there is a dimension of how the AEAS are integrated with science in the broad sense – not just agricultural science. This can still be embraced by the AIS conceptualisation by appreciating that all the domains are underpinned by science. Hence the integration of AEAS in science can be said to be through the science content in the knowledge exchanges between the AEAS and the other aspects of the AIS. It is also recognised that all the domains are dynamic and new elements emerge all the time for instance ICTs and media as part of support structures.

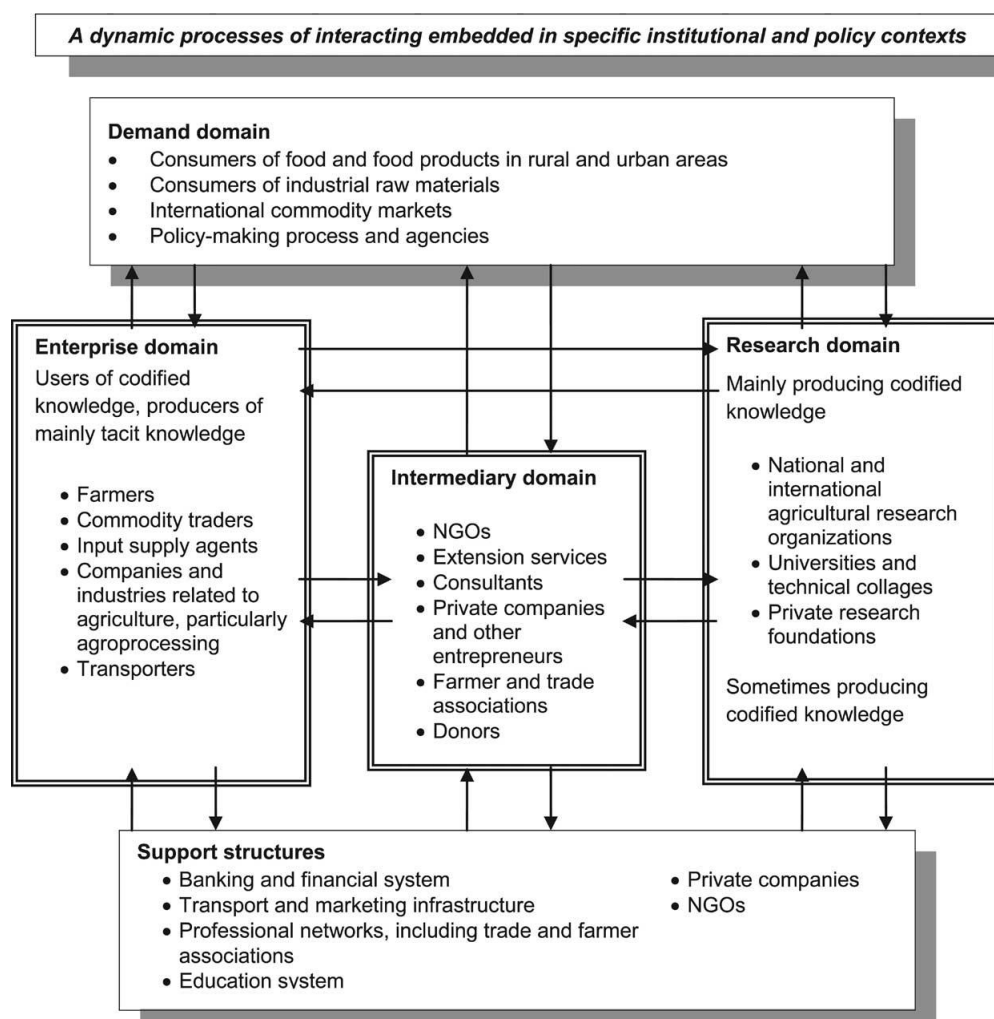


Figure 1: Elements of an agricultural innovation system. (Source: Adapted from Arnold and Bell, 2001; World Bank, 2006)

2.3 Assessment and analysis of effectiveness

Effectiveness is defined as the extent to which the program's objectives were achieved or expected to be achieved taking into account their relative importance. This definition was used as the basis for analysing literature on work that has been done to assess the extent to which AEAS have achieved the objectives expected of them. Generally, the objectives of extension programmes include increased production and eradication of poverty (Rivera & Amanor, 1991). For any extension model to be deemed effective it should be able to improve production and productivity (Rivera and Carry, 1998). Essentially the implication of these definitions is that while the primary outcomes/ results of AEAS may be in many domains - such as institutional and policy changes – the ultimate goal has to include poverty-reducing changes in production. Effectiveness of AEAS has to be assessed with an appreciation that there are preconditions and assumptions that have to be met for the AEAS to contribute to the attainment of these objectives. Birner et al. (2006), AGRA-AASR (2013); Asenso-Okyere and Jemaneh (2012) highlight appropriateness of method used, capacity and numbers of extension staff, the governance and management structures of the organisations delivering the services (preconditions) as well as underlying contextual factors such as the factors of production (farmland, water, and labour), agricultural inputs, the policy environment, enabling institutions, incentives, market access, diseases, characteristics of beneficiary communities and weather conditions (assumptions). **This assessment of the effectiveness of the AEAS includes a cursory analysis of the preconditions for performance of AEAS but does not delve into analysis of the assumptions for effectiveness.**

2.4 Identifying challenges and opportunities

The future challenges and opportunities for enhancing the effectiveness of AEAS delivery and the changes needed to increase the contribution of Africa's AEAS towards improving the application and development impact of science in agriculture were identified and analysed through the lens of the thrusts of the S3A. Effectively the S3A is seen, in this study, as the framework for integration of science and AEAS into interventions on agricultural innovation systems in the future. The analysis is therefore intended to gauge the alignment of the current thinking underlying the AEAS with the future aspirations for African science in agriculture, and to inform the design of interventions aimed at enhancing the integration of the AEAS into the S3A.

The immediate priority for the S3A is implementing the CAADP. This locks the S3A into the African agricultural innovation system because the goal of CAADP - *"To eliminate hunger and reduce poverty through agriculture"* - can only be achieved through interventions that embrace the whole agricultural innovation system. FARA has developed the Framework for African Agricultural Productivity (FAAP) as the tool to help stakeholders in implementing the CAADP Pillar IV. The FAAP lays out a number of guiding principles (Table 1) that articulate

the best practices that can be employed to improve the performance of agricultural institutions – including AEAS. Effectively the FAAP principles provide the framework for integration of elements of the African agricultural innovation system. Furthermore the principles can be aligned with the thrusts of the S3A (Table 1).

Based on the above the compliance of the AEAS with the FAAP principles is, in this study, used as the framework for identifying the challenges, opportunities and the related changes needed to increase AEAS effectiveness. The analysis focused on: (i) the national AEAS policies - with a hind look at the evolution of the AEAS as this has a policy dimension, (ii) the translation of current polices into CAADP investment plans, and (iii) the implementation of these plans.

Table 1: Alignment of the S3A Thrusts with the FAAP Principles

S3A THRUST	FAAP PRINCIPLE
1. Creating a favourable policy environment for the performance of science	i. Empowerment of end-users to ensure their meaningful participation in setting priorities and work programs for research, extension, and training to ensure their relevance;
	ii. Planned subsidiarity to give responsibility and control over resources for agricultural research, extension, and training activities at the lowest appropriate level of aggregation (local, national and regional);
	iii. Pluralism in the delivery of agricultural research, extension, and training services so that diverse skills and strengths of a broad range of service providers (e.g. universities, NGOs, public and the private sectors) can contribute to publicly supported agricultural productivity operations;
	iv. Integration of gender considerations at all levels, including farmers and farmer organizations, the private sector, public institutions, researchers and extension staff.
2. Research themes (that) connect science with needs and opportunities in African agriculture;	v. Evidence-based approaches with emphasis on data analysis, including economic factors and market orientation in policy development, priority setting and strategic planning for agricultural research, extension, and training;
3. Strengthening institutional systems of science for agriculture in Africa	vi. Integration of agricultural research with extension services, the private sector, training, capacity building, and education programs to respond in a holistic manner to the needs and opportunities for innovation in the sector (<i>Capacity issues are included here</i>)
	vii. Systematic utilization of improved management information systems , in particular for planning, financial management, reporting, and monitoring and evaluation;
4. Sustainable financing of the S3A	viii. Explicit incorporation of sustainability criteria in evaluation of public investments in agricultural productivity and innovation program (fiscal, economic, social and environmental);
	ix. Introduction of cost sharing with end users, according to their capacity to pay, to increase their stake in the efficiency of service provision and to improve financial sustainability;

3 EVOLUTION OF AGRICULTURAL EXTENSION AND ADVISORY SERVICES IN AFRICA

3.1 Introduction

This section of the report combines the findings and assessments relating to the following ToRs for the study:

1. Take stock of agricultural extension and advisory systems and their current status and evolution in African member countries
2. Analyse how well AEAS are integrated into science and Africa's agricultural innovation system and how this has affected their performance

This is done to avoid repetition because the integration of science into AEAS and of the AEAS into agricultural innovation systems can be assessed as variables along the AEAS evolutionary path. In the assessment framework for evolution of AEAS the integration of AEAS into science relates to the technical aspects of the approaches and methods, while the integration of AEAS into agricultural innovation systems relates to the linkages and partnership that are forged in the different approaches.

The reported findings are based on reviews of the histories of 24 countries³ from the study on the status of agricultural extension and rural advisory services by The Global Forum for Rural Advisory Services (GFRAS, 2014). In the following sections, these findings are fortified by other findings from literature

3.2 Colonial and Early Post-Colonial (1940 -1980)

3.2.1 General AEAS Characteristics

The general assessment from the review of the countries studied is that **the goals** and objectives of the AEAS in the colonial and early post-colonial period were to increase the production and productivity of exportable tropical products such as coffee, cocoa, tea, cotton, sugar, sisal and pyrethrum. For the peasant farmers this meant increasing area under cultivation otherwise the AEAS needs of the subsistence farmers for food crops and livestock were neglected. It was only when famine broke out that the colonial authorities introduced food crops such as sweet potato and cassava as crops to ensure food security. However, in the later part of this period, after many of the countries of Sub-Saharan Africa

³ **East Africa**-Uganda, Kenya, Rwanda, Tanzania, Ethiopia, **N. Africa**- N. Sudan, Morocco, Egypt, Algeria, and Libya; **Central Africa**- Democratic Republic of Congo, Central African Republic, Cameroon, Chad; **Southern Africa**- RSA, Botswana, Namibia, Swaziland, Mozambique; **W.Africa**- Benin, Ghana, Ivory Coast, Nigeria, Senegal

gained independence, the focus of the government owned AEAS widened to embrace increased agricultural (mainly food) production and spread the benefits of improved farming techniques more widely. Other reviews have made similar assessments (Birmingham, 1999; Picciotto and Anderson, 1997; Anderson, 2007).

The **funding** of the AEAS was by the colonial governments and after independence funding by bilateral and multilateral donors kicked in. In the countries studied the donors who surfaced most often were the International Fund for Agricultural Development (IFAD), United States Agency for International Development (USAID), Swedish Agency for International Development (SIDA), World Bank and the then United Kingdom Department for International Development (UKAID). However there were instances - such as in Libya – where the African governments funded their own AEAS.

In most countries **the clients** of the AEAS were the farmers producing commodities for export. In some countries the AEAS differentiated the clients. For instance, in Kenya the approaches used for settler and commercial farmers included well-packaged programs that combined extension services with credit and subsidized inputs. In South Africa, during the apartheid years the approaches used in the ‘white’ extension service pursued productivity and profitability whereas ‘Black’ extension services were operated with politically motivated, rather than developmentally motivated objectives (Worth, 2012). In Ethiopia during the imperial era extension services were mainly tailored to landlords, commercial farmers and only those small farmers who were around project areas.

During this period the **major actors** in the AEAS space were the agriculture-related ministries, departments and units in Government. Gradually the AEAS in some countries started to acquire some institutional independence. The extension system in Egypt was introduced as a formal service of the Ministry of Agriculture in 1953. In the Sudan (North) after independence in 1956, the government established agricultural extension services. In Ethiopia the agricultural extension system was started in 1953 and was modelled on the Land Grant College system of the United States⁴. It was transferred to the Ministry of Agriculture in 1963. In general the AEAS in this period were guided by the **policies** pursued by the governments in the different agricultural sub-sectors. Out of the 25 countries reviewed it was only in Sudan that a Non-Government Organisation (NGO) – *Plan Sudan* – was found to have been active.

3.2.2 Approaches and Methods

The transfer of technology (ToT) approach was used. The approach was partly premised on the assumption that technology would diffuse through the communities. The focus of the

⁴ <http://ohioline.osu.edu/lines/lgrant.html>

approach was on commodities but in the later stages of this period the whole farm was targeted and integrated agricultural development approaches started to emerge. Most of the countries reviewed attest to the fact that in the earlier part of this period the approaches were used coercively with no recourse to dialogue between farmers and extension workers. Hence farmers blindly responded to demands and standards set by the colonial governments. More persuasive and educational approaches started to be introduced after independence.

The methods used in this approach varied in the countries. For example Kassa (2008) narrates the evolution of methods in Ethiopia. As early as 1943, the ministry of agriculture in Ethiopia began establishing demonstration farms as the medium for ToT. Model farmers were later used to introduce innovation but, after legislation in 1978, they were replaced with service and producer cooperatives. The transition from this phase was initiated by (the unsuccessful) introduction of the Minimum Package Program in 1970 that aimed at providing smallholder farmers with minimum essential services for agricultural development including tested technologies, access to credit and market advice. In Kenya, training based in farmer and pastoralist training centers, whole farm extension, and the integrated agricultural development methods were used. In Botswana, Pupil Farmers Scheme and the Integrated Rural Development methods were used. In Libya farmers were contacted individually, and through contact farmers and cooperatives. In Egypt and Libya women farmers were contacted in groups. In other countries the other methods that were repeatedly noted were individual farmer contact, contact farmers and group contacts.

3.2.3 Services rendered and roles and functions of AEAS Providers

The **services rendered** were aligned with the objectives and included giving advice and dissemination of knowledge and technologies for cash crop production. This sometimes included comprehensive and minimum technology packages, credit and subsidized inputs (for white settlers). The AEAS services variously involved seed production, pest control, agro-processing, provision of capital and/or credit to both state and private sectors. At a broader level the AEAS contributed to adult education. The responsibilities of extension workers included training of farmers, setting up and managing, demonstration sites and organizing adult education meetings and agricultural youth clubs. In some countries they undertook research at the demonstration sites and disseminated the results through the AEAS system.

3.2.4 Integration of science into the AEAS

In this period the science content of the AEAS focused on the agricultural sciences needed to enhance production and productivity. The science originated from “experts” in government and was passed down in a top-down way to the farmers to “inform” and

“persuade” them to adopt technologies and practices (Haug, 1998; Botha and Stevens, 1999; Anderson, 2007).

3.2.5 Integration of AEAS into agricultural innovation systems

In this period, farmers, extensionists and researchers were viewed as three separate strata and the links between them were weak or non-existent. Indeed weak linkage between research and extension was identified as the major factor limiting the flow of information, knowledge, useful new technologies, and resources among actors in the technology-delivery-utilization system (Purcell and Anderson, 1997; Agbamu, 2000; Asiabaka, 2002; Belay, 2002, 2003; Van de Fliert, 2003; Anderson and Feder, 2004). **In this period there was little appreciation of the need to integrate the AEAS into the AIS.**

3.2.6 Effectiveness of the approaches used

In the colonial and early post-colonial period the approaches used for delivery of AEAS are generally adjudged as not having been effective as reflected by the low and unsustained adoption of technologies. Many reasons have been cited for this including:

- Absence of “smallholder-friendly” research findings (Wiggins, 1986; Röling, 1988; Jiggins, 1989; Chambers, 1993; Christoplos, 1996; Pretty and Chambers, 1993; Hagmann *et al.*, 1999).
- "Farmers' ignorance" or "resistance to change" for which the ToT is not the best method for overcoming (Chambers and Ghildyal, 1985; Chambers, 1993).
- A misconception that farmers can only benefit from innovations that are external to their farming systems and that they are “ignorant” i.e. they are empty vessels to be filled with knowledge and expertise (Opio-Odongo, 2000)
- Too little attention being paid to smallholder labour supplies, to the riskiness of the innovations, to the likely availability of inputs, or to the presence of markets and to the economic attractiveness of recommendations (Wiggins, 1986).
- The agricultural technologies accelerating the twin processes of resource degradation and selective impoverishment of women and the poor (Röling, 1988)
- Considering farmers as homogeneous mass and thus failing to categorize them into different groups with different resources, problems, opportunities and requirements (Röling, 1988; Jiggins, 1989; Chambers, 1993; Christoplos, 1996; Van de Fliert, 2003).
- Failure to recognize farmers’ indigenous knowledge as one of the most important elements in designing and providing effective and efficient agricultural extension services (Vanclay and Lawrence, 1995; Haug, 1998; Black, 2000; Murray, 2000; Van de Fliert, 2003).
- Reinforcing existing social inequalities within the farming population, since the producers benefiting most from the adoption process tended to be those better endowed than others in material, intellectual and social resources (Röling, 1988),

- Primarily benefiting those farmers in low-risk, natural and social environments, (Farrington, 1988; Jiggins, 1989; Tripp, 1991; Norman et al., 1995; Martin and Sherington, 1997).

3.3 Structural Adjustment Period (1981 – 1995)

3.3.1 General AEAS Characteristics

This period was marked by the introduction of Structural Adjustment Programs (SAPs) policies promoted by the World Bank and International Monetary Fund (IMF). The main theoretical premise of SAPs was that government interventions were inefficient because they distorted market signals (<http://thinkafricapress.com>). The SAPs policies that were directly linked to AEAS included reduction of government services, privatization, deregulation and decentralization (<http://www.who.int>).

The goal of the AEAS remained enhancing production and productivity. In many countries the higher objectives to which this goal contributed had dimensions of food security, income generation and poverty reduction. **The policy** guidance came from the general agriculture sector policies although in some countries – most notably Algeria, Senegal, Cameroon and Botswana - the policies were becoming more explicit on AEAS. The **funding** for AEAS predominantly came from donors with some in-kind contributions from the African governments. The **clients** of the AEAS diversified in this period to include smallholder farmers (cash crop and food crops), farmer groups, and producers associations

The outcomes of the SAP policies were far reaching with regards to the **actors** in AEAS. The policies opened the door for private sector, Non-Government Organizations (NGO) and Community-Based Organisations (CBOs) Faith-Based Organisations (FBO), Commodity Boards, Farmers' Cooperatives to fill the gap left behind due to reduction in public funding of the services. However, the central role of governments in delivery and funding of the services remained important. The government efforts were supported by donor/development partners. This was the time when the World Bank was actively expanding its support to AEAS throughout Africa. Other significant development partners that were noted included IFAD, African Development Bank (ADB) and the Food and Agriculture Organisation (FAO).

3.3.2 AEAS Approaches and methods

During this period the AEAS approaches and methods underwent fundamental transformation. Studies and analysis of the reasons for the low AEAS ineffectiveness of the AEAs in the previous periods pointed to the fact that the AEAS had primarily benefited resource-rich farmers and that the main reason why resource-poor farmers had been slow or unable to adopt recommendations was that the technologies were not sufficiently

relevant to their circumstances and their environment (Farrington, 1988; Jiggins, 1989; Chambers, 1993; Farrington, 1994; Christoplos, 1996) and their complex and diverse environments, circumstances and farming systems (Jiggins, 1989; Chambers, 1993; Gibbon, 1994; Norman et al., 1995). The major AEAS outcome of these studies/ analyses was the emergence of the Farming Systems Research/Extension (FSR/E) approach in the 1970s. The essence of the FSR/E approach is to develop and transfer appropriate agricultural technologies based upon a clear understanding of the existing farming systems and to do this with the participation of farmers taking the farm household as the principal unit of analysis (Gibbon, 1994).

During this period approaches that were intended to enhance the participation of farmers in the AEAS process and to empower them to demand AEAS also started to emerge. Many of the countries that were reviewed reflect this dimension. These participatory approaches dominated the following period of AEAS evolution and are discussed in Section 3.4.

Nevertheless the top-down approaches persisted in this period in the form of the Training and Visit (T&V) approach that was attached as a prescription to World Bank-supported AEAS programmes (OPEV, 2004) in 13 African countries. The T&V was aimed at inducing farmers to increase production of specified crops under close technical supervision and logistic support (Ponniah, et al. 2008). The T&V approach also promoted commodity approach to AEAS.

3.3.3 Services rendered and roles of AEAS Providers

The functions and roles of the AEAS providers stayed largely the same in the T&V-driven government funded AEAS. However, the format for delivery of services under the T&V was changed to the unified extension system. This meant that AEAS were brought under one umbrella. The roles of AEAS providers changed in the FSR/E approach and the participatory approaches from technology transfer to predominantly facilitating the demand discovery processes, priority setting and planning ending with feeding information on what innovations farmers adopted or rejected (and how and why) back into the research system (Farrington, 2002). The services rendered included farmer empowerment – and all the dimensions that it entails such as capacity building and farmer institution development.

3.3.4 Integration of science into AEAS

The science base of the T&V was narrowly focused on production and productivity as in the previous period. Another criticism cited by Ponniah, et al. (2008) was related to the inability of the approach to meet the widely varied needs of farmers with a single, inflexible technology package given its top-down orientation.

From a science perspective the FSR/E approach ushered the social and the environmental sciences into the science for agriculture. Furthermore, farmers' indigenous knowledge began to be appreciated. To implement FSR/E required different management approaches. Hence the approach also contributed to changes in the management and targeting of agricultural research and extension (Tripp, 1991). This broadened the sciences that were integrated into AEAS.

3.3.5 Integration of AEAS into agricultural innovation systems

The concerns in this period were more on the processes of enabling farmers to participate in problem diagnosis, setting the agenda and priorities for research and extension, testing of on-station research findings and providing feedback. Numerous weaknesses were associated with the FSE/R as outlined in section 3.3.5 below. In the main these weaknesses point to poor integration of the AEAS into AIS.

The T&V approach also encountered numerous criticisms related to failure to integrate AEAS into agricultural innovation systems. For instance, in Tanzania the approach was found to have created insufficient linkage to the provision of factors of production (e.g. input supply, credit, and access to market and market information); and to have failed to take into consideration the organisation and workings of traditional African agriculture where smallholder farms are scattered throughout the land, making extension service provision expensive (OPEV, 2004). Similarly, in Uganda the approach was found to have been overly centralized and bureaucratic. It also failed to establish an appropriate incentive and institutional framework that would enhance staff performance and accountability to the clients, in addition to its inadequate concern for sustainability (World Bank, 2012).

3.3.6 Effectiveness of the approaches

Despite years of FSE/R work, evidence of effectiveness is limited (Tripp, 1991; Gibbon, 1994; Biggs, 1995). Many reasons are cited for this outcome (Gibbon, 1994; Scoones and Thompson, 1994; Biggs, 1995; Purcell and Anderson, 1997; Farrington, 2002 and Swanson and Rajalathi, 2010). The reasons include: failure of the FSR/E approach to overcome the dominance of researchers in the processes; failure to strengthen farmer-extension- research linkages; failure to recognise the private sector and NGOs as important forces for development; failure to take on board policy issues; high cost of placing FSR/E teams in the field for long periods; weakness in addressing gender issues; poor focus on problems and potentials of the resource poor farmers; inability to find unconventional technological alternatives taking into account the complexity and diversity of prevailing agricultural systems; the tendency for researchers and their immediate collaborators to imagine that they can (on their own) quickly develop relevant research outputs that will positively benefit the lives of many rural people; limitations in the scope for scaling out the findings; and

FSR/E mainly concentrated on national food security rather than improving rural livelihoods of the poor, and thus enabling them to achieve food security.

3.4 Poverty Reduction Strategies Period (1995 – 2005)

3.4.1 Characteristics of the AEAS

In this period many African countries pursued development driven by Poverty Reduction Strategy Papers (PRSP). The PRSP were instruments used as the basis for planning development interventions that were supported by the IMF and the World Bank. As the name indicates, poverty reduction was at the **overarching policy** in national development. In the agricultural and rural development sectors the PRSPs were cascaded down to Agricultural Development Strategies (ADSs) and Rural Development Strategies (RDSs). In different countries the **goals** of AEAS were variously set within these strategies. Significantly food security appears to have been taken from the centre of these goals and emphasis was put on income generation – the assumption being that food security would be secured through enhanced incomes of producers. The sustainable livelihood approach to poverty reduction (Chambers & Conway, 1992)⁵ was introduced during this period and promoted extensively through the development assistance programmes supported by the Department for International Development (DFID) of the United Kingdom.

The deepening of the goals of AEAS led to extensive broadening of **the objectives** of the AEAS beyond production, and productivity to include farmer empowerment, increasing incomes, enhancing natural resource management, strengthening stakeholder linkages and partnerships among others.

In this period the broad **client** categories stayed largely the same but there was differentiation within categories. Within communities, farmers were not treated as a homogeneous group but differentiated by socio-economic characteristics such as women, youth, the poor, and the commercially oriented. Farmers' organisations were becoming strong at all levels – from national farmers' federations at national level to common interest farmer groups at community level.

⁵ According to these Authors, a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term.

The major changes in the **main actors** during this period were the deepened involvement of the private sector service providers in countries like Uganda that had taken steps to privatise AEAS delivery, the increased participation of farmers' organisations, research, and private sector value chain actors in the planning, monitoring and evaluation of AEAS services. This was most pronounced in countries where AEAS had acquired semi-autonomy from government such as the National Agricultural Advisory Services (NAADS) in Uganda and National Agency for Agricultural and Rural Counsel (ANCAR) in Senegal. Pluralism in AEAS deliver was hence ushered in.

The major **sources of funding** remained largely as they were in the previous period namely, African Governments and a wide range of donors/ development partners including the World Bank, USAID, IFAD, French African development fund, European Union (EU), ADB, IDA, FAO etc.

3.4.2 AEAS Approaches and Methods

As indicated previously, in the period that FSE/R approaches were being used and their limitations realised, farmer-centred approaches started to evolve. They were collectively referred to as participatory extension approaches (PEA). Black (2000) listed 32 participatory approaches practiced in the 1980s and 1990s. The PEA are broadly defined as a multi-directional communication process between and among extension staff and farmers, involving the sharing, sourcing and development of knowledge and skills, in order to meet farmers' needs and develop innovative capacity among all actors, in which farmers have a controlling interest (Chandrapatya, 2002). The key concepts that are attached to the PEA approaches are participation, demand-drive and cost-sharing on the basis of ability to pay.

One of the dominant methods that was added to the menu of methods used in the previous period was the Farmer Field School (FFS) method that started to be used in the previous period of AEAS evolution but intensified in this period. FFS are intended to facilitate groups of farmers to diagnose problems in their own fields, find out the answers for themselves and develop solutions. This method was promoted by many development organisations but most notably the FAO.

In addition to FFS, other training-based methods were used utilizing Farmer Training Centers (FTCs) and Agricultural Technical and Vocational Education and Training colleges (ATVETs). This period coincided with a big surge in the use of modern ICT in Africa – ranging from wide mobile telephone access to proliferation of private radios. The AEAS started to use these media albeit sluggishly.

3.4.3 Services provided and the role of AEAS providers

The role of the extension agent is to facilitate this process in which the farmers are the clients and the researchers are “technicians” in the joint experimentation and learning

process based on their knowledge of technical options available for the problems identified by farmers (Nagel, 1997; Hagmann, *et al.*, 1998; Anderson, 2007). Effectively, the PEA make extension more demand driven and more accountable to farmers hence ensuring that services are relevant and responsive to local conditions and meet the real needs of users (World Bank, 1995).

The PEA required a major shift in roles of agricultural extension workers from teacher - connecting researchers and farmers - to facilitator who has to be innovative in providing the methodology for the process, facilitating communication and information flow, and providing the technical backup and options (Christoplos, 1996; Röling and Pretty, 1997; Farrington, 2002; Birner *et al.*, 2006; Kahan, 2007).

In the countries that were reviewed the following appeared to be the new services that were added to the ones in the previous period: production and dissemination of extension materials, distribution of improved seeds and other inputs, monitoring the progress of extension, organizing farmers, transfer of environmentally sustainable and improved technology, managing distribution of inputs, and advice on access to credit and markets.

3.4.4 Integration of science into AEAS

The new sciences that the PEA integrate in AEAS are, therefore, process facilitation with the associated re-orientation of communication skills from teacher-to-student to service provider-to-client mode. In addition, the methods that evolved around the PEA can be recognized as having deepened the understanding of the determinants of community interactions and the need to appreciate that communities are not homogeneous and, therefore, they need to be disaggregated for targetting members by socio-economic category – most notably gender and poverty.

3.4.5 Integration of AEAS into Agricultural Innovation Systems

The review indicates that during this period there was a widening of linkages such that AEAS networked not only with academic and research institutes – an apparent strength of the T&V – but also with private sector actors, NGOs, input suppliers, farmers' organisations, and agro-processors. Linkage was put high on the networking agenda. This appeared to have triggered the genesis of the value chain and innovation systems discussed in the following period of evolution.

3.4.6 Effectiveness of the approaches

Early literature appeared to be converging on a consensus that, with reduced public sector funding, the participatory extension approach was proving to be the best means to improve sustainability-both of the benefits of investment in new technology and the extension service itself (Woodhouse, 1994; Hagmann, *et al.*, 1999; Opio-odongo, 2000). Röling and

Pretty (1997) argue that PEA was effective in disseminating improved technologies in many developing countries. Similarly, Picciotto and Anderson (1997) note that in both more and less-developed countries, farmer-led approaches to extension are spreading, while farmers' associations, cooperatives, and self-help agencies are contributing handsomely to the diffusion of modern technologies. Examples of PEA effectiveness that have been cited in literature are: in the development and spreading of soil conservation practices in Zimbabwe (Hagmann *et al.*, 1999); in pasture management technology generation and dissemination in South Africa (Botha and Stevens, 1999); in integrated soil fertility management in Kenya (Baltissen, *et al.*, 2000); in irrigation and water use projects in Zambia (Rivera, 2001); in FAO special program for food security in Tanzania (Rivera, 2001).

However there are some dissenting voices now emerging about the effectiveness of PEA approaches. An example is that of FFS. An estimated 12 million farmers have been trained since the late 1980s by FFS in over 90 countries across Asia, Africa and Latin America. However the effectiveness of this approach has long been a subject of debate and the consensus appears to be emerging that while FFS can change practices and raise yields in pilot projects, they have not been effective when taken to scale, diffusion has rarely occurred in practice and they are unlikely to be a cost-effective approach to extension, apart from possibly in cases of serious environmental damage from farming practices. For simple messages about good agricultural practices and dissemination of information, other approaches are likely to be more cost-effective (Waddington and White, 2014).

Farrington (1994), Cornwall and Jewkes (1995), World Bank (1995); Martin and Sherington (1997), Hagmann *et al.* (1999) and Black (2000) reviewed the challenges faced by the PEA. These include: relatively high costs of participation (particularly in terms of time) to smallholder farmers; lack of understanding and awareness of the long term outcomes of participation and the pursuit of short-term goals result in low community participation; community members have a tendency to "identify" problems that they believe are important in terms of encouraging donor participation; some groups suppress diversity and impose what has been called a 'tyranny of consensus', arbitrarily rejecting some potentially good ideas; extension agents, even experienced, often lack technical, communication and facilitation skills to respond to the emerging and rising needs of farmers; and there is often a tendency to leave out inaccessible, unorganized and marginalized groups by practitioners.

To the extent that the PEA approaches were successful, they amplified the farmers' voice as clients and started the migration from supply-driven to demand driven services. They can also be said to have strengthened farmer-extension-research linkages. However they did not integrate other innovation system actors into the farmer-centred processes. As such they did not strengthen agricultural innovation systems.

3.5 Current Period (2006 – to date)

3.5.1 General AEAS Characteristics

The current period can be characterized as being driven by homegrown national and continental development agendas. At the continental level the key driver is the CAADP whose **goal**, as stated previously is: *“To eliminate hunger and reduce poverty through agriculture”*. At the country level the drivers are the national agricultural development agendas which at the beginning of this period – and a bit before for some countries - started to align at different speeds from the PRSPs to the CAADP goal. The new **objectives** that have been added or strengthened in this period are: (i) to have private sector-led, client responsive and fully commercialized extension service, (ii) linking production with processing and marketing, (iii) to transform agriculture from subsistence to a commercial enterprise - farming as a business, and (iv) to strengthen farmer organisations and the technical capacities of producers.

Many countries do not have explicit policies to guide the AEAS (Oladele 2011). **The policies** that drive extension are, in many countries, still embedded within the policies for agricultural sector development. However some countries have distilled/ started to distill out explicit AEAS policies. Kenya, Liberia, Malawi and South Sudan have stand-alone agricultural extension (and advisory services) policies. South Africa has Government-endorsed Norms and Standards for Extension and Advisory Services in Agriculture and a final draft of the *National Extension and Advisory Services Policy* document is on the table for final approval and implementation. Uganda has an Act of Parliament from which the AEAS policies have been inferred. Rwanda has a National Agricultural Extension Strategy since 2009 and Mozambique has a National Extension Master Plan for 2007 to 2016. The extension policies for Ethiopia, Zambia and Zimbabwe are embedded in the Agricultural Sector Policies. Some of the policies are analysed in Section 5.1.1 from the perspective of challenges and opportunities for future AEAS evolution.

The major change in the AEAS **clients** is the inclusion of non-farm actors along value chains and the whole agricultural innovation system. In other words AEAS providers are expected to make knowledge from agricultural research available to value chain and innovation system actors as well as facilitating cross learning among the actors. This reflects the expansion of the research agenda to embrace value chain and innovation system constraints. The farmers are becoming more differentiated. For instance in South Africa they include large commercial farmers, medium commercial farmers, small commercial farmers, smallholder farmers and new small farmers who have started practicing following the land reforms. The needs vary, and emphasis of government AEAS also vary along the continuum.

There is pluralism with respect to actors now including mentors, and community based facilitators who play a key role in farmer to farmers transfer of knowledge. The interesting

dimension relating to the AEAS **actors** is the tension between finding quick ways of filling the gap in numbers of AEAS providers and professionalising the AEAS. In South Africa Extension is recognised as a profession and every individual who performs AEAS duties is expected to be a professional and AEAS providers can register with South African Council for Natural Scientific Professions (SACNASP) in five different categories depending on qualifications and experience. Registration for government and private extension advisors is mandated under the National Scientific Professions Act, 2003 (Act No 27 of 2003). Continuous Professional Development (CPD) of registered professional extensionists is mandatory. In contrast to this, Rwanda is piloting the use of voluntary extension workers as a means of facilitating wider access to AEAS (Government of Rwanda, 2009).

Funding for the AEAS is shifting from the predominantly free public extension services. The trend that many countries are likely to follow is set by Kenya. In its policy on AEAS the three modes of funding extension services are open: Model 1: offers free public AEAS to smallholder farmers engaged in growing staple foods and minor cash crops; Model 2: partial cost-shared provision of extension services where limited commercialization has taken place; and Model 3: fully paid AEAS provision for commercial agriculture (NASEP, 2012). In most countries the sources of funds for public extension services remain the national governments and donors. Alternative avenues – especially funding through social investors/entrepreneurs and crowd-funding – are not being pursued as vigorously as they should given their high potential for financing small projects such as those undertaken by farmers.

3.5.2 AEAS Approaches and Methods

The current approaches to AEAS delivery stem from the realisation that smallholder farmers face the core problem of low productivity combined with, among others, lack of market access, distorted market prices, inadequate market information, high transaction costs, shortage of working capital and underdeveloped and unreliable infrastructure (Bernet *et al.* 2005; Anderson, 2007; World Bank, 2007). The perceived way of overcoming this is through fostering linkages and alliances from production to consumption. Three interrelated approaches have emerged for attaining this, namely: value chain approaches, innovation system approaches and modern ICT approaches. These shall be the launching pads for AEAS in the impending S3A implementation.

A value chain is made up of a series of actors - from input suppliers, producers and processors, to exporters and buyers - engaged in the activities required to bring a product from its conception to its end use (Kaplinsky and Morris, 2001) The principal aim of the value chain approach is to reinforce business linkages and partnerships among the various market chain actors and thereby improve the performance of the chain and generate direct and/or indirect benefits to all the participants in the chain (Bernet *et al.* 2005; Bammann, 2007).

The history of the application of innovation system approaches in agricultural development was critically reviewed by Spielman (2005). The innovation systems approach was initially used as a framework for studying developing-country agriculture and agricultural research systems (Hall and Clark, 1995; Hall et al. 1998; Johnson and Segura-Bonilla, 2001; Clark, 2002; Arocena and Sutz, 2002; and Hall et al., 2002 & 2003). The common thread in the findings of these studies is the emphasis placed on the role of diverse actors and interactions within complex systems of innovation, and the institutional context within which these processes occur. The initial challenge in the application of the innovation systems approach was to develop practical methodologies for implementation. The Innovation platform has emerged as the remedy to the challenge. An innovation platform is defined by Nederlof et.al (2011) as consisting of a broad range of stakeholders who share a common interest and come together to solve problems and develop mutually beneficial solutions.

Currently the trend on the rise is the use of modern ICT in AEAS. Gakuru et. al. (2009) made a comprehensive inventory of projects in Africa that focus on delivery of information to farmers directly through the use of ICTs. The inventory includes projects that use voice information delivery services (e.g. call-in centres), radio, mobile phones and videos. From their assessment of the projects – most of which, they noted, were still in the pilot stages – they concluded that: *“There will never be a ‘one fit for all’ system. But the inventory suggests that systems which use a voice platform or audio files provide an innovative and promising entry point to farmer information while the other platforms (SMS) and web platforms remain essential to provide a back end offering more detailed information”*.

3.5.3 Services provided and roles of service providers

Rasheed & Davis (2012) have discussed the new roles and functions expected of AEAS in the agricultural innovation system and listed the following:

- Acting as a bridge linking the different bits of knowledge held by different actors;
- Promoting platforms/partnerships/ alliances/ networks, facilitating their interactions in the processes of developing, sharing and sustaining a common vision of their problems and opportunities – and the commitment to work together;
- Building trust among the diverse actors;
- Developing the capacities of other AEAS providers so that they are able to contribute better to the larger innovation goals;
- Fostering intra-AEAS collaboration (between public/ private/ NGO);
- Innovation process management including the formation and convening of innovation platforms, alliances and partnerships;
- Supporting social learning and dealing with dynamics of power and conflict;
- Brokerage (including resource mobilization) for ideas for innovation developed on the platforms;

- Taking a lead in identifying gaps in service delivery and in ensuring that these gaps are addressed;
- Promoting capacity development, collaboration and synergy between AEAS providers;
- Coordinating activities of diverse AEAS so that the resources are used most efficiently;
- Ensuring that the poor, small farmers, women, and disadvantaged farmers are also served well;

3.5.4 Integration of science into AEAS

Value chain approaches introduce new sciences in agriculture. These include institutional and organizational development, information and knowledge management, managing farm and non-farm businesses, identifying market opportunities, organizational and supply chain management, economic competitiveness, market intelligence as well as understanding the options for diversifying into alternative and higher value products (Van den Ban, 2005; Bammann, 2007; World Bank, 2007; Christoplos, 2008; Rajalahti *et al.*, 2008).

The innovation systems approach exposes the AEAS to a multitude of sciences. Depending on the problem at hand, stakeholders from any domain of the agricultural innovation system and beyond – for example health, education, policy, finance, information technology, gender, environment etc. - can come on the Innovation Platform and contribute to finding a solution from their scientific perspective.

South Africa is developing an approach that can ensure continuous integration of science in agricultural extension. The approach is based on periodically analysing the agricultural landscape to identify the specific extension concepts, study fields and essential skills and knowledge areas that every extension worker need, to successfully fulfill his/her task in a professional manner (Terblanche, 2008). The landscape is analysed at the following three levels:

- (i) Upstream level at which the science and agricultural science needed are determined;
- (ii) Extension level at which the sciences needed to deliver extension are determined; and
- (iii) Downstream level at which topical issues to which extension has got to respond.

3.5.5 Integration of AEAS into agricultural innovation systems

With regards to integration of AEAS into agricultural innovation systems, the value chains go a long way compared to the approaches used in the past that were farm and farmer-centred and/or production and productivity centred. However the integration is primarily focused on the enterprise, intermediary, and demand domains of the agricultural innovation system

(Figure 1). The innovation systems approaches have the potential to go beyond this and to bring science needed by AEAS from all the domains of the agricultural innovation system.

3.5.6 Effectiveness of the AEAS approaches

The indications from the literature are that value chain promotion replaces the traditional supply-driven and 'top-down' approach to public agricultural extension delivery by a demand-led approach with multiple providers (Van den Ban, 2005; KIT *et al.*, 2006; Anderson, 2007; World Bank, 2007). The approach focuses on enhancing the entrepreneurial and managerial abilities of market chain actors. In the discussion of the approaches by Christoplos (2008) and Rajalahti *et al.* (2008) the following weaknesses have to be mitigated against in the promotion of the approaches: failure to empower smallholders, failure to nurture stakeholder organizations, marginalising the poor, failure to clearly articulate and fund advisory services, and failure to garner policy support.

Nederlof *et.al* (2011) reviewed the work that was done using the innovation platform methodology in the facilitation of innovation in Tanzania, Rwanda and Zambia. The outcomes that arose out of the work were quite diverse and included policy influence, institutional changes and enhanced network capacities. FARA has also piloted the use of the innovation platform-driven concept in Burkina Faso, DRC, Kenya, Mali, Mozambique, Tanzania, Uganda and Zambia. Assessment of this work by Adekunle *et.al.* (2013) led to the conclusion that innovation platform impact positively on the lives of beneficiaries, delivers more benefits than the conventional research and development methods and can be scaled out beyond the areas of operation. However, it is too early to discern what the impact of innovation platforms has been on the effectiveness of AEAS. This points to the need for work that examines whether the innovation systems approach can be viably developed as an AEAS approach.

Rudgard *et.al.* (2011) examined the ways in which ICTs are helping transform extension, including the emergence of public and private innovators and startups with business models built around ICT- enabled advisory services. They examined how traditional and new ICTs are being used to reach rural communities, enable the creation and sharing of rural communities' own knowledge, and support connections of rural communities to markets, institutions, and other sources of information and advice. Their report strongly supports the view that the ICTs have the potential for enabling agricultural innovation systems to develop and function more effectively - and to enhance integration of science into AEAS - by their inherent properties of enhancing many-to-many interactions, communication, cooperation, and ultimately innovation among the growing array of actors in agriculture.

3.6 Conclusions on evolution of AEAS

The assessment of the evolution of AEAS points to the following as the defining characteristics of the status of the AEAS in Africa and therefore the launching pads for the S3A to engage with AEAS:

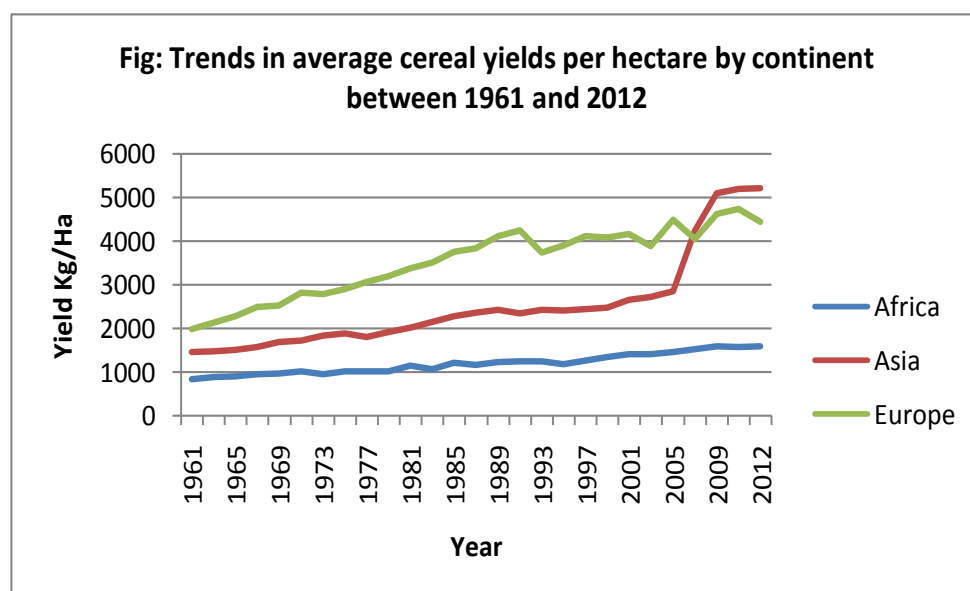
1. Expanded goals of AEAS that still maintain the core of increasing production and productivity but through impacts that do not only target technology adoption but do this in ways that address systemic social, economic and natural resource utilisation issues, engender farmer participation and ownership, and embed them in value chains and agricultural innovation systems;
2. The technical approaches and methods that are currently in use/ emerging through which the S3A can engage with the AEAS are the value chain, innovation system and ICT-based approaches;
3. The expanded roles and services that AES providers have to offer open the door for AEAS to be integrated into science not just agricultural science and to enhance the integration of the AEAS into agricultural innovation systems;
4. The roles and services that AEAS providers play changed from training farmers to facilitating them to make their own choices and to link them to actors within value chains and innovation systems;
5. The providers of AEAS have become very diverse and now include non-public actors;
6. One of the challenges that has been faced in all the phases of AEAS evolution is ensuring equity in the delivery of AEAS to all client categories. All AEAS interventions have to be explicit in ways in which this challenge is to be addressed;
7. Future evolution of AEAS has to include ways of equipping the AEAS providers with the necessary knowledge and skills, keeping them updated and ensuring quality of service provision;
8. The increasing complexity in all dimensions of AEAS requires that robust policies that address AEAS in a comprehensive manner are formulated and implemented;
9. The desire of countries is to evolve funding mechanisms that include private sector and commercial funding. The funding route through social investors and crowd-funding mechanisms although not mentioned in the literature should also be considered.

4 ASSESSMENT OF THE EFFECTIVENESS OF AEAS IN AFRICA

4.1 Overview of Agricultural productivity in Africa

Empirical evidence suggests that agricultural production and productivity in Africa lags considerably behind that of other continents and is below the region's potential (Staatz & Dembele 2007; AGRA-AASR, 2013 and World Development indicators, 2014). Figure 2 illustrates the trends. It is noteworthy that some countries - most notably Malawi, Ethiopia

and Rwanda - have performed well (Wiggins & Leturque, 2010; AGRA-AASR, 2013). In the period 2008 – 2012 South Africa, Mauritius and Egypt had cereal yields levels that match those in Asia and Europe (above 4 metric tons per hectare). However, during the same period Botswana, Namibia, Mozambique, Niger, Sudan, Somalia, Lesotho, Eritrea, Angola, DRC, Libya, and Congo Republic recorded average cereal yields of less than 1 metric ton per hectare.



Source: Author computation using World Development Indicators⁶ data.

4.2 Impact Assessments

4.2.1 Agricultural productivity and livelihoods

Results of most agricultural extension program impact evaluations depict a positive impact of AEAS on agricultural productivity in Africa. A review by Taye (2013) found that 15 (71%) out of 21 impact evaluation studies reported positive and significant impacts on knowledge, adoption, and productivity. Similar findings were reported by Birkhaeuser *et al.* (1991), who found that of the 48 impact studies of extension reviewed 36 (75%) showed significantly positive results. According to the International Evaluation Group (2011), impact evaluations for more than half (55 percent) of agricultural interventions report positive impacts. In terms of the outcomes targeted, a similar number of interventions aimed at improving yields and farm household income, but interventions focusing on yields had higher reported success rates. The studies show high rates of return to extension in the range of 13% – 500%, implying that it is a cost-effective way to improve farmer productivity and income.

⁶ <http://data.worldbank.org/data-catalog/world-development-indicators>

In Ethiopia, Dercon et al. (2008) reported that receiving at least one extension visit reduces headcount poverty by 9.8 percentage points and increases consumption growth by 7.1 percent. Similarly, Kidanemariam al. (2013), found that the Integrated Household Extension Program in Northern Ethiopia, had a large positive impact on household welfare – increasing income by about 10 percent – and on investment and income diversification. Bolwig et al. (2009) noted that participation in the extension program and use of the technology led to increased farm revenues among coffee farmers in Uganda. Likewise Benin et al (2011), and Okoboi et.al (2013) reported that farmers who participated in the National Agricultural Advisory Services (NAADS) in Uganda had better welfare depicted by relatively higher consumption expenditures than their counterparts that were non-NAADS. In Ghana, an intervention that distributed new varieties of cocoa to farmers resulted in a 42 percent yield increase. In Kenya an intervention that demonstrated top-dressing fertilizer in western Kenya showed farmers that productivity gains were possible when the right amount of fertilizer was used. Membership in burley tobacco clubs in Malawi, where farmers are interlinked with various actors in the supply chain, had a positive impact on productivity- yields increased by 40–70 percent- and income due to higher premiums at sales auctions (IEG 2011).

The impact record of the extension services on farmers' outcomes is mixed and highly dependent upon the type of program and context (Evenson 2001; and Anderson and Feder 2007). Evidence from impact evaluations in Africa reveals that the effectiveness of various agricultural extension models is context specific. For instance, a review of T&V extension models in five countries in Africa found that the approach had somewhat satisfactory effect in three countries - Kenya, Somali and Zimbabwe - whereas it had an unsatisfactory effect in Ivory Coast and Rwanda (Purcell and Anderson, 1997)

The Uganda National Agricultural Advisory Services (NAADS) was reported to have positive impact in terms of availability of services but there was no significant difference in terms of increased use of improved technologies, yield growth and sales by households (Benin *et al* 2007, Benin *et al.* 2011; and Okoboi *et al.* 2013). Similarly, Davis *et al.* (2010) found that Farmer Field Schools projects in Kenya, Tanzania and Uganda improved production, productivity and household incomes but differences were seen between countries. The projects brought significant change in terms of productivity and income in Kenya and Tanzania as well as at overall project level whilst it had non-significant impact on the same variables in Uganda. Romani, (2003) reported mixed impacts of extension in Côte d'Ivoire where food crops production benefited significantly from extension services while the analysis did not show any significant impact of extension on the production of export crops.

However some of the impact evaluation studies have also produced contradictory results in the same country. For instance in the review by Taye (2013), Ayele *et al.* (2005) and IFPRI

(2008) reported a positive and significant effect of extension in Ethiopia, another study conducted by EEA/EEPRI (2006) asserted that the Ethiopian extension programme suffered from various problems and its impact on farm income, productivity, food security and poverty was not significant. Likewise in Mozambique, Walter *et al.* (2004) reported that agricultural extension had a negative and statistically insignificant impact on individual and household income while ECON Analysis (2005) rejected this finding and reported that extension services in Mozambique had positive effects on rural livelihoods through promotion of new varieties, inputs such as natural pesticides and soil conservation practices.

4.2.2 Impact of AEAS on adoption of technologies

Adoption of improved technologies and practices is a prerequisite for improving productivity. However data on adoption of improved agricultural technologies reveal low levels of adoption in Africa. For example, by 2000, adoption of modern varieties of maize was estimated to be 17 percent of total area harvested in sub-Saharan Africa compared to 90 percent in East and South East Asia and the Pacific, and 57 percent in Latin America and the Caribbean (Gollin et al. 2005). According to AGRA-AASR (2013), overall adoption rates of improved maize varieties in 12 African countries average at 28% of total area harvested.

4.3 Assessment of preconditions

4.3.1 Coverage of extension services:

For an extension model to be effective it should not only lead to increased production and productivity, but it should be readily available and accessible (Chambers, 1990). Evidence from literature suggests that only a small proportion approximately 30% of the farming population is reached. For instance in Uganda the NAADS program was noted to reach only 27% of the farming households (Okoboi et al. 2013), similarly Akpalu (2013) reported that only 38% of farmers in Limpopo province of South Africa were accessing extension services. Inability of many farmers to access or be served by the Agricultural Development Centers due to lengthy travel distances was cited as a key challenge of extension services in Namibia (WWES 2011). A review by Ragasa et al (2013) in DRC reveal that only 17 percent of the sample villages reported having had visits from any extension agent or development worker between 2009–2010 while a majority (87 percent) of communities and farmers were underserved due to absence of active public agricultural extension system.

Extension systems and delivery methods in many developing countries have been constantly viewed ineffective in responding to the demands and technological challenges of various types of clients and in reaching the rural poor (Rivera, Qamar, and Crowder 2001; Davis 2008; Birner et al. 2009). Hence there is exclusion of farmers as the majority of the farmers do not have access to the services of extension officers. The situation is even worse with

regards to women farmers with only 5-7% receiving AEAS. Evidence from assessments has shown that rural extension and advisory services in Africa are rarely relevant to women farmers (Jiggins et al., 1997; Swanson & Rajalahti, 2010). There is a problem of elite capture in AEAS. The WWES, (2011) reports that in Swaziland, extension work has often been to the advantage of large, cash crop farms, and is less effective for smaller, diversified operations. Okoboi et al 2013, and Benin et al 2011 report a lower participation rate of vulnerable households in Uganda (households headed by women, young people and People living with Disabilities) in the NAADS program. In DRC the public extension workers largely serve the large scale farmers (Ragasa et.al 2013). In Cameroon it is noted that a recent trend, as well as in other countries of Sub-Saharan Africa, has been the increased channelling of extension services through more commercialized farmer organizations, which tend to be less inclusive of small scale and women farmers (Swanson and Rajalahti 2010). However innovative extension programmes are effectively reaching and benefiting poor people, especially women and people with low literacy levels (GFRAS 2012)

4.3.2 Number of extension workers

Literature suggests that the number of AEAS workers/extensionists in Africa is inadequate. Swanson (1990) reported that there were 58,958 extension services workers in Africa, based on a survey done for FAO in the late 1980s. However, according to Sasakawa Global, in the mid-1990s there were about 150,000 extension services workers in Sub-Saharan Africa from the private, public, and civil-society sectors (Davis et al. 2013). While there is no good idea of the current continental ratio of extension services agents to farmers the indication from literature is that the ratios vary widely across countries. For instance in Ethiopia due to a series of reforms and investment in agricultural extension systems the ratio in that country is 1:476. This is comparable to that of South Africa (1:487, (Akpale 2013)). Examples of ratios in a sample of countries include: DRC (1:535), Kenya (1:949), Ghana (1:1500), Uganda (1:2500) farmers in Uganda and Nigeria (1:3333) (Ragasa et al. 2013).

4.3.3 Governance, Management and Incentives

Literature indicates that inadequate performance of public extension in Africa is partly attributed to poor governance, management and incentives for extension agents. Anderson and Feder (2007) assert that in most public systems, AEAS agents are nominally accountable to their superiors (who may not be attentive to effective supervision) and are only indirectly (if at all) accountable to their farmer-clients. Extension officers and systems often lack on-the-ground supervision by managerial staff including inadequate incentives for good performance, all of which result in poor productivity and low morale. Low budget allocated for public extension services, late disbursement of funds irrespective of the growing season; lack of reliable means of transport to reach the farmers, limited logistical support for carrying out activities, and low salaries affect moral and hamper implementation of planned activities (Elifadhili 2013; Ragasa et.al. 2013).

4.3.4 Knowledge and skills of extension service providers

The AEAS providers' knowledge and technical skills are preconditions for effectiveness of extension services. Davis and Kroma (2013) note that probably this is the most critical issue in AEAS delivery today. Most AEAS staff lack the knowledge and skills required to work in the complex and rapidly changing agricultural environment. The skills of extension staff in many developing countries were built on a weak general education on which was built university-level agricultural education that was geared towards generic technology messages rather than the more specific and localized issues that farmers tend to identify as their priorities (Feder et al. 2010). Extension services agents typically are trained in the theory of technical issues - such as animal or crop production and natural resource management – with little practical exposure (Angsreitch & Zinnah, 2007; Davis et al., 2008). Their knowledge is also deficient in areas needed for value chain and innovation systems development. Many authors have alluded to, among others, the knowledge and skills deficiencies in communication, management, problem solving for technical issues, financial management, market issues, farm management and leadership (ANAFE, 2011; Akpalu, 2013; Okoboi et al. 2013; Hanyani-Mlambo, 2002; GFRAS WWES, 2012).

4.3.5 Access to sources of knowledge and continuous professional development

The AEAS are dynamic and require that AEAS providers are continuously retooled and have access to new knowledge. For example, Birner et al. (2006) have asserted that institutional pluralism and farmer participation are important conditions for effective extension services but it requires new skills, which allow field and administrative staff to manage complex relations among a wide set of partners. The shift towards participatory extension approaches that focus on innovation systems require extension and advisory services agents, organizations, and systems to have capacity to perform a range of innovation management functions (Davis and Kroma 2013). They should have technical and functional capacity to promote new agricultural technologies, apply participatory approaches, help organize producers, understand markets and value chains, and address new forms of climatic, social and economic vulnerability (Sulaiman & Davis, 2012). Tahseen et.al (2014) contend that the role of agriculture extension in the context of the women's empowerment framework is to connect structure with agency through effective relationships and partnerships with both male and female farmers. All these new roles call for mechanisms for fundamental reorientation of the existing field staff.

4.4 Conclusions on effectiveness

Evidence from literature suggests that AEAS can have positive impacts on agricultural productivity and poor people's livelihoods but the variation of the impacts - even when the same approach is analysed - points to the variability to which the assumptions for effectiveness are met in different circumstances. This validates the common adage currently

used in reference to AEAS that there is no one-size-fits-all approach to AEAS. There are intrinsic causes of poor effectiveness such as gender blindness in AEAS (GFRAS 2012; Tahseen et al. 2013; Akpalu 2013; and Okoboi 2013), intermittent and insufficient funding, poor governance and management of AEAS, low incentives for AEAS providers, insufficient numbers of committed extension which led to limited coverage, low level of training of a large proportion of extension staff and limited opportunities for continuous professional development in the light of a very dynamic and diverse demand on the AEAS. Over and above all these causes is the low coverage of extension which is currently reflected in the low extension to farmer ratios. While it may not be possible in the short term to increase the numbers of AEAS providers, ways have to be found for utilising the few that are available more efficiently. The most immediate mechanisms for achieving this would in all probability include intensification of modern ICT usage in AEAS.

5 CHALLENGES AND OPPORTUNITIES

5.1 Identification of issues underlying the challenges and opportunities

5.1.1 Issues related to AEAS evolution and current policies

The national AEAS policies of eight countries ⁷ (Ethiopia, Kenya, Liberia, Malawi, South Africa, South Sudan, Zambia, Zimbabwe) were analysed for alignment with the FAAP Principles. The assessment is summarised in Table 3.

Table 3: Assessment of the alignment of extension policies with FAAP Principles in eight African countries

FAAP PRINCIPLE	Assessment of explicitness		
	Silent/ not clear	Poor/ weak	Good/ strong
i. Empowerment	3	0	5
ii. Subsidiarity	2	1	5
iii. Pluralism	2	1	5
iv. Integration of gender	2	0	5
v. Evidence-based approaches	2	1	5
vi. Integration (partnerships and linkages) (<i>Capacity issues are included here</i>)	2	1	5
vii. Utilization of management information systems	3	2	3
viii. Explicit incorporation of sustainability criteria	2	1	5
ix. Introduction of cost sharing with end users	4	0	4

⁷ These were the countries for which the African Forum for Agricultural Research on Africa (AFAAS) had documented policies published by Governments. Benin has a policy which is in French and could not be translated in time for this study. Ghana evidently has an extension policy for which an undated and unreferenced PowerPoint Presentation was availed but could not be used for this study because its source was unknown and the policy was not on the Internet.

Within the limitations of the small number of countries studied, the trends that the analysis of the policies reveals is that the level of explicitness of the policies in addressing the FAAP principles is generally good for countries that have stand-alone extension policies/ guiding principles/ Acts. Kenya and South Africa were fully aligned with all the FAAP Principles and provide good examples of what could be considered best practice in extension policy articulation. Uganda exemplifies a situation in which the policies have been embedded in an Act of Parliament - and therefore embedded in law.

With regards to the qualitative attributes, the policies are tending towards aligning with FAAP principles. The weak areas appear to be systematic utilization of improved management information systems and - if silence of the policy on an issue reflects not being aware of its importance - introduction of cost sharing with end users.

5.1.2 Issues relating to the AEAS in National CAADP Investment Plans

The CAADP implementation at national level is initiated by participatory processes (termed CAADP round tables) national levels key players come together to assess the realities of their own particular situation and develop a road map for going forward. These processes lead to the identification of priority areas for investment through a 'CAADP Compact' agreement that is signed by all key partners. Following the signing of their compacts, countries develop their CAADP country investment plans/ national agricultural investment plans. The national investment plans of ten countries⁸ were reviewed in this study. The countries were selected on the basis that they had investment plans that had been technically reviewed through a CAADP process (next section). Table 4 summarises the ways in which AEAS have been embedded into the Investment Plans in the ten countries reviewed.

Table 4: The AEAS in Agriculture Sector Investment Plans in 10 countries

Country	Agricultural Extension and Advisory Services in the Investment Plans
Ethiopia	The Ethiopia's Agricultural Sector Policy And Investment Framework (PIF) 2010-2020 (Federal Democratic Republic of Ethiopia, 2010) has four strategic objectives (SO). The AEAS are extensively referred to in the first SO that addresses sustainable increase in agricultural productivity and production, but there is no explicit priority investment area addressing the AEAS although the PIF expresses a commitment in the PIF to train and deploy at least three development (extension) agents to each of the 18,000 <i>kebeles</i> - the smallest administrative unit of the country.
Gambia	Gambia National Agricultural Investment Programme (GNAIP) has six Programmes one of which is on development of agricultural chains and market promotion. Provision of agricultural extension services is an activity under the sub-component on developing of

⁸ The countries reviewed were Ethiopia, Gambia, Ghana, Kenya, Liberia, Malawi, Nigeria, Sierra Leone, Uganda and Zambia.

	food processing chains that focuses on food crops that have comparative high market potentials at domestic, regional and global levels. The Programme has a budget that is 2.6% of the total budget but the portion of this that goes to agricultural extension is not stated.
Ghana	Ghana's Medium Term Agriculture Sector Investment Plan (METASIP) has six (6) strategic programmes one of which is: <i>"Science and technology applied in food and agricultural development"</i> . Within this programme there is a sub-activity on "Uptake of technology along the value chain and application of biotechnology in agriculture". The sub-activity has a budget that is 0.1% of the total budget although the strategic programme in which it is embedded has 3.4% of the budget – most of which goes to Management of Agriculture Research Information under which the AEAS would presumably benefit.
Kenya	The Kenya Agricultural Sector Development Strategy: Medium Term Investment Plan (MTIP) 2010 – 2015 (Government of Kenya, undated) has six priority investment interventions of which one is: <i>"Reforming and improving delivery of agricultural services and research"</i> . The MTIP explicitly states that this intervention is most strongly linked to CAADP Pillar IV. The investment area is allocated 1% of the total MTIP budget,
Liberia	The Liberia Agriculture Sector Investment Programme [(LASIP), (Government of Liberia, Undated)] has four sub-Programmes. Technology Dissemination and Adoption is an activity under the Sub-Programme on Institutional Development. The allocation for the activity is 2.9% of the total budget.
Malawi	The Malawi Agriculture Sector Wide Approach Programme (ASWAp) has an explicit focus area on Agricultural Research and Extension Services, under which it has a component on: <i>"Efficient farmer-led extension and training services"</i> that has a budget allocation that is 5.8% of the five year budget.
Nigeria	The Nigeria National Agricultural Investment Plan – 2009 – 2012 [(NAIP) (Federal Republic of Nigeria, 2010)] five core components. The AEAS are not an explicit sub-component of any of the core components but are mentioned where they shall be needed/ addressed. However, the NAIP Results Framework has a general outcome of: <i>"Adoption of appropriate and efficient technologies"</i> and one of the associated results leading to this outcome is: <i>"Achieve an efficient agricultural extension delivery system which includes extension worker farmer ratio of 1:500 by 2020"</i> . No specific budget for AEAS
Sierra Leone	The Sierra Leone National Sustainable Agriculture Development Plan 2010-2030 (Government of Sierra Leone, 2009) which was adapted by the Sierra Leone CAADP Compact has four inter-related Sub-Programmes. Under the Sub-Programme on Commodity Commercialization there is a specific activity: <i>"Strengthen research and extension capacities following FARA's innovation platform methodology for participatory research and extension techniques"</i> . The budget for this activity is not crystallised out from the budget for the Sub-Programme
Uganda	Uganda's Development Strategy and Investment Plan [(DSIP, MAAIF 2010)] explicitly lays out how the CAADP principles will be implemented by the Ministry of Agriculture and its agencies. Advisory and extension services is one of the 22 DSIP sub-programmes with a provision of 26.7% in the five year budget – the highest for any component and is more than double the provision for the next ranked sub-programme – is technology development – with 12.6% of the total budget.
Zambia	The Zambia The National Investment Programme [(NAIP), Government of the Republic of Zambia (2013)] will have a total of seven investment programmes. CAADP Pillar IV is

	covered under two Programmes: (i) Agricultural production and productivity improvement, and (ii) Key knowledge support services. There is an activity on “ <i>Enhancement of the extension service delivery systems</i> ” that has an allocation of 4.5% of the total five year budget.
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The AEAS feature in all the national agricultural development/ investment plans. The variation is in the emphasis and contextualization of the AEAS within the plans. From the S3A perspective, Ghana has the best contextualized plan in which the AEAS (uptake of technology with specific mention of application of biotechnology) are explicitly tethered to science and technology.

From the perspective of emphasis, of the countries analysed, Kenya, Malawi and Uganda are examples of high emphasis of AEAS in agricultural development investment plans – with the AEAS being a sub-programmes/ priority investment areas of their own within the plans. A high level of emphasis is also indicated in the area of capacity development for AEAS by the Ethiopian investment plan. In the rest of the countries the AEAS are activities under broader sub-programmes - Nigeria representing a case where the AEAS are most obscurely addressed.

5.1.3 Issues arising from technical reviews of CAADP Pillar IV implementation

The National CAADP investment plans, once formulated, undergo technical review led by the African Union, the NEPAD Planning and Coordinating Agency, and CAADP Lead Pillar Institutions. With regards to the CAADP Pillars, the review seeks to establish whether the investment plan includes the adoption of best practices and inclusion of core program elements. The main tool used for review of Pillar IV is the FAAP. Hence the analysis of implementation status and the associated opportunities, challenges and changes that are needed is based on the CAADP technical reviews. The analysis of the technical reviews of eleven countries⁹ was undertaken and is summarized in Table 5.

⁹ The countries whose CAADP Technical Reviews were analysed were: Benin, Ethiopia, Gambia, Ghana, Kenya, Liberia, Malawi, Nigeria, Sierra Leone, Uganda, Zambia

Table 5: Alignment of S3A Thrusts with FAAP Principles and overview of reviews of AEAS in CAADP performance assessments in a sample of 11 countries

FAAP PRINCIPLE	With respect to agricultural extension and advisory services, % countries for which reviews are		
	Silent/ not clear	Poor/ weak	Good
i. Empowerment	4	4	3
ii. Subsidiarity	6	1	4
iii. Pluralism	6	2	3
iv. Integration of gender considerations	6	2	3
v. Evidence-based approaches	5	5	1
vi. Integration (linkages & partnerships) (<i>Capacity issues are included here</i>)	1	9	1
vii. Utilization of improved management information systems,	0	9	2
viii. Explicit incorporation of sustainability criteria	5	4	2
ix. Introduction of cost sharing with end users,	6	4	1

The technical reviews reflect the extent to which the AEAS policies (where they exist) and FAAP principles are translated into actions in the investment plans. Unfortunately the technical reviews were silent or not clear on many aspects of the FAAP in many of the plans. It is difficult to interpret this finding other than that the reviews were not done as systematically against the FAAP principles as the CAADP implementation process demands. To the extent that the reviews did examine the alignment of the plans with the FAAP Principles the review of the Uganda plan noted that the research and extension programmes are: “.... exemplary in Africa for the extent to which, in most respects, they are aligned with the principles advocated by the Framework for Pillar 4 (the Framework for African Agricultural Productivity – or FAAP)”. At a conceptual level the Uganda Plan can be taken as an example of good practice in aligning AEAS plans with FAAP Principles.

5.2 Challenges and opportunities

The challenges and opportunities are distilled from the review and the identified issues in Table 6.

Table 6: Challenges and opportunities derived from the review and analysis

Challenge	Opportunity
<i>From an evolutionary and policy perspective</i>	
Building on past experiences and lessons	AEAS actors coming together under national and continental fora (AFAAS) to share experiences and lessons and to advocate for policies
Lack of explicit policies on AEAS	Examples of good practice (e.g. Kenya) with expertise in policy formulation that other countries can draw on
Poor policy implementation	AEAS actors under AFAAS fora having a collective voice to advocate and advise on policy implementation (e.g. currently in Uganda)
<i>From an CAADP Investment planning perspective</i>	
Ensuring that AEAS are adequately addressed into CAADP investment plans and that FAAP principles are integrated into the operational plans	AFAAS has built capacity to support countries on how to integrate AEAS considerations in investment plans
Dealing with externalities that underlie assumptions and preconditions	CAADP investment plans address the externalities that impede effectiveness of AEAS
Low investment in some countries	AFAAS advocacy for investment in AEAS
<i>From an implementation perspective</i>	
Integrating AEAS into innovation systems and knowledge systems	Approaches being developed e.g. the Innovation Platform Approach that has been piloted by FARA
Poor capacity to deliver (human, financial, operational)	Enhanced awareness that AEAS can be effective in improving productivity and improving livelihoods but that poor capacity is a major contributor to low AEAS effectiveness can be used to lobby and advocate for increased investment
Use of evidence-based approaches	Use of FAAP principles, examples of good practice, and the S3A focus on integration of science into AEAS
Incorporation of sustainability criteria	Use of FAAP principles, examples of good practice, sustainable intensification of agriculture as a new paradigm
Utilisation of improved information management systems.	Proliferation of ways of using ICT for all aspects of management and information management
Retooling AEAS providers and ensuring their continuous professional development (CPD) and access to new knowledge	Regional/ Continental bodies such as RUFORUM AFAAS and ANAFE capable of identifying CPD needs and designing programmes for addressing them
Poor governance and management	Increased demands for stakeholder participation in governance and management accountability – FAAP principle
Diverting AEAS from their core functions and elite capture of AEAS programmes	Pluralism in AEAS delivery possibly opening doors for alternative funding mechanisms that protect AEAS

6 CONCLUSIONS AND RECOMMENDATIONS ON WHAT NEEDS TO CHANGE

6.1 Preamble

This study was intended to provide AEAS levers and entry points for operationalizing and implementing the S3A at country and regional levels - through CAADP in the short term and through the themes of the S3A in the long term (Rukuni, 2014). The hypothesis underlying the logic behind the Terms of Reference for the study was derived by the authors as:

“The contribution of the AEAS to the S3A would require them to take a future evolutionary path that builds on the lessons learnt on past evolution of AEAS and their effectiveness in Africa but weaves them into science and agricultural innovation systems”

Hence the analysis of the AEAS evolution and the integration of science as well as the observed effectiveness along the way was used to arrive at challenges and opportunities that have to be addressed if the AEAS are to make their expected contribution to the implementation of the S3A. The conclusion and recommendations on what has to change are therefore made - based on the identified challenges and opportunities – against the background of the derived hypothesis.

In the implementation of AEAS interventions in the S3A, AFAAS is going to be the lynchpin at regional level but its actions are going to be largely expressed at national level. AFAAS already has a strategic and operational plan that can be used as the launching pad for S3A implementation. Hence most of the recommendations are based on aligning, supporting and accelerating implementation of the AFAAS plan.

6.2 Evolutionary trajectory for the AEAS

Much as the term “evolution” is used in this study to describe the approaches along a timeline, the changes have tended to be more “revolutionary”. Rarely, if at all, have new approaches taken on board the good practices from the approaches that they have attempted to replace. For example, “top-down” approaches are adjudged by some as being absolutely bad, and “bottom-up” approaches as being absolutely good. The consequence of such absolutism has been that often “the baby is thrown out with the bath water”. What has to change in the future is that pursuit of new AEAS approaches should not necessarily discard approaches that have been used in the past. Much more so than has been the case in the past, the future trajectory of development of AEAS approaches should be based on deliberate reflection, lesson learning, and rigorous evaluation. It is **recommended** that AFAAS should, in its capacity as the continental body that is mandated to spearhead the integration of AEAS within CAADP and S3A implementation, should proactively and

aggressively implement the aspects of its strategic plan that relate to facilitating country-level AEAS actors to share lessons, exchange experiences, and have an audible voice in dialogue on policy processes.

This assessment clearly shows how complex and diverse the demands on AEAS have become as they have evolved. The policies that guide the AEAS can no longer be comprehensively addressed within the framework of general agricultural sector development policies as has been the case in the past. It is **recommended** that countries should endeavour to develop AEAS policies in the way that Kenya, Liberia and South Africa have done. To this end it is **recommended** that a pool of African experts who have been engaged in these policy processes be put in place to facilitate processes in other countries. AFAAS should provide leadership in undertaking this.

Evidence suggests that having in place AEAS policies does not guarantee that AEAS programmes based on these policies will necessarily get implemented successfully. Uganda is a typical example of this. In spite of the accolades of the Uganda Plan with respect to addressing the FAAP Principles, it is on record that the President of the country intends to disband the AEAS and hand over the AEAS functions to the army!¹⁰ Responding to such policy reversals requires that AEAS have means of getting their voice heard. In the case of Uganda the Uganda Forum for Agricultural Advisory Services (UFAAS) has emerged as such a voice¹¹. The institutional development of UFAAS has been supported by AFAAS. It is therefore **recommended** that within the framework of CAADP and the S3A, AFAAS should be supported to facilitate the emergence and institutional development of country fora that bring AEAS actors together with one of their objectives being to advocate for AEAS policy implementation.

If CAADP and the S3A are going to be the beacons for the development of the AEAS in Africa their future evolution should be guided by the FAAP principles. This study indicates that as the CAADP investment plans are being developed, integration of FAAP principles within the AEAS sub-components/ thrusts can be a challenge. Countries will need assistance to overcome this challenge – especially to ensure adequate budgetary provision for the AEAS and that the preconditions and assumptions for AEAS effectiveness are very explicitly spelt out. Fortunately AFAAS has already anticipated this challenge and started to put together a team of African experts who can facilitate country fora to ensure that AEAS are adequately addressed in the investment plans. It is therefore **recommended** that the one entry point for the S3A in engaging with the AEAS in Africa should be supporting AFAAS to build the capacity it needs to develop, sustain and deploy the CAADP facilitation team.

¹⁰ <http://www.statehouse.go.ug/category/state-house-tags/naads>

¹¹ http://www.afaas-africa.org/media/uploads/uganda/ufaas_press_statement_on_naads.pdf

Tracking how well the AEAS aspects in CAADP investment plans are being implemented is undertaken through technical reviews of CAADP Pillar IV implementation. So the technical reviews tend to handle research and AEAS simultaneously. What was observed in this study is that in this scenario the AEAS tend to get cursory attention and the alignment of the AEAS with FAAP principles is not systematically examined. It is **recommended** that the technical reviews should disaggregate research from AEAS and review them separately.

6.3 Integration of science into AEAS and AEAS into agricultural innovation systems

The science drivers of AEAS are embedded within the methods used while their integration into agricultural innovation systems is largely determined by the extent to which the approach in which the method is embedded fosters linkages. It is critical therefore that, as AEAS approaches and associated methods are being developed and piloted, deliberate effort is made to embed science in the content and to employ processes that have outcomes of enhanced linkages between AEAS and other actors in the agricultural innovation systems. Implementation of the S3A will take off at a time when the approaches that are being promoted most vigorously are the innovation systems approaches, the value chain approaches and the ICT-driven approaches. It is **recommended** that a critical review of these approaches is undertaken to examine how well the AEAS have performed within these approaches with regard to science content and building of linkages. If the review is to be undertaken using the FAAP principles, the relevant principles appears to be the following:

- i. Integration of agricultural research with extension services, the private sector, training, capacity building, and education programs to respond in a holistic manner to the needs and opportunities for innovation in the sector*
- ii. Evidence-based approaches with emphasis on data analysis, including economic factors and market orientation in policy development, priority setting and strategic planning for agricultural research, extension, and training”*

The first statement is research-centred while the second does not address the need to have a broad scientific base – let alone an agricultural science base. It is **recommended** that these principles should be re-framed so that they are explicit about integration of science into AEAS and of AEAS into agricultural innovation systems. The following statements could be debated in this regard:

- i. Integration of institutions in all the domains of agricultural innovation systems so as to respond in a holistic manner to the needs and opportunities for innovation that supports agricultural development*

- ii. Evidence-based approaches with emphasis on science content, data analysis, including economic factors and market orientation in policy development, priority setting and strategic planning for agricultural research, extension, and training”*

It is **recommended** that AFAAS should develop communities of practice around all the approaches and methods being used and facilitate them to share experiences and cross-fertilise each other. In this way different approaches and methods will be able to exchange “genes” and evolve in ways that are suitable for the environments in which they exist. It is important that in the future approaches are not promoted in dogmatic ways that portray them as the panacea for overcoming all the challenges that face AEAS in all circumstances. In the medium to long term it is these communities that shall spearhead the expansion of the AEAS science agendas to embrace the themes proposed by the S3A.

6.4 Enhancing effectiveness of AEAS

This study suggests that the apparently poor effectiveness of AEAS is partly attributed to low coverage (extension to farmer ratios). The AEAS in Africa can never be effective if they do not have the needed quantitative and qualitative capacities. Ethiopia appears to be leading in addressing the quantitative issue. It is **recommended** that AFAAS should commission a study on lesson learning on this issue from the Ethiopian experiences and use the lessons learnt to provide evidence-based policy advice to countries on how to improve the extension-to-farmer ratios.

In the short and medium term it is not likely that countries will be able to dramatically reduce the extension-to-farmer ratios. However, in the short term, improvements can be made by increasing the efficiency with which the extension workers on the ground are utilised. The most likely mechanisms for achieving this are vested in enhancing the use of both traditional and modern ICT. It is therefore **recommended** that AFAAS should spearhead the development of a strategy and framework for promoting use of ICT in extension.

The roles and functions of AEAS providers have greatly expanded and diversified as the AEAS have evolved. Performance of these roles – and hence integration of science into AEAS and of the AEAS into agricultural innovation systems - requires at least three things: First AEAS providers have to be equipped with a diverse range of knowledge and competencies; second, they have to have continuous capacity development to keep abreast of the dynamic needs for innovation; and third they need to be embedded into a robust knowledge support system which invariably, in this day and age, has to be strongly based on modern information and communication technologies (ICT). It is **recommended** that AFAAS should engage with CAADP to ensure that capacity building of AEAS providers is strongly addressed in CAADP’s current strategic theme on knowledge and knowledge management. For a start

the capacity building should address the needs for the new roles and functions that AEAS providers are expected to play (Sub-section 3.5.3)

In addition to building capacity of AEAS providers it is going to be necessary to put in place quality assurance mechanisms for AEAS delivery. It is through the capacity development and quality assurance that the AEAS shall be able to ensure that the FAAP principles percolate to the operational level of the AEAS and that the AEAS providers can cope with the dynamic needs of their clients. From the quality assurance perspective the AEAS have to be professionalised. It is **recommended** that AFAAS should take stock of how the AEAS in different countries in Africa and elsewhere are professionalising their AEAS. It should also begin to increase the awareness of the country AEAS fora on the need to initiate processes that would lead to recognition of AEAS as a science-driven profession requiring registration of AEAS providers.

BIBLIOGRAPHY

Adekunle, A.A., Ayanwale, A.B, Fatunbi, A.O., Agumya, A., Kwesiga, F. and Jones, M.P.: Maximising impact from agricultural research: Potential of the IARSD Concept. FARA, Accra, Ghana

AGRA-AASR (2013): Africa Agriculture Status Report: Focus on Staple Crops, Nairobi Kenya: Alliance for a Green Revolution in Africa

ANAFE (2011) Synthesis report on tracer study on effectiveness of agricultural training programmes in Botswana, Lesotho, and Zambia: Strengthening capacity for agricultural research and development in Africa (SCARDA) (Report to SADC.) African Network for Agriculture, Agroforestry and Natural Resources Education. (ANAFE) Nairobi, Kenya

Anderson, Jock R. and Gershon Feder. 2007. "Handbook of Agricultural Economics." Agricultural Extension. 3: 2343-2378

Alex G., Byerlee, D. M. Collion, and W. Rivera. 2004. Extension and rural development: converging views on institutional development approaches. Agricultural and rural development paper No. 4. Washington, DC: World Bank.

Angstreich M., M. M. Zinnah 2007. A Meeting of the Minds: Farmer, Extensionist, and Researcher. Journal of International Agricultural Extension and Education 14(3):85-95

Akpala D.A 2013, Agricultural Service Delivery in a Semi-Arid rural area in South Africa. The case study of thornedale in the Limpopo province. African Journal of Food, Agriculture, Nutrition and Development Vol 13 No.4

Arocena, R., and J. Sutz. 2002. *Innovations Systems and Developing Countries*. DRUID Working Paper No. 02-05. Ålborg, Denmark: Danish Research Unit for Industrial Dynamics, Ålborg University.

Ayele, G., Alemu, D. & Kelemework, F., 2005, 'The provisions of rural services in Ethiopia: Characterization, impacts, and farmers' priorities', unpublished manuscript, International Food Policy Research Institute (IFPRI), Washington, DC.

Benin, S., E. Nkonya, G. Okecho, J. Randriamamonjy, E. Kato, G. Lubadde, M. Kyotalimye, and F. Byekwaso. 2011. *The Impact of Uganda's National Agricultural Advisory Services Program*. Research Monograph. Washington: International Food Policy Research Institute

Birkhaeuser, Dean, Robert E. Evenson and Gershon Feder. 1991. "The Economic Impact of Agricultural Extension: A Review." Economic Development and Cultural Change. 39(3): 607-650.

Birner, R., Davis, K., Pender, J., Nkonya, E., Anandajayasekeram, P., Ekboir, J., Mbabu, A., Spielman, D., Horna, D., Benin, S. & Cohen, M. 2006, 'From "best practice" to "best fit": A framework for analyzing pluralistic agricultural advisory services worldwide', DSGD Discussion Paper No. 37, IFPRI, Washington, DC.

Bolwig, S., Peter, Gibbon., and Jones, S. (2009): The Economics of Smallholder Organic Contract Farming in Tropical Africa. *World Development* 37(6): 1094–1104.

Chambers, R. 1990. Rural Development- Putting the Last First, Longman Scientific and Technical, Longman Group UK Ltd. 75-102.

Chambers, R. and Conway, G (1992): Sustainable Rural Livelihoods: Practical concepts for the 21st Century. IDS Discussion Paper 296, IDS, Brighton, UK,

Christoplos, I. (2010). Mobilizing the potential of rural and agricultural extension. Rome, Italy: Food and Agriculture Organization of the United Nations and the Global Forum for Rural Advisory Services

Clark, N. 2002. Innovation systems, institutional change and the new knowledge market: Implications for third world agricultural development. *Economics of Innovation and New Technology* 11(4–5): 353–368.

Davis, K. 2008. 'Extension in sub-Saharan Africa: Overview and assessment of past and current models and future prospects', *Journal of International Agricultural and Extension Education* 15(3), 15–28

Davis, K., Nkonya, E., Kato, E., Mekonnen, M., Odendo, M., Miiro, R. & Nkuba, J. 2010, 'Impact of farmer field schools on agricultural productivity and poverty in East Africa', IFPRI Discussion Paper 00992, International Food Policy Research Institute, Washington, DC, viewed 27 August 2013, from <http://www.ifpri.org/sites/default/files/publications/ifpridp00992.pdf>

Davis Kristin, and Kroma Margaret, 2013, Extension and Advisory Services for facilitating sharing of innovations, in Africa Agriculture Status report Focus on Staple Crops AGRA 2013

Dercon, S., D.O. Gilligan, J. Hoddinott, and T. Woldehanna. 2008. —The Impact of Agricultural Extension and Roads on Poverty and Consumption Growth in Fifteen Ethiopian Villages. Discussion Paper 840, International Food Policy Research Institute (IFPRI), Washington, DC.

ECON Analysis (2005): 'Impacts of extension services in rural Mozambique', Report 2005-015, commissioned by World Bank, Project no. 42860 Public, viewed 27 August 2013, from http://www.econ.no/stream_file.asp?iEntityId=2001

EEA/EEPRI. 2006. *Evaluation of the Ethiopian agricultural extension with particular emphasis on the participatory demonstration and training extension system (PADETES)*, Ethiopian Economic Association/Ethiopian Economic Policy Research Institute, Addis Ababa.

Elifadhili Daniel 2013, Assessment of agricultural extension services in Tanzania. A case study of Kyela, Songea Rural, and Morogoro Rural Districts. Internship report in Plant Sciences, Wageningen University, and Africa Rice Programme

Evenson, R.E. and G. Mwabu. 2001. "The Effect of Agricultural Extension on Farm Yields in Kenya." *African Development Review*. 13: 1-23.

FARA (2014) Science Agenda for Agriculture in Africa: "Connecting Science" to transform agriculture in Africa

Gershon Feder, Jock R. Anderson, Regina Birner, and Klaus Deininger: Promises and Realities of Community-Based Agricultural Extension: IFPRI 2010 Discussion Paper 00959

GFRAS (2012): <http://www.g-fras.org> Fact sheet on Extension Services June 2012

GFRAS (2012). Building knowledge systems I agriculture – five key areas for mobilising the potential of extension advisory services. www.worldwide-extension.org .

GFRAS, 2013. Introduction paper: Universities' Consortium on Extension and Advisory Services. <http://www.g-fras.org>

GFRAS (2014): Status of Agricultural Extension and Rural Advisory Services Worldwide. Global Forum for Rural Advisory Services (GFRAS), Switzerland (<http://www.g-fras.org/en/world-wide-extension-study>)

Gollin, D., M. Morris, and D. Byerlee (2005). "Technology adoption in intensive post-Green Revolution systems." *American Journal of Agricultural Economics* 87(5): 1310-1316

Government of Ghana (2010): Medium Term Agriculture Sector Investment Plan (METASIP). Ministry of Agriculture and Food, Accra, Ghana

Government of Kenya (xxxxx): Agricultural Sector Development Strategy: Medium Term Investment Plan – 2010 -2015 (<http://www.resakss.org/sites/default/files/pdfs//growth-and-food-security-through-increased-agricul-45324.pdf>)

Government of Liberia (undated): The Liberia Agricultural Sector Investment Plan (LASIP) <http://www.caadp.net/pdf/Investment%20Plan%20Documents%20-%20Liberia.pdf>

Government of Malawi (2010): The Agriculture Sector Wide Approach (ASWAp) – Malawi's Prioritised and Harmonised Agricultural Development Agenda. Ministry of Agriculture and Food Security Republic of Malawi

Government of Malawi (2011): The National Agricultural Policy: Promoting Agricultural Productivity for National Food Security and Economic Growth and Development Through Value Chain Development. Ministry of Agriculture and Food Security, Capital Hill P.O. Box 30134 Lilongwe 3.

Government of Sierra Leone (2009): National Sustainable Agriculture Development Plan 2010-2030 – Sierra Leone's Comprehensive African Agriculture Development Programme (Version Adapted by CAADP Compact 18th September 2009, Freetown) https://www.gafspfund.org/sites/gafspfund.org/files/Documents/SL_NSADP.pdf

Government of South Sudan (2011): National Agriculture and Livestock Extension Policy (NALEP). Ministry of Agriculture and Forestry (MAF) & Ministry of Animal Resources and Fisheries (MARF), Juba

Government of the Federal Democratic Republic of Ethiopia (2010): Ethiopia's Agricultural Sector Policy and Investment Framework (PIF) 2010-2020. Ministry of Agriculture and Rural Development

Government of the Federal Republic of Nigeria (2010): ECOWAP/CAADP Process National Agricultural Investment Plan (NAIP) 2011-2014. Federal Ministry of Agriculture And Rural Development

Government of the Gambia (undated): Gambia National Agricultural Investment Programme (GNAIP). <http://www.nepad-caadp.net/pdf/Investment%20plan%20-%20Gambia.pdf>

Government of the Republic of Kenya (undated): Agricultural Sector Development Strategy: Medium Term Investment Plan – 2010 -2015 (<http://www.resakss.org/sites/default/files/pdfs//growth-and-food-security-through-increased-agricul-45324.pdf>)

Government of the Republic of Liberia (2012): National Policy for Agricultural Extension and Advisory Services. Ministry of Agriculture

Government of the Republic of South Africa (2005): Norms and Standards for Extension and Advisory Services in Agriculture. Directorate of Agricultural Information Services. Department of Agriculture

Government of The Republic Of Zambia (2011): The National Agriculture Policy

Government of the Republic of Zambia (2013): Zambia National Agriculture Investment Plan (NAIP) 2014-2018 Under the Comprehensive Africa Agriculture Development Programme (CAADP). Ministry of Agriculture and Livestock.

http://www.gafspfund.org/sites/gafspfund.org/files/Documents/6.%20Zambia_investment%20plan.pdf

Government of Uganda (2001) The national Agricultural Advisory Services Act. Government of Uganda

Government of Zimbabwe (2012): Comprehensive Agricultural Policy Framework (2012-2032) - Executive Summary. Ministry of Agriculture

Hall, A. J., and N. G. Clark. 1995. Coping with change, complexity and diversity in agriculture: The case of *Rhizobium* inoculants in Thailand. *World Development* 23(9): 1601–1614.

Hall, A., M. V. K. Sivamohan, N. G. Clark, S. Taylor, and G. Bockett. 1998. Institutional developments in Indian agricultural research systems: Emerging patterns of public and private sector activities. *Science, Technology and Development* 16(3): 51–76.

Hall, A., R. Sulaiman, N. Clark, and B. Yoganand. 2003. From measuring impact to learning institutional lessons: An innovation systems perspective on improving the management of international agricultural research. *Agricultural Systems* 78:213–241.

Hall, A., R. Sulaiman, N. Clark, M. V. K. Sivamohan, and B. Yoganand. 2002. Public- private sector interaction in the Indian agricultural research system: An innovation systems perspective on institutional reform. In D. Byerlee and R. Echeverría (Eds.), *Agricultural Research Policy in an Era of Privatization* (pp. 155–176). Oxon, UK: CABI.

Independent Evaluation Group 2011. Impact Evaluations in Agriculture: An Assessment of the Evidence. Washington, DC: World Bank

IFPRI, 2008, 'The impact of agricultural extension and roads on poverty and consumption growth in fifteen Ethiopian villages', IFPRI Discussion Paper 00840, International Food Policy Research Institute, Washington, DC, <http://www.ifpri.org/sites/default/files/publications/ifpridp00840.pdf>

Jack, B. Kelsey. 2013. "Constraints on the adoption of agricultural technologies in developing countries." Literature review, Agricultural Technology Adoption Initiative, J-PAL (MIT) and CEQA (UC Berkeley)

Kidanemariam G. Egziabher, Erik Mathijs, Jozef Deckers, Kindeya Gebrehiwot, Hans Bauer and Miet Maertens (2013): The Economic Impact of a New Rural Extension Approach in Northern Ethiopia, Bioeconomics Working Paper Series, Working Paper 2013/2

Kwadwo Asenso-Okyere and Samson Jemanah 2012: Increasing agricultural productivity and enhancing food security in Africa: New Challenges & Opportunities. A synopsis of an International Conference. IFPRI March 2012.

Jean-Philippe Deschamps-Laporte 2013, The impact of extension services on farming households in Western Kenya; A propensity score approach

Johnson, B., and O. Segura-Bonilla. 2001. *Innovation Systems and Developing Countries: Experiences*

from the SUDESCA Project. DRUID Working Paper No. 01-12. Ålborg, Denmark: Danish Research Unit for Industrial Dynamics, University of Ålborg.

MAAIF (2010): Agriculture for Food and Income Security: Development Strategy and Investment Plan 2010/11 – 2014/15. Ministry of Agriculture Animal Industry and Fisheries, Government of the Republic of Uganda

Gakuru, M., Winters, K. & Stepman, F (2009): *Inventory of Innovative Farmer Advisory Services using ICTs*. FARA, Accra, Ghana.

Landini, F., Leeuwis, C., Long, N. and Murtagh, S., 2014. Towards a psychology of rural development processes and interventions. *J. Community Appl. SOC. Psychol.*, (2014).

NeNederlof, P. G, Willem, H and Femke, L (2011): Facilitation of innovation: experiences of RIU innovation platforms in Tanzania, Rwanda and Zambia. Royal Tropical Institute (http://www.kit.nl/net/KIT_Publicaties_output/ShowFile2.aspx?e=1929)

Oladele 2011, Agricultural Policies, the missing link in Innovations in Extension and Advisory Services. In proceedings on the International Conference on Innovations in Extension and Advisory Services

Okoboi Geoffrey, Annette Kuteesa, and Mildred Barungi 2013: The impact of the National Agricultural Advisory Services (NAADS) on household production and welfare in Uganda paper 7, March 2013.

Pey-Smith, C., 2012. Agricultural extension – A time for change – linking knowledge to policy and action for food and livelihoods. Technical centre for Agricultural and Rural Cooperation, Wageningen, The Netherlands.

Purcell, D.L., & Anderson, J.R., 1997, *Agricultural extension and research: Achievements and problems in national systems*, World Bank, Washington, DC.

Qamar, M. K., 2005. Modernizing National Agricultural Extension Systems: A practical guide for policy-makers of developing countries. FAO, Rome.

Sulaiman, V. & Davis, K (2012): The “New Extensionist”: Roles, Strategies, and Capacities to Strengthen Extension and Advisory Services. Global Forum for Rural Advisory Services (GFRAS), Switzerland (<http://www.g-fras.org/en/knowledge/gfras-publications/file/126-the-new-extensionist-position-paper?start=20>)

Ragasa Catherin, John Ulimwengu, Josee Randriamamonjy, and Thaddee Badibanga 2013: Assessment of the Capacity, Incentives, and Performance of Agricultural Extension Agents in Western Democratic Republic of Congo. IFPRI Discussion Paper 01283 August 2013

Rivera, W. M. & Amanor, D. 1991. World-wide Institutional Evolution and Forces of Change: New York:ELSEVIER.pp 89-100.

Rivera, W. M. & Carry, J. W. 1998. Privatising agricultural extension Worldwide: Institutional Changes in funding and delivering agricultural extension: in B. E. Swanson, ed. *Agricultural extension: reference manual* (3rd ed.) FAO. Rome.

Rivera, M.R., Qamar, M. K., 2003. A new extension vision for food security – Challenges to face. FAO, Sustainable Development Department, Rome, Italy.

Romani, M. 2003. —The Impact of Extension Services in Times of Crisis. Cote d’Ivoire 1997-2000. Working Paper 190, The Centre for the Study of African Economies, Oxford

University, Oxford, UK

Romero, L., 2012. Rural Extension as part of an innovation, RELEASER – Latin American Network for Rural Extension Services, January 2012

Rudgard, S., Ballantyne, P., Castello, R.D., Edge, P., Hani, M., Maru, A., Morras, E., Nichterlein, K., Porcari, E., Treinen, S., Balaji, V. and Balasubramanian, K (2011): Module 6 – ICTs as enablers of agricultural innovation systems. In: ICT in Agriculture Sourcebook - Connecting Smallholders to Knowledge, Networks, and Institutions. World Bank, Washington, DC. (e-book at: <http://www.ictinagriculture.org/content/ict-agriculture-sourcebook>)

Rukuni (2014): Analytical framework for finalising companion reports to the Science Agenda. PowerPoint presentation made at the Science Agenda for Agriculture in Africa (S3A): Studies and Analysis Authors Workshop – 25th June 2014. FARA, Accra, Ghana.

Singh, J.P., Swanson, B. E, and Singh, K. M., 2006. Developing a decentralized, market-driven extension system in India: the ATMA model. Delhi India. B R Publishing, pp.203 – 322.

Spielman, J. D (2005): Innovation Systems Perspectives on Developing-Country Agriculture: A Critical Review. ISNAR Discussion Paper 2. International Food Policy Research Institute

Staatz, J.M. & Dembele, N.N., 2007, Background paper for World Development Report 2008, World Bank, Washington, DC, from http://siteresources.worldbank.org/INTWDR2008/Resources/2795087-1191427986785/StaatzJ&DembeleN_AgriForDevInSSA_ve19.pdf

Swanson, B. E., 2008. Global review of good Agricultural Extension and Advisory Services. FAO, Research and Extension Division, Rome , Italy.

Swanson, B., & Rajalahti, R. (2010). Strengthening agricultural extension and advisory systems: Procedures for assessing, transforming, and evaluating extension systems. Agriculture and Rural Development Discussion Paper 44. ARD. Washington, DC: World Bank.

Sulaiman, R., & Davis, K. (2012). The new extensionist: Roles, strategies, and capacities to strengthen extension and advisory services. GFRAS Position Paper. Lindau, Germany: GFRAS

Tahseen Jafry, Bohson Moyo, and Lessah Mandaloma 2014: Assessment of Extension and Advisory Methods and Approaches to reach rural women. Examples from Malawi. MEAS Evaluation Series

Taye H. (2013): Evaluating the impact of agricultural extension programmes in sub-Saharan Africa: Challenges and prospects. *African Evaluation Journal* 1(1), Art. #19, 9 pages. <http://dx.doi.org/10.4102/aej.v1i1.19>

Terblanche, S. E., 2008. Towards an improved agricultural extension service as a key role player in the settlement of new farmers in South Africa. *S A Journal of Agricultural Extension*, Volume 36, pp. 58 – 84.

United States Department of Agriculture. (2012). *International Food Security Assessment, 2012–22*. GFA-23 (Report from the Economic Research Service). Washington, DC: Author

Waddington, H. & White, H. (2014): Farmer field schools - From agricultural extension to adult education. Systematic Review Summary 1. International Initiative for Impact Evaluation

Walker, T., Tschirley, D., Low, J., Pequenino Tanque, M., Boughton, D., Payongayong, E. & Weber, M., (2004) 'Determinants of rural income in Mozambique in 2001–2002', Research Report 57E,

Ministry of Agriculture and Rural Development, Directorate of Economics, Maputo,
<http://ageconsearch.umn.edu/bitstream/56061/2/wps57E.pdf>

Wiggins and Leturgue (2010): Africa Progress Panel Policy Brief September 2010: Raising Agricultural Productivity in Africa: Options for action and the role of subsidies