



**DRAFT SYNTHESIS REPORT OF REGIONAL
AND NATIONAL CONSULTATIONS ON THE
ROLL-OUT OF THE SCIENCE AGENDA
FOR AGRICULTURE IN AFRICA**

23 AUGUST 2017



**"Connecting Science" to
Transform Agriculture in Africa**



REGIONAL AND NATIONAL CONSULTATIONS FOR THE ROLL-OUT OF THE SCIENCE AGENDA FOR AGRICULTURE IN AFRICA

SYNTHESIS REPORT

23 AUGUST 2017

In Collaboration with ASARECA, CCARDESA, CORAF/WECARD and NASRO



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This synthesis report was prepared based on the individual reports from the three regional and five national consultations under the guidance and oversight of FARA in collaboration with the ASARECA, CCARDESA, CORAF/WECARD and NASRO. These institutions, which constitute the Science for Agriculture Consortium organizations wish to express profound gratitude to FARA Secretariat led by its Executive Director, Dr. Yemi Akinbamijo and the guidance under the tireless delivery capacity of its Director of Research and Innovations, Dr. Irene Anno-Frempong, as well as extensively thoughtful professional inputs of Dr. Aggrey Agumya, Director for Corporate Partnerships and Communication, for the very successful regional and national consultations. The effective facilitation of the consultations owes a great deal to the collaborative efforts of the Sub-Regional Research Organizations. For this, we are most grateful to Dr. Cyprian Ebong, Acting Executive Secretary, ASARECA; Dr. Simon Mwale, Acting Executive Director, CCARDESA; Dr. Alioune Fall, Chairperson of CORAF/WECARD and Dr. Abdou Tenkouano, Executive Director, CORAF/WECARD; and Dr. Mahmoud Medany, Executive Director, NASRO. Together, we are considerably stronger, more effective and better capacitated to deliver this game-changing agenda, which requires shared commitment for Africa's agriculture.

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It is our fervent hope that the observations, conclusions, recommendations and the way forward presented in this report would provide a veritable guide for taking implementation of the Science Agenda for Agriculture in Africa to the next milestone.

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ACRONYMS AND ABBREVIATIONS

A3GT	Accelerated Africa Agricultural Growth and Transformation
AOAD	Arab Organization for Agricultural Development
AARP	African Agricultural Research Programme
AFAAS	African Forum for Agricultural Advisory Services
AGRA	Alliance for a Green Revolution in Africa
AHC-STAFF	Africa Human Capital, Science Technology and Agri-preneurship for Food Security Framework
AR4D	Agricultural Research for Development
AIS	Agricultural Innovation System
AIS-PPI	Agricultural Innovation System-Policy Practice Index
ALINE	Agricultural Learning and Impacts Network
APPS	Agricultural Productivity Programmes
AR4D	Agricultural Research for Development
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
ASPRODEB	Senegalese Association to Promote Grass-Roots Development
AU	Africa Union
AUC	Africa Union Commission
CAADP	Comprehensive Africa Agriculture Development Programme
CAADP PP	Comprehensive Africa Agriculture Development Programme Partnership Platform
CCARDESA	Centre for Coordination of Agricultural Research and Development for Southern Africa
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Centre for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Centre
CORAF/WECARD	West and Central African Council for Agricultural Research and Development
DARD	Department of Agricultural Research Development
EDP	Enterprise Development Program
EC	European Commission
EU	European Union
FAO	Food and Agricultural Research Organization
FCRI	Field Crops Research Institute
FARA	Forum for Agricultural Research in Africa
FNSSA	Food and Nutrition Security and Sustainable Agriculture
GAP	Good Agriculture Practice
GDP	Gross Domestic Product
GERD	General Expenditure on Research and Development
OHADA	Organization for the Harmonization of Business Law in Africa
IAR4D	Integrated Agricultural Research for Development
IFAD	International Fund for Agricultural Research
ICARDA	International Centre for Agricultural Research in the Dry Areas
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IP	Innovation Platform
ISRA	Senegal Institute for Agricultural Research
IITA	International Institute for Tropical Agriculture
IWMI	International Water Management Institute
M&E	Monitoring and Evaluation
MoC	Ministry of Communication
NAFSIP	National Agricultural Financial Sector Investment Plan
NAIP	National Agricultural Investment Plan
NARIS	National Agricultural Research Institutions
NARS	National Agricultural Research System
NASRO	North African Sub-Regional Organization
NEPAD	New Partnership for Africa's Development
NPCA	AU NEPAD Planning and Coordinating Agency
OPA	Organization for Agricultural Producers

PAFO	Pan-African Farmers' Organization
PRACAS	Senegal Program for Agricultural Recovery and Acceleration
PPI	Policy Practice Index
R&D	Research and Development
RECs	Regional Economic Communities
S3A	Science Agenda for Agriculture in Africa
S4ARC	Science for African Agriculture Research Consortium
SADC	Southern Africa Development Community
SDGs	Sustainable Development Goals
SME-SMI	Small and Medium Enterprise – Small and Medium Industry
SRO	Sub-regional Organization
STI	Science Technology and Innovation
STISA	Science, Technology and Innovation Strategy for Africa, 2024
TAAT	Technology for African Agricultural Transformation
TAEI	Tertiary Agricultural Educational Institution
ToC	Theory of Change
WAAPP	West Africa Agricultural Productivity Programme
ZAIP	Zambian Agricultural Investment Plan

EXECUTIVE SUMMARY

I. INTRODUCTION

This is a draft summary of the synthesis report of the regional and national consultations held over the period April – July 2017 by the Forum for Agricultural Research in Africa (FARA), in collaboration with host national governments in which the consultations were held and the Sub-regional Research Organizations (SROs) – ASARECA, CCARDESA, CORAF/WECARD and NASRO - for the roll-out of the Science Agenda in Agriculture in Africa (S3A). The regional consultations were sponsored by the International Fund for Agricultural Development (IFAD) and held in Malawi for Southern African countries on 9th -11th April 2017; Rwanda for East and Central African countries over the period 19th -21st April 2017; and Ghana for West and North African countries on 9th -11th May 2017. The national consultations were held in the five (5) Tier 1 countries¹, namely, Egypt, Ghana, Malawi, Rwanda and Senegal.

Today's science is tomorrow's technologies and innovations required to sustainably transform agriculture and improve quality of lives. For the African continent, the S3A is a means to this transformation. It is an investment for a better future for African countries. To make science work for Africa's agriculture, the continent will need to invest considerably more in agricultural research for development as well as make national agricultural research institutes and policies work more effectively and efficiently.

Home to about 60% of uncultivated arable land globally and a vibrant youthful population, the African continent has vast agricultural potential. Yet, it is a net importer of agricultural and food products. Low agricultural productivity, droughts, effect of climate change, declining outputs per head due to rapid population growth, poor infrastructure, ineffective policies and weak institutions are among factors challenging agricultural development in African countries. A number of continental, regional and national agricultural transformation and development frameworks and strategies are in place to help address these challenges. Although progress is being made², the results are still far from impressive. There is a need to considerably step up investment in agriculture. Only 8 out of 54 African countries are keeping the promise to invest more in agriculture. In this year, due to favourable rains in the first quarter of the year and high-quality seeds, the Southern Africa region will reap bountiful harvest of maize much of which most likely will go to waste due to challenges in post-harvest management of crops. This should however not be the fate of the continent's agriculture.

Africa's agriculture is sustained largely by small-holder farmers, and can do more to produce food, exports, employment and incomes, only if productivity can be improved. The continent's present agricultural yield is about 1.4 tonnes per hectare. This will have to double by 2025 for Malabo targets

¹ The Tier 1 countries are those that have made significant progress in preparation for implementation of the Science Agenda. Progress is reflected in commitment, leadership and stakeholder awareness and preparedness, among other considerations. The Tier 1 countries are: Southern Africa: Malawi; East Africa: Rwanda; North Africa: Egypt; and West Africa: Ghana and Senegal. Beside the five countries, others that meet Tier 1 requirements would be encouraged to accede to this category of implementation readiness.

² For instance, among numerous initiatives by both public and private sector organizations, the Dangote Group in Nigeria plans to invest US\$3.8billion in sugar and rice and US\$800million in dairy production over the next three years, 2018-2020. The conglomerate plans to increase its production of sugar to 1.5 million metric tons a year by 2020 from 100 000 tons at present and is seeks to add 1 million tons of rice. Nigeria relies heavily on food and agricultural products imports to meet shortages in local production and growing demands from a population that is about 180 million. The Group also plans to expand investments in soybean, oil palm, palm kernel and corn production. It plans to support rice cultivation by supplying high-yield seeds, pesticides and fertilizers to contract farmers. These projects will draw heavily on the application of science in agriculture.

on food security to be attained. Achieving these targets will require less land; less use of existing water resources; more fertilizers, improved seeds, healthy livestock breeds and dairy products; and significantly reduced post-harvest losses. In essence, sustainable increase in productivity in agriculture is required. The first direct implication is intense application of science in agriculture. Present intervention is such that there is inadequate coordination of key players in the agriculture sector, ineffective use of existing technologies and innovations and poor financing of agricultural research for development and national innovations systems. There is therefore an intervention gap between agriculture targets and means for their achievement. This is therefore an area in which the continent will now have to look beyond present frameworks and strategies and draw on the sciences, among other factors, to respond sustainably to the productivity, nutritious and safe food challenges. Science is by no means the weakest link to sustained productivity³. It is however fundamental and has direct impact on yields performance. Crop yields on the continent range between one-third and one-half of the global average. Researchers per million population are considerably lower than what exists in other developing regions such as Latin America and South Asia. Africa has 70 per million agricultural scientists and researchers. The comparable figures for Latin America and North America are 550 and 2,640, respectively (AGRA: 2015⁴).

The space and potential for science to accelerate productivity increases in Africa are enormous and very promising. Farmers need improved access to existing and new tools, knowledge and technologies to be productive. Uptake of research findings and innovative technologies rose from about 5% in the 1970s to 60% in 2005 (FARA). The overall rate of return to investment in research is more than 43% (FARA). Investment in science will enable the continent to step up research, develop, breed and reach out to the large number of small-holder farmers with new crop varieties and healthy livestock to increase productivity, outputs and reduce food prices and environmental footprints of farmers; develop technologies that would be generally available to or affordable by small-holder farmers; improve nutritional value of food, which is just as important as improved productivity so as to deal with the undernourishment challenges, given that about 30% of the African population is undernourished; develop hybrid seeds, improved varieties and support local production and increased use of fertilisers required by small-holder farmers; reduce cost of inputs due to import dependence; ease access to leading edge technology like molecular markers, which can accelerate traditional breeding methods and enhance seeds availability to farmers; and bring within reach new tools of biotechnology – such as genome definition and marker-assisted selection (genetic code variations or markers) - that can help to tell how specific genes would perform. It is in this context that the Science Agenda for Agriculture in Africa was developed and is being rolled out to the regions and countries on the African continent.

The S3A is an organizing framework or instrument for mobilising the physical, human, institutional, financial and policy resources required to increase the application of science, technology and innovations to achieve agricultural development goals and targets in African countries. As a framework, it provides countries with guidelines and instruments for reorganizing and strengthening capacity of AR4D institutions, building partnerships, developing innovation systems, improving policy environment and mobilizing resources for science-led agricultural transformation.

The imperative for application of science in agriculture in Africa and thus the implementation of the science agenda is therefore enormous.

³ AGRA Agriculture Status Report 2015, for instance, observed that farmers in the US pay US\$226 delivery price for a tonne of fertilizer. This is about the price in some countries in Africa due to shipping costs, port duties, storage fees, fuel costs, inland transportation costs, importers and seller's mark-ups and administrative malfeasance like bribes for import licences and port clearance. In Zambia, the price is about US\$414. Farmers may be willing to bear the cost if they could be sure of selling their surplus produce at a decent price. But the route to market is too precarious for most smallholders. Up to a fifth of surpluses is lost because of poor storage and roads. The shortage of credit forces small farmers to sell low rather than wait for the best seasonal prices

⁴ AGRA Agriculture Status Report 2015.

II. S3A FUNDAMENTALS

The science agenda sets out principles to help African countries effectively apply science to transform their agriculture. It thus provides a guide to the science, technology, extension, innovations, policy and social learning the countries need to apply in order to meet agricultural development goals. The science agenda is based on the recognition of the potential of science for the continent's agricultural transformation as encapsulated in the CAADP and the roadmap strategy for implementing the 2014 AU Malabo Declaration on Accelerated Africa Agricultural Growth and Transformation (A3GT).

II.1 Vision of S3A: The vision of S3A is to ensure that “By 2030 Africa is food and nutrition secure; becomes a recognized global scientific player in agriculture and food systems; and emerges as the world's bread-basket” The S3A in addition seeks to double public and private sector investment in agricultural research for development (AR4D) by 2020. Its aim therefore is to ensure that the required level of science, technology and innovations is generated for Africa to achieve the three major targets by 2030.

II.2 Strategic Goals of S3A: The science agenda is guided by three sets of strategic goals. In the short term of 2-3 years, the implementation of S3A is expected to lead to an increase in domestic public and private sector spending and the creation of an enabling policy and infrastructural environment for the application of science in agriculture in the countries. For the medium-term period of 3-5 years, the science agenda should lead to the development of youth-development and women-empowerment responsive capacity for the conduct of internationally comparable scientific research in the NARIs, Universities and related agencies for sustained improvement in agricultural productivity and outputs. In the long-term, specifically by 2025, the application of science in Africa's agriculture is expected to double current level of agricultural productivity, which stands at about 1.4 tonnes per hectare.

II.3 Key Thematic Foci: There are four major areas in which the S3A seeks to make interventions in Africa's agriculture. These are sustainable productivity in major farming systems; food systems and value chains; agricultural biodiversity and natural resource management; and mega trends and challenges for agriculture in Africa. In addition to these, three other areas will constitute cross-cutting themes that will be taken into consideration during interventions in the four key areas. These are Sustainable intensification; biosciences, information and communication technologies, and foresight capabilities

II.4 Planned Interventions: Planned interventions under S3A will consist of strengthening institutional systems, which support the application of science in agriculture; sustaining core capacity at national level; enhancing regional and global collaboration; mobilizing sustainable financing for science application in agriculture; enhancing the conduciveness of the policy environment; improving the policy-science interface; and stepping up commitment to youth development and women empowerment

II.5 S3A Implementation Process: This consists of countries committing to implementing the agenda; conducting stocktaking and profiling implementation needs by defining productivity targets to be attained by 2025, the areas of science needed to achieve the set targets, required capacity, investment needed to achieve targets, policies required and collaborative engagements needed. The implementation process also involves monitoring and evaluating activities and learning lessons for continuous improvement.

Mandated by the African Union Commission and NEPAD in 2012, S3A was developed by FARA through an elaborate consultation process cross the African continent and internationally. The agenda was formally endorsed by the African Union Assembly of Heads of State and Government in Malabo in 2014 and launched in Johannesburg, South Africa, in 2015. Focussed on four core thematic areas - Sustainable productivity in major farming systems, Food systems and value chains, Agricultural

biodiversity and natural resource management, and Mega trends and challenges for agriculture in Africa – the science agenda has reached its implementation phase and is thus being rolled-out to countries on the continent.

III WHAT THE ROLL-OUT OF THE SCIENCE AGENDA ENTAILS

The roll-out of the science agenda regionally and at the country level involves mobilizing and supporting African countries to initiate implementation of the framework by mainstreaming it into existing agricultural development strategies, programs and investment plans such as CAADP and the National Agriculture and Food Security Investment Plans (NAFSIPs). To this end, FARA and the Sub-Regional Research Organizations are working with countries to identify key areas in which changes are required for the implementation of the agenda and to facilitate the needed transformative change. It is for this reason that with the support of IFAD, FARA launched the regional and country-level consultations to inform the roll-out process.

III.1 Objectives of the Consultations

At the regional level, the consultations sought to achieve four major objectives. These are to:

- 1) Sensitize countries on the S3A and consult them on the proposed process for its roll out and S3A implementation process
- 2) Consult countries and seek their inputs in the construction of a continental Theory of Change for the S3A.
- 3) Consult countries on the principal enablers for increasing the application of the STI to double agricultural productivity by 2025 (i.e. capacity strengthening, policy changes, investments and partnerships and collaborations)
- 4) Apprise countries of emerging S3A initiatives and explore how these will be leveraged to strengthen the principal enablers

For the national level, the country consultations are meant to achieve the following core objectives, namely, to:

- 1) Secure the country's commitment to the implementation of S3A
- 2) Initiate formulation of a country theory of change for the S3A
- 3) Initiative stocktaking and profiling of the state of the country's agriculture
- 4) Assemble requisite data and information for the formulation of the country's action plan and implementation arrangements

In addition to the foregoing core objectives, the consultations are aimed at ensuring that the S3A is owned and driven by countries; clear entry points are identified for its implementation to contribute concretely and measurably to National Agricultural and Food Security Investment Plans as well as other agricultural development strategies and deliver CAADP-Malabo targets; and to provide an engagement platform for the lead institutions, especially FARA, SROs, AFAAS and the NARIs to plan and work together most effectively and efficiently in the roll-out of the agenda.

III.2 Expected Outcomes of the Consultations

The roll out of the science agenda brings along major benefits to the process of agricultural transformation on the continent. Central among these, it will facilitate the following:

- 1) Assist countries to launch and maintain a process of developing, regularly updating and sustaining statistics on their agriculture profiles.
- 2) Enable countries to assess the amount of scientific research that is going into agriculture, so as to regularly document and report on the application of innovative technologies and their quality.

- 3) Help countries to determine the level of uptake of new technologies and innovations by small-holder farmers and the impact on productivity.
- 4) Launch a process for the assessment of the amount of funding that is going into AR4D within the 1% of gross national product (GDP) that countries are to allocate to science, technology and innovations under STISA 2024.
- 5) Share among all countries knowledge of the innovations platforms (IPs) as a tool for fostering generation, sharing, application and communication of technologies and innovations.
- 6) Develop a databank of regional information on countries' strengths and lead areas in scientific research in order to promote learning, joint research and to eliminate duplication of efforts and waste of resources.
- 7) Promote the use of common national and regional facilities and laboratories in order to maximize on utility of existing capacity.
- 8) Encourage the use of local products to facilitate the growth of domestic markets for farmers and reduce import dependence.
- 9) Provide national platforms for NARS institutions and stakeholders to coordinate their activities and maximize use of resources.
- 10) Develop knowledge and information management system that delivers real-time new technologies, innovations and market-related information to small-holder farmers.

III.3 Organization of the Consultations

Three regional consultations, which cover the entire five regions on the continent were held. These took place in Malawi for Southern Africa countries; Rwanda for countries in East and Central Africa; and Ghana for West and North Africa countries.

The Malawi Regional Consultation was organized jointly with CCARDESA and hosted by the Government of Malawi. A total of 10 out of 13 countries in the sub-region participated, namely, Angola, Botswana, Lesotho, Malawi, Namibia, Seychelles, South Africa, Swaziland, Zambia and Zimbabwe. The meeting was declared open by Dr. Albert Changaya, Comptroller of Agricultural Extension and Technical Services on behalf of the Permanent Secretary of the Ministry of Agriculture and the Government of Malawi. The opening session was also addressed by the Executive Director of FARA, Dr. Yemi Akinbamijo and Acting Executive Director of CCARDESA, Dr. Simon Mwale.

The Rwanda Regional Consultation was organized in collaboration with ASARECA and hosted by the Government of Rwanda. The meeting was declared open on behalf of the Government of Rwanda by Dr. Mark Bagabe, Director-General of the Rwanda Agriculture Board. Opening remarks were also presented by Dr. Irene Annor-Frempong, Director of Research and Innovation, representing FARA; and Dr. Cyprian Ebong, Interim Executive Secretary of ASARECA. A total of eight (8) countries participated in the East Africa regional consultative meeting. These are the Democratic Republic of Congo, Ethiopia, Kenya, Madagascar, Rwanda, South Sudan, Sudan and Uganda.

The regional consultations for West and North African countries were held in Ghana in association with CORAF/WECARD and NASRO. The meeting was hosted by the Government of Ghana and attended by twenty-two (22) countries, namely, Benin, Burkina Faso, Cameroon, Cape Verde, Central Africa Republic, Chad, Congo – Brazzaville, Cote d'Ivoire, Equatorial Guinea, Gambia, Guinea – Conakry, Guinea Bissau, Liberia, Mali, Mauritania, Morocco, Nigeria, Sao Tome & Principe, Sierra Leone, and Togo. Also present were representatives of Farmers Organization, Universities, NGOs, CGIAR and development partners.

The National Consultations were held in Egypt, Ghana, Malawi, Rwanda and Senegal.

III.4 Participants at the Consultative Meetings

Participants consisted of Executive Directors, Director of Research and Innovation and Senior Professional staff of FARA, AFAAS, ASARECA, CCARDESA, CORAF/WE CARD and NASRO; Directors-General, Directors of National Agricultural Research Organizations, National Agricultural Research Council, Agricultural Research Board and related organizations and agencies. Also in attendance were representatives of International Agricultural Research Organizations (CIAT, CIMMYT, IITA), Farmers Organizations, Universities, NGOs, African Union Commission, NEPAD Planning and Coordinating Agency and development partners.

Presentations at all the regional consultations were made by Dr. Irene Annor-Frempong, Director of Research and Innovations, FARA who led the consultations with a detailed overview of the trajectory in the development of the S3A and its present status. Dr. Annor-Frempong also led the meetings in the plenary presentation on the “Alignment of Regional and Sub-Regional Mega Initiatives to S3A Roll-Out” with illustrations using the Technologies for African Agricultural Transformation (TAAT), the African Agricultural Research Program (AARP), APPs, among other initiatives. Dr. Yvonne Pinto of Agricultural Learning and Impacts Network (ALINE), Dr. Enock Warinda, Lead Monitoring and Evaluation Specialist, FARA and Ms. Cassidy Travis of ALINE guided the meetings through the “Emerging S3A Theory of Change and Results Framework”, while Dr. Benjamin Abugri of FARA and Mr. Max Olupot of AFAAS made the presentations on the “Emerging Knowledge Management Plan of the Science Agenda”.

These presentations were followed by background papers, which provided pre-requisites for the realization of the vision of the S3A at the country level. The presentations were made by Dr. Paul Boadu of FARA on “Creating a Favourable Policy Environment for Science in Agriculture (using PPI); Dr. Amos Gyau of FARA on “Strengthening Human and Institutional Capacity for Science in Agriculture”; Dr. Fatumbi Oluwale, Lead Specialist at FARA, on “Country Level Implementation Platforms for S3A; Prof. Mandi Rukuni, FARA Institutional Advisor on the S3A, on “Effective Modalities for Collaboration at all Levels – National, Regional and International” and lastly, the Facilitator of the Meetings, Dr. Genevesi Ogiogio, who examined sources and options for “Sustainable Financing of the Science Agenda”.

At the regional consultations, three presentations were made by the host countries, which highlighted *Country Profiles and National Level Success Factors in Agriculture*. Dr. Wilkson Makumba, Director, Ministry of Agriculture of Malawi presented the Country Profile for Malawi; Dr. Mark Bagabe, Director-General for Rwanda Agriculture Board, gave the presentation on Rwanda, while Dr. Mina Quayе, Deputy Director, CSIR, Ghana, outlined the Country Profile of Ghana’s Agriculture.

Each of the regional consultations featured a Panel Discussion and Break-Out Sessions.

On the last day of the consultations, participating countries presented their emerging Country Action Plans with milestones in the implementation of the science agenda in their respective countries. They also put forward possible areas of support they would like from FARA and the SROs to facilitate implementation. A total of 41 countries across all five regions presented their draft Action Plans.

The consultative meeting in each region ended with a presentation by the SRO for the hosting region on the “Next Steps and Action Planning” and closing remarks by FARA, SRO of the host region and the representative of the host country.

The presentations made, issues raised and perspectives put forward during the sessions formed the basis of the conclusions and recommendations presented in this synthesis report.

IV CONCLUSIONS AND RECOMMENDATIONS FROM THE REGIONAL CONSULTATIONS

IV.1 Observations, Conclusions and Recommendations from Presentations and Discussions

Based on the presentations and the discussions that followed, the deliberations at the regional consultations led to the following conclusions and recommendations

- There is a need to clarify what is different in S3A that will drive countries to buy into the agenda. Essentially, the value-added of S3A needs clarification.
- In calling for commitment to S3A, what constitutes commitment should be defined operationally and measures provided. Additionally, how to incentivize commitment is needed.
- Accessibility of FARADATAInformS should be improved. The platform or service should be linked to other public domain data such as those by IFAD, FAO, World Bank, etc. It should be developed into a One-Stop Agriculture Statistics and Information platform for Africa and continental awareness significantly enhanced
- Knowledge sharing program should identify and classify countries according to their research capacity and strengths by crops so that there is a database that supports knowledge and information exchange
- A framework for and regular assessment of the rate of return to research should be derived and assessments reported regularly
- Need for shared research competencies, leveraging of knowledge, skills and experiences from countries that are well endowed by those that are less endowed. Crop competency profile of countries.
- Promote shared knowledge and experiences in the transfer of germplasm, seed policy and commodity standards
- Need to raise knowledge of S3A among stakeholders, particularly at senior policy levels.
- Need for S3A not to be entirely productivity centred. Technologies alone do not lead to improved productivity. There are other factors. The issue of adoption or uptake rate is critical. This is a function of good and stable prices, access to markets, availability of transport to move produce from farms, cost and availability of farm labour, cost of fertilizers which make it uneconomic as farmers will produce at high cost and sell at low prices, access to and cost of new improved varieties and seeds, availability of agricultural extension services, availability of water/irrigation facilities in a largely rain-fed agriculture system easily devastated by drought, and access to credit facilities to procure some of the inputs mentioned above.
- There are serious challenges facing most NARIs, which will have to be addressed, if they are to play the required role in connecting science to increased agricultural productivity. Most NARIs are faced with shortage of qualified scientists and researchers; infrastructural facilities, laboratories and chemicals are critically in short supply; condition of service for staff in institutes is poor; provisions are hardly available for access to new knowledge on techniques, discoveries, meeting like-minded researchers and scientists for joint projects due to inadequate resources; poor funding base making proper operation difficult and to carry out decent research; government policies that are counterproductive as they do not support products from domestic research and rather prefer imports. There is also the issue of inadequate collaboration among NARIs across countries and research organizations within countries to complement rather than compete with each other. Proactivity by NARIs and need to step up trust in the quality of domestic science and findings are important. It will equally help strengthen national science, if governments have institute national rewards for breakthroughs. And the work of NARIs will be aided, if training offered by universities are directly linked to real agricultural challenges, the development of new technologies and innovations.
- S3A should place some emphasis on developing capacity for precision agriculture, including the use of drone technology.
- S3A implementation by SROs should:

- Create regional learning and knowledge sharing platforms for countries to share knowledge and learn from each other's experiences, explore collaborative arrangements and joint projects and programs. Learning, Knowledge Exchange and Information Sharing Platforms for NARIs should be created by SROs
- Develop regional databases of countries' S3A profiles to provide easily accessible information countries and areas in they have leading edge capabilities, policies, genebanks, germplasms on particular crops, livestock, poultry products on which others could draw
- Mobilize resources to target re-building of NARIs capacity, based on a comprehensive capacity building model.
- Breeding system should improve seed production systems and scale up production
- Improve quality and accuracy of databases
- The attention has largely been on crops and livestock. Bring in dairy production
- Clarify value added of S3A to existing frameworks and strategies
- A special meeting should be convened to sensitize policymakers at the level of PS, Directors-General of Ministries of Agriculture and Ministers
- Develop Country Implementation Guides for application of S3A at the country level
- Some of the key priorities for S3A should include the following, among others:
 - Biotechnology development
 - Drought-resistant or tolerant varieties (crops and livestock)
 - Soil fertility – nutrient loss – management
 - Pest and disease management
 - Animal nutrition
 - Conservation of germplasm
 - Genetic characterization of local and indigenous breeds
 - Conservation and development of indigenous and local breeds
 - Animal nutrition participatory germplasm evaluation and selection
 - Climate smart agricultural systems and practices
 - Tissue culture germplasm production for potato, banana and pawpaw
 - Molecular and phenotypic maize germplasm characterization
 - Conventional and bio-fortified crops
 - Multi-stress tolerant germplasm
 - Scaling up of bio-pesticides production
- While there are potential challenges in ensuring S3A is backed by high-level commitment, a number of countries offer a strong sense of assurance. In Rwanda for instance, there is the National Commission on Science and Technology and the National Research and Innovation Fund. These report directly to the President. Thus, countries such as Morocco, Rwanda, Kenya, South Africa are among very promising countries for commitment to the implementation of S3A.
- FARA should share the Innovation Platform practices more widely across countries on the continent to scale up adoption and application to various commodity chains. The Innovation Platform concept has been successfully proven. It is now an innovations-generating practice that should be widely disseminated.

IV.2 Observations, Conclusions and Recommendations from Break-Out Sessions

- There is coordination among institutions in AR4D. This is however weak. There exists more of competition and duplication of efforts rather than of coordination
- Cost of developing and maintaining up-to-date databases and accessibility are challenges
- Sustainable Financing: On the financing of the implementation of S3A, the working groups called for the science agenda to be mainstreamed as opposed to having it projectized. They proposed the following sources among others:
 - Sourcing funds through competitive grants.

- Proposal development to source more funding from donors.
- Conducting joint research/partnership with institutions that have funds for research such as academic institutions.
- Getting in kind support through secondment where salaries of staff are paid elsewhere but the people conduct research.
- Co funding arrangements
- Partnership with commodity organizations.
- Partnership with CGIARs.
- Namibia has private sector, NGOs, institutions of higher learning which can provide support. NGOs can be partners in sourcing funds. Public private partnerships
- South Africa has a private sector which is still untapped in terms of funding science and technology.
- Generally, royalties from intellectual property rights can also help in financing S3A.
- Establishing consortia like the Science in Agriculture Consortium to promote joint funding of projects

IV.3 Observations, Conclusions and Recommendations from Panel Discussions

- Collaboration with international agricultural research and development institutions and agencies is just as important as among national stakeholders. One reason for this is that knowledge is without boundaries. An NIS needs access to global knowledge and databases for innovations.
- An AIS is only responsive to agricultural development challenges to the extent of its funding, the quality of science the country supports or has access to and capacity to utilize, leadership and trust among stakeholders on implementation of commitments made. Well-funded NIS and capacity to undertake respectable science that engenders trust in the applying community go a long way in the development of responsive AIS.
- There is growing working relationship between farmers and researchers across the continent. This is due to productive extension services, practice of IAR4D, IPs, APPs, forums and associations, among other platforms. This needs to be stepped up and Public-Private Partnerships extended to embrace farmers more directly through Public-Private-Producers (PPP) Partnerships. With one extension service officer to about 1,500 farmers, there is still a lot to be done to bring extension services, new technologies and innovations to small-holder farmers and promote uptake of new technologies, which is still very low across the continent. It is also worth noting that a policy of free agricultural extension services is increasingly becoming untenable. But for donor funding support, not many African countries provide resources for extension services. A policy of “Free to Fee” AES is inevitable.
- Science must be demand-driven and must be profitable to make investment in it worthwhile. However, given that Africa’s agriculture relies largely on outputs of the numerous small-holder farmers a significant amount of investment in science may have to be supported on public-good basis to contribute to uptake of new technologies.
- On concluding remarks, views were expressed that:
 - a. Quality science is paramount to an AIS that generates results, promotes uptake and encourages investment by stakeholders, including farmers who are the ultimate beneficiaries of innovative technologies that enhance productivity and profitability.
 - b. An AIS must pool collective capacity of institutions of a country to work together as a system. At present, institutions that have the mandates and capacity to support agricultural transformation across the continent are not working together adequately. Not enough knowledge is documented and shared.
 - c. Science must be purposefully connected to a systematic and collective process of agricultural transformation. The question of “what science is required for what” is still not clearly articulated in countries’ agricultural transformation strategies and plans.

- d. Conceptually, FARA still has to clarify what constitutes a National Agricultural Innovations System. Agriculture stakeholders do not currently share a common knowledge of the concept, its practice, processes in its establishment and management, what it produces, how its outputs are used and how its effectiveness is monitored and evaluated.
- e. For responsiveness and operational effectiveness, participation of decisionmakers in AIS is vitally important. A strategy in this direction would be worthwhile.
- f. The IPs do not seem to be strong participants in AIS at present. Their stakeholder composition and operational strength need careful attention.

IV.4 Observations, Conclusions and Recommendations from Countries Action Plans Presentations

The countries in their presentation of the emerging country action plans put forward the following proposals and recommendations:

- Need for country team to drive the country action plan (CAP)
- Need for national stakeholders' validation of the country action plans
- Infusion of the S3A into National Agriculture and Food Security Investment Plans
- After regional consultation meeting, participants are to brief their principals in the Agriculture ministries and other relevant key stakeholders
- FARA and relevant SRO need to undertake missions to countries to reinforce importance of the S3A. Countries that made direct requests are: Angola, Botswana, Swaziland
The mission or country visits will essentially be sensitization meetings for policymakers and legislators; senior government and private sector officials; farmers and farmers' organizations
- Assistance by FARA and SRO to countries like Swaziland to establish platform to advocate for S3A
- Assistance for the establishment of national Innovation Hubs and sensitization of policymakers as requested (Botswana)
- Guidance and guidelines in the creation of National Research and Innovations Fund
- Sensitization of policymakers (Botswana).
- Facilitation of participation of key experts for better and deeper understanding of the science agenda, the theory of change, IAR4D and Innovations Platforms and Systems.
- Southern Africa countries put forward the following timelines for the submission of their completed and validated country action plans

V FOLLOW-UP ON THE REGIONAL CONSULTATIONS

At the end of the regional consultations, participating countries and institutions emerged with a good knowledge of the Science Agenda, were clear about what it entails and seeks to achieve and the role expected of institutions and countries in its implementation. There was also an appreciable understanding of the implementation framework. The preferred option is to have the agenda mainstreamed in existing strategies, policies and programs of countries as opposed to being projectized as a special intervention.

The following were raised as areas of immediate follow-up:

V.1 Clarification of Concepts and Finalization of Frameworks

- FARA should develop a value-added statement for the S3A to clearly articulate the value it brings to current frameworks, policies and practices.

- Clarification of the concept of Innovations Platform and development of implementation guides for National Agricultural Innovations System and the Innovation Platforms
- Finalization of the complete theory of change for the S3A at regional and continental levels
- Finalization of the results framework for the S3A at regional and continental levels, including a performance (implementation) monitoring and evaluation strategy, system and indicators

V.2 Development of Implementation Arrangements and Programs

- Development of a comprehensive knowledge and information support system for the implementation of the Science Agenda, building on the framework offered by FARADATAInformS.
- Elaboration of a comprehensive capacity building and strengthening program for the implementation of the Agenda at national, regional and continental levels. This should help strengthen NARIs, develop partnerships, support high quality scientific research, among others.
- Articulation of financing strategy and instruments for mobilizing resources for implementation of the Agenda at all levels – national, regional and continental – and launch of a resource mobilization drive. Resource requirements should take into consideration individual country circumstances and assistance to launch implementation of the Agenda over the immediate 2-3 years. The needs assessment should be based on Country S3A Needs Assessment or Country Profiles and priority areas of needs.
- FARA to develop clear Country Implementation Guidelines (CIG) and Framework for Reporting on the implementation and performance of the agenda. The CIG should provide countries with options in respect of implementation framework for the Agenda.

V.3 National Focal Points and Champions and Sensitization Missions to Countries

- Conduct of sensitization missions by FARA and the SROs to countries that made formal request during the consultations, namely, Angola, Botswana, Madagascar, Swaziland...
- Countries should advise FARA of their focal points in the implementation, coordination and reporting on the agenda. Efforts should be made to identify and cultivate champions of the Agenda at national and regional levels.

V.4 S3A Communication and Advocacy Strategy and Program

- Review, editing and standardization of the presentation of all Country Action Plans for upload on FARA, SROs and AFAAS web sites
- Development of portals for S3A documentation, information and news on FARA, SROs and AFAAS web sites.
- Production of an Annual Implementation Report on the Agenda
- FARA should provide participants access to all materials presented during the consultation meetings
- An S3A communicating plan should be developed to systematically raise awareness of the Agenda at national level across the continent. This should draw on the use of national, regional, continental and international platforms, conferences and meetings such as Science and Technology (S&T) Platforms, Scientific Conferences, Briefings of political leaders, among others

VI. THE NATIONAL CONSULTATIONS: KEY OBSERVATIONS, CONCLUSIONS, RECOMMENDATIONS AND WAY FORWARD

Based on deliberations at the National Consultations, what follows are some of the key observations, conclusions reached and recommendations made by the participants.

VI.1 Observations and Conclusions

- 1) **Critical Importance and Timeliness of the Science Agenda:** The Science Agenda is a critically important intervention in Africa's agriculture. It will provide a strong impetus for the transformation of Africa's agriculture and enable the continent to achieve CAADP-Malabo goals and targets. Its focus should however not be solely on improving productivity. It should foster application of existing innovations and look into improving nutritional value of food.
- 2) **Strong Outreach to National Stakeholders:** A broad range of stakeholders should be cultivated to facilitate its implementation. In essence, the institutions composing NARS and AIS should be more inclusive. Engagement of the private sector should be significantly enhanced. NARS must also embrace the participation of other key actors particularly the private sector, NGOs, extension organizations.
- 3) **Stakeholder Framework:** A new stakeholder coordination framework may not be required for the implementation, partnership and coordination of S3A implementation. Existing frameworks like ASWAp (Malawi) should be strengthened to include stakeholders that are not present, especially Universities research centres and CGIAR institutes in the countries.
- 4) **Improved Institutional Cooperation and Collaboration:** Institutions within the NARS need to step up collaboration for effective implementation of the Agenda. At present, this is inadequate, especially between African Universities and Research Centres. The result is avoidable duplication of scientific research and waste of resources.
- 5) **Operational Model for Implementation of the Science Agenda:** The Science Agenda is not a project or a separate program. It is a guiding framework for more intensive application of science in Africa's agriculture. To this end, its implementation requires that it be mainstreamed into existing national agricultural development strategies and implementation plans. There will therefore not be a single operational model for the implementation of S3A at the country level. Each country will develop its implementation model that is suitable for its own context. However, countries should be mindful of the need to define clear entry points in terms of priorities for S3A to add distinct value to existing strategies and programs. Otherwise, it would be difficult to break away from the self-perpetuating business as usual circle. The Science Agenda is a new way of doing things.
- 6) **New Generation of Farmers and the Youth:** S3A should have a well-defined strategy for addressing the needs and enabling environment for the new generation of farmers and entrepreneurs. Some further work is needed in this area in terms of approaches and mechanisms.
- 7) **Success Factors in S3A Implementation:** The Science Agenda that has been rolled-out is a guide to countries. Its translation into an implementation plan will require a number of factors or inputs at the level of the countries. Central among these will be leadership role of the government, designation of focal points or responsible institutions for mainstreaming the Agenda and reporting on implementation; availability of financial resources; human and institutional capacity; enabling policy environment; and a robust knowledge management and information support system. A sub-strategy for each should be elaborated to guide countries' implementation arrangements.

VI.2 Recommendations

- 1) **Framework for S3A Implementation:** The theory of change and results framework for each country should be finalized, endorsed by national stakeholders and made widely available to all stakeholder institutions

- 2) **National Focal Points:** FARA and the SROs should follow up with the Tier 1 countries to ensure that national focal points are designated to coordinate implementation and reporting on the performance of the Agenda.
- 3) **Financial Resources for S3A Implementation:** Countries should look inward within national budgets for agriculture; science, technology and innovations; education, among other related sectors as well as Public-Private Sector Partnerships to support implementation of the Agenda. These should be supplemented with investment proposals to development partners. Each country will therefore need to develop a concrete financing strategy for implementation of the Agenda.
- 4) **A Robust Knowledge Management and Information Support System:** FARADDataInformS is a veritable platform that could provide knowledge and information support to the S3A. It should be enhanced to regularly and systematically collate, process and share implementation strategies, programs and lessons. For instance, experience in the implementation of Innovation Platforms (including learning from the WAAPP platforms) should be shared.
- 5) **National Validation Workshop:** Each Tier 1 country should organize a National Validation Workshop sequel to the National Consultation held. This should be developed to the following issues:
 - a. Review and endorsement of the recommendations of the Report of the National Consultation.
 - b. Review and endorsement of the Country Theory of Change and Results Framework
 - c. Proposal and endorsement of National Focal Points for S3A Implementation
 - d. Outline of national strategy for financing implementation of the Agenda
 - e. Country level implementation arrangement:
 - i. Link with CAADP and other national agricultural and STI frameworks
 - ii. Country commitment letter
 - iii. National strategy documents into which S3A will be mainstreamed
 - iv. Implementation schedule, milestones and targets
 - f. Regular communication and dissemination of information on progress
 - g. Monitoring, evaluation and reporting on S3A Implementation
- 6) **Sustainable Financing of S3A Implementation:** Sustainable financing for S3A could be placed within the context of CAADP 10% of national budget allocation to the agricultural sector, 1% of GDP allocation to Science, Technology and Innovations under STISA 2024, and innovative sources of financing. Dependence on donors will not provide sustainable long-term solution to the effective implementation of the Science Agenda. Donor support however has a vital role to play.
- 7) **National S3A Capacity Building Strategy and Program:** At the heart of the successful implementation of the Science Agenda is the existence of adequate and responsive human and institutional capacity. Well capacitated national policy and program coordinating institutions and agencies; well-staff, equipped and resourced national agricultural research institutes

VI.3 Emerging Key Priorities for S3A Interventions

(a) Technical Priorities

The consultations showed that country circumstances and state of agriculture, especially in terms of capacity for innovations, differ across the continent. Equally, they also revealed similarities or commonly shared challenges and opportunities in the implementation of the Science Agenda. Thus, while there were variations in areas of strategic priorities for S3A interventions, generally the following were some of the key priorities identified by the countries during the consultations.

- 1) Management of post-harvest losses.
- 2) Strengthening capacity for aquaculture
- 3) Expansion of knowledge and effective use of Innovation Platforms, drawing on and disseminating lessons from platforms of existing programs (e.g., WAAPP)

- 4) Food quality and nutritional value of food
 - Strengthening bio-fortification to achieve food and nutritional security.
 - Enhancement of research into nutritionally rich varieties of crops as against singular focus on increased productivity.
 - Food safety with a focus on aflatoxins
 - Improvement on collaboration and networking among stakeholders.
 - Enhancement of the level of adoption of existing technologies
 - Improvement of dissemination of existing technologies.
 - Development of appropriate technologies to double crop and livestock yields by 2025
 - Production and supply of high-quality seeds accessible to farmers.
 - Research to promote availability of rich and nutritious food all through the year to address issue of seasonality of food crops.

(b) Institutional and Process-Related Priorities

In addition to the technical priorities, the consultations identified a number of priorities in the realm of institutions, systems, processes, and practices that S3A implementation arrangements should seek to address. Among these are:

- 8) Farmers' access to low-cost finance and structured markets. A long term sustainable financing arrangement for small scale farmers is required. Schemes should facilitate low-cost borrowing; farmer-friendly repayment terms; and affordable individual and group insurance.
- 9) S3A should consider appropriate business models for upscaling new technologies and extension services. It will not be sustainable for innovations and extension services to be delivered for free. A strategy of moving from free to affordable fees should be in for consideration.
- 10) knowledge management, S3A should seek to define clearly the type of knowledge and information it wants to generate, collate and disseminate and the stakeholders who need this input and for what. The products, services and expected outcomes of the knowledge management system should be cogently articulated. The KMS should build on existing data and information management platforms, where these exist. FARADDataInformS should have defined strategy for working with these. It should seek to harmonize the formats in which these are provided and ensure easy access, especially online. FARADDataInformS may have to be developed into a continental Knowledge and Information Centre for S3A and Africa's Agriculture.
- 11) The regional and national consultations have made considerable progress in tackling most of the issues in the rolling out of the Science Agenda. A second round of highly specialized region or continental consultations is required to focus on salient issues, particularly that of the priorities it should address and finance of implementation, among others.
- 12) Need for regular training and knowledge sharing among Innovation Platforms members and stakeholders.
- 13) Business models that facilitate commercialization of innovations and research outputs must be developed.

VI.4 Way Forward

The end of the Regional and National Consultations marks the beginning of a new phase in the implementation of the Science Agenda. This is particularly the case, when the strategy is a framework that has to be adopted and mainstreamed by the government. As a way forward, this report puts forward the following:

- 1) **National Validation Meetings:** Organization of follow-up National Validation Meetings by Tier 1 countries to reach out to a larger number of stakeholders who did not participate in the National Consultations.

- 2) **Confirmation of National Focal Points:** Tier 1 countries be requested to confirm national focal points for implementation of the Agenda.
- 3) **Signing of S3A Memorandum of Commitment:** All Tier 1 countries and others subsequently should be encouraged to sign a Memorandum or Letter of Commitment for deposition with FARA. The SROs should be one of the signatories for the countries in their regions. FARA in consultation with the SROs should develop and agree on the format for the MoC or LoC drawing inspiration from the CAADP National Compact of stakeholders.
- 4) **Production of Country S3A Strategy Document:** Each Tier 1 country should be encouraged to produce a National S3A Document (Implementation Strategy) to articulate its priorities and map out its implementation pathway. The document should incorporate the endorsed Theory of Change and Results Framework for the country.
- 5) **S3A Regional Implementation Strategy:** ASARECA, CCARDESA, CORAF and NASRO should each consider developing a regional implementation strategy for the Agenda. This should draw on the countries' S3A strategy documents.
- 6) **Cultivation of Champions for S3A Implementation:** The focal points or institutions in each country should launch a drive to cultivate national champions or influential individuals in support of the Agenda.
- 7) **Alignment of S3A Value Addition:** The expected value addition of S3A should be aligned with those of existing ASWGs to harmonize performance indicators and measures.
- 8) **Use of Existing Institutional Structures and Policy Frameworks:** Countries should be encouraged to use existing institutional structures and policy frameworks to implement S3A at the national, regional and continental levels.
- 9) **FARADaInFormS as Knowledge Management Framework:** Existing data, knowledge and information system should be built into or linked with FARADaInFormS to ensure complementarity.
- 10) **Capacity Strengthening:** S3A has implications for how farmers and agri-business entrepreneurs are trained and re-skilled. It should therefore contribute to curriculum reform at tertiary education level, including in vocational training schools.

PART I

INTRODUCTION

INTRODUCTION

This report presents a synthesis of the presentations and deliberations of the regional and national consultations held over the period April – July 2017 by the Forum for Agricultural Research in Africa (FARA), in collaboration with host national governments in which the consultations were held and Sub-regional Research Organizations (SROs) for the roll-out of the Science Agenda in Agriculture in Africa (S3A). The regional consultations were sponsored by the International Fund for Agricultural Development (IFAD) and held in Malawi for Southern African countries on 9-11 April 2017; Rwanda for East African countries over the period 19-21 April 2017; and Ghana for West and North African countries on 9-11 May 2017. The national consultations were held in the five (5) Tier 1 countries⁵, namely, Egypt, Malawi, Rwanda, Ghana, and Senegal.

Today's science is tomorrow's technologies and innovations required to sustainably transform agriculture and improve quality of lives. For the African continent, the S3A is a means to this transformation. It is an investment for a better future for African countries. To make science work for Africa's agriculture, the continent will need to invest a lot more in agricultural research for development as well as make national agricultural research institutes and policies work more effectively and efficiently.

Home to about 60% of uncultivated arable land globally and a vibrant youthful population, the African continent has vast agricultural potential. Yet, it is a net importer of agricultural and food products. Low agricultural productivity, droughts, effect of climate change, declining outputs per head due to rapid population growth, poor infrastructure, ineffective policies and weak institutions are among factors challenging agricultural development in African countries in varying degrees. A number of continental, regional and national agricultural transformation and development frameworks and strategies are in place to help address these challenges. Although progress is being made⁶, the results are still far from impressive. There is a need to considerably step up investment in agriculture. Only 8 out of 54 African countries are keeping the promise to invest more in agriculture. In this year, due to favourable rains in the first quarter of the year and high-quality seeds, the Southern Africa region will reap bountiful harvest of maize much of which most likely will go to waste due to challenges in post-harvest management of crops. This should however not be the faith of the continent's agriculture.

⁵ The Tier 1 countries are those that have made significant progress in preparation for implementation of the Science Agenda. Progress is reflected in commitment, leadership and stakeholder awareness and preparedness, among other considerations. The Tier 1 countries are: Southern Africa: Malawi; East Africa: Rwanda; North Africa: Egypt; and West Africa: Ghana and Senegal. Beside the five countries, others that meet Tier 1 requirements would be encouraged to accede to this category of implementation readiness.

⁶ For instance, among numerous initiatives by both public and private sector organizations, the Dangote Group in Nigeria plans to invest US\$3.8billion in sugar and rice and US\$800million in dairy production over the next three years, 2018-2020. The conglomerate plans to increase its production of sugar to 1.5 million metric tons a year by 2020 from 100 000 tons at present and is seeks to add 1 million tons of rice. Nigeria relies heavily on food and agricultural products imports to meet shortages in local production and growing demands from a population that is about 180 million. The Group also plans to expand investments in soybean, oil palm, palm kernel and corn production. It plans to support rice cultivation by supplying high-yield seeds, pesticides and fertilizers to contract farmers. These projects will draw heavily on the application of science in agriculture.

Africa's agriculture is sustained largely by small-holder farmers, and can do more to produce food, exports, employment and incomes, only if productivity can be improved. This is an area in which the continent will now have to look beyond present frameworks and strategies and draw on the sciences, among other factors, to respond sustainably to the productivity challenge. Science is by no means the weakest link to sustained productivity⁷. It is however fundamental and has direct impact on yields performance. Crop yields on the continent range between one-third and one-half of the global average. Researchers per million population are considerably lower than what exists in other developing regions such as Latin America and South Asia. Africa has 70 per million agricultural scientists and researchers. The comparable figures for Latin America and North America are 550 and 2,640, respectively (AGRA: 2015⁸).

The space and potential for science to accelerate productivity increases in Africa are enormous and very promising. Farmers need improved access to existing and new tools, knowledge and technologies to be productive. Uptake of research findings and innovative technologies rose from about 5% in the 1970s to 60% in 2005 (FARA). The overall rate of return to investment in research is more than 43% (FARA). Investment in science will enable the continent to step up research, develop, breed and reach out to the large number of small-holder farmers with new crop varieties and healthy livestock to increase productivity, outputs and reduce food prices and environmental footprints of farmers; develop technologies that would be generally available to or affordable by small-holder farmers; improve nutritional value of food, which is just as important as improved productivity so as to deal with the undernourishment challenges, given that about 30% of the African population is undernourished; develop hybrid seeds, improved varieties and support local production and increased use of fertilisers required by small-holder farmers; reduce cost of inputs due to import dependence; ease access to leading edge technology like molecular markers, which can accelerate traditional breeding methods and enhance seeds availability to farmers; and bring within reach new tools of biotechnology – such as genome definition and marker-assisted selection (genetic code variations or markers) - that can help to tell how specific genes would perform.

The imperative for application of science in agriculture in Africa is therefore enormous. It is in this context that FARA under the mandate of the African Union Commission and NEPAD Agency developed and launched the Science Agenda in Agriculture in Africa, which is being rolled out by means of the regional and national consultations.

This report is produced in five parts. Part I is introductory. Part II examines the Science Agenda for Agriculture in Africa in the context of an STI framework, the vision and goals the Agenda seeks to achieve, what the implementation roll-out entails, the objectives of the regional and national consultations and their expected outcomes. In Part III, the report outlines the importance of the consultations for Africa's agriculture, paying specific attention to the evolving AR4D landscape and the financing of AR4D, which remains inadequate and challenging. Part IV presents the consolidated report of the regional consultations held in Malawi, Rwanda and Ghana, highlights the discussions, examines emerging issues, states the conclusions, recommendations put forward and defines the way forward as proposed by the participants. Lastly, Part V presents the individual reports of the national consultations in the five tier-one countries, namely, Egypt, Ghana, Rwanda, Malawi and Senegal, the observations and conclusions emanating from the consultations, recommendations put forward by participants, key priorities that the Science Agenda should address and the way forward after the consultations.

⁷ AGRA Agriculture Status Report 2015, for instance, observed that farmers in the US pay US\$226 delivery price for a tonne of fertilizer. This is about the price in some countries in Africa due to shipping costs, port duties, storage fees, fuel costs, inland transportation costs, importers and seller's mark-ups and administrative malfeasance like bribes for import licences and port clearance. In Zambia, the price is about US\$414. Farmers may be willing to bear the cost if they could be sure of selling their surplus produce at a good price. But the route to market is too precarious for most smallholders. Up to a fifth of surpluses is lost because of poor storage and roads. The shortage of credit forces small farmers to sell low rather than wait for the best seasonal prices

⁸ AGRA Agriculture Status Report 2015.

PART II

THE SCIENCE AGENDA: STI FRAMEWORK, GOALS AND OBJECTIVES OF THE CONSULTATIONS

II.

THE S3A: STI FRAMEWORK, GOALS AND OBJECTIVES OF THE CONSULTATIONS

II.1 S3A AS AN STI FRAMEWORK

As an STI organizing framework, the S3A provides instruments for mobilising human, institutional, infrastructural, financial and policy resources required to enhance the application of science, technology and innovation to raise agricultural productivity and outputs in order to achieve agricultural development goals and targets.

The development of science, technology and innovations (STI) capacity is pivotal for the transformation of Africa's agriculture. It has been given concrete expression in the development and launch of the Science Agenda for Agriculture in Africa (S3A). African countries need to invest in science and technology and the development of new technologies and innovations systems in the agricultural sector. STI has an important role to play in the attainment of Africa's sustainable agricultural development objectives. Yet, it has received the most inadequate support on the continent. Africa's continued low investment in science and technology is manifest in the declining quality of science and engineering education at all levels of the educational system. Institutions of higher learning, particularly universities and technical colleges, are in urgent need of renewal and link to the needs of the agricultural sector. There is a tenuous link between STI institutions and industry, a mismatch between R&D activities and national agricultural and industrial development strategies and priorities. As a result, research findings from public research institutions are not adequately accessed and used by local industries and particularly small and medium-sized agricultural enterprises.

The transfer of science and technological knowledge is often an issue that is not well addressed by African countries and regional research institutions. The continent has continued to register limited increases in R&D expenditure, attract only a small number of R&D projects, and record low growth in patent applications (Table II.1) and trademarks granted. In many countries, infrastructure for R&D is neglected, inadequate or decaying.

**TABLE II.1: AFRICA IN GLOBAL PATENTS REGISTRATION, 2002 – 2015
AND R&D SPENDING**

	No. of Registered Patents	R&D Spending (% of GDP)
• United States:	5,739,851	2.74
• Japan:	1,069,394	3.58
• Germany:	365,627	2.87
• S. Korea:	166,353	4.29
• Taiwan:	162,732	3.00
• UK:	140,227	1.70
• France:	139,866	2.26
• Canada:	123,904	1.61
• China:	45,366	2.10

• India:	17,865	0.85
• Russia:	4,955	1.19
• South Africa:	4,600	0.73
• Brazil:	4,116	1.15
• Egypt:	275	0.68
• Kenya:	90	0.98 (2012)
• Tunisia:	43	1.10 (2012)
• Zimbabwe:	39	
• Nigeria:	36	0.22 (2012)
• Cameroon:		15
• Ghana:	13	0.38 (2012)
• Algeria, Mauritius:	07	0.07 (Algeria)
• Senegal:	06	0.54 (2012)
• Madagascar, Tanzania, Uganda	05	0.48 (Uganda)
• Chad, DRC, Ethiopia, Gabon, Guinea, Liberia, Malawi, Namibia:	02	0.61 (Ethiopia)
• Benin, Burkina Faso, Mali	01	0.66 (Mali, 2012)

Sources: Patent Technology Monitoring Team Report, December 2015; UNESCO, WORLD Bank

REGIONAL AVERAGE OF R&D EXPD (% of GDP)

• North America	2.6%
• Oceania	1.9%
• Europe	1.6%
• Asia	1.6%
• Latin America & the Caribbean	0.6%
• Africa:	0.4%
• Global Average:	1.77%
• STISA 2024 Target	1.00%

Source: UNESCO, Global Investments in R&D, August 2011; STISA, 2024

Technological applications and innovations are created through knowledge derived from investment in agricultural R&D. The continent does not at present feature highly among the top locations that attract R&D projects. Until recently, the most significant development in science, technology and innovation has been the establishment of the NEPAD Science and Technology Consolidated Plan of Action (CPA) and the African Ministerial Council on Science and Technology (AMCOST) of the AU that oversaw the implementation of the CPA.

The CPA, which has now been replaced by the Science, Technology and Innovations Strategy for Africa (STISA) 2024, identified some key priority areas for Africa to work on, and the strategies and policy processes for their implementation. This drove some of the science-based sustainable modernization of agriculture and rural transformation supported through CAADP. A number of countries participated through plans for modernizing agriculture or agriculture-led industrialization strategies. Efforts by Uganda, Malawi, Nigeria, Ghana and Ethiopia are promising examples. To build on these developments and achievements, FARA led the continent in the development and launch of S3A. A key aim behind the science agenda is to encourage private sector participation in ASTI; leverage available human, financial and institutional resources through partnerships and cooperation; and encourage learning through exchange of replicable practices and wider application of STIs.

The roll out of S3A must galvanize countries to create an enabling environment for the implementation of the agenda and guide positive actions by governments and the private sector.

II.2 S3A: VISION AND GOALS

The science agenda sets out principles to help African countries effectively apply science to transform their agriculture. It thus provides a guide to the science, technology, extension, innovations, policy and social learning the countries need to apply in order to meet agricultural development goals. The science agenda is based on the recognition of the potential of science for the continent's agricultural transformation as encapsulated in the CAADP and the roadmap strategy for implementing the 2014 AU Malabo Declaration on Accelerated Africa Agricultural Growth and Transformation (A3GT).

The vision of S3A is to ensure that “By 2030 Africa is food and nutrition secure; becomes a recognized global scientific player in agriculture and food systems; and emerges as the world's bread-basket” The S3A in addition seeks to double public and private sector investment in agricultural research for development (AR4D) by 2020.

The science agenda is guided by three sets of strategic goals. In the short term of 2-3 years, the implementation of S3A is expected to lead to an increase in domestic public and private sector spending and the creation of an enabling policy and infrastructural environment for the application of science in agriculture in the countries. For the medium-term period of 3-5 years, the science agenda should lead to the development of youth-development and women-empowerment responsive capacity for the conduct of internationally comparable scientific research in the NARIs, Universities and related agencies for sustained improvement in agricultural productivity and outputs. In the long-term, specifically by 2025, the application of science in Africa's agriculture is expected to double current level of agricultural productivity.

Mandated by the African Union Commission and NEPAD in 2012, S3A was developed by FARA through an elaborate consultation process across the African continent and internationally. The agenda was formally endorsed by the African Union Assembly of Heads of State and Government in Malabo in 2014 and launched in Johannesburg, South Africa, in 2015. Focussed on four core thematic areas - Sustainable productivity in major farming systems, Food systems and value chains, Agricultural biodiversity and natural resource management, and Mega trends and challenges for agriculture in Africa – the science agenda has reached its implementation phase and is thus being rolled-out to countries on the continent.

II.3 WHAT THE ROLL-OUT OF THE SCIENCE AGENDA ENTAILS

The roll-out of the science agenda regionally and at the country level involves mobilizing and supporting African countries to initiate implementation of the framework by mainstreaming it into existing agricultural development strategies, programs and investment plans such as CAADP and the National Agriculture and Food Security Investment Plans (NAFSIPs). To this end, FARA and the Sub-Regional Research Organizations are working with countries to identify key areas in which changes are required for the implementation of the agenda and to facilitate the needed transformative change. It is for this reason that with the support of IFAD, FARA launched the regional and country-level consultations to inform the roll-out process.

II.4 OBJECTIVES OF THE CONSULTATIONS

At the regional level, the consultations sought to achieve four major objectives. These are to:

- 1) Sensitize countries on the S3A and consult them on the proposed process for its roll out and S3A implementation process
- 2) Consult countries and seek their inputs in the construction of a continental Theory of Change for the S3A.

- 3) Consult countries on the principal enablers for increasing the application of the STI to double agricultural productivity by 2025 (i.e. capacity strengthening, policy changes, investments and partnerships and collaborations)
- 4) Apprise countries of emerging S3A initiatives and explore how these will be leveraged to strengthen the principal enablers

For the national level, the country consultations are meant to achieve the following core objectives, namely, to:

- 1) Secure the country's commitment to the implementation of S3A
- 2) Initiate formulation of a country theory of change for the S3A
- 3) Initiative stocktaking and profiling of the state of the country's agriculture
- 4) Assemble requisite data and information for the formulation of the country's action plan and implementation arrangements

In addition to the foregoing core objectives, the consultations are aimed at ensuring that the S3A is owned and driven by countries; clear entry points are identified for its implementation to contribute concretely and measurably to National Agricultural and Food Security Investment Plans as well as other agricultural development strategies and deliver CAADP-Malabo targets; and to provide an engagement platform for the lead institutions, especially FARA, SROs, AFAAS and the NARIs to plan and work together most effectively and efficiently in the roll-out of the agenda.

It is expected that the consultations will generate inputs for the development of a proposal for support to countries in the implementation of the science agenda.

II.5 EXPECTED OUTCOMES OF THE CONSULTATIONS

The roll out of the science agenda brings along numerous benefits to the process of agricultural transformation on the continent. Central among these, it will facilitate the following:

- 1) Assist countries to launch and maintain a process of developing, regularly updating and sustaining statistics on their agriculture profiles.
- 2) Enable countries to assess the amount of scientific research that is going into agriculture, so as to regularly document and report on the application of innovative technologies and their quality.
- 3) Help countries to determine the level of uptake of new technologies and innovations by small-holder farmers and the impact on productivity.
- 4) Launch a process for the assessment of the amount of funding that is going into AR4D within the 1% of gross national product (GDP) that countries are to allocate to science, technology and innovations under STISA 2024.
- 5) Share among all countries knowledge of the innovations platforms (IPs) as a tool for fostering generation, sharing, application and communication of technologies and innovations.
- 6) Develop a databank of regional information on countries' strengths and lead areas in scientific research in order to promote learning, joint research and to eliminate duplication of efforts and waste of resources.
- 7) The use of common national and regional facilities and laboratories in order to maximize on utility of existing capacity.
- 8) Encourage the use of local products to facilitate the growth of domestic markets for farmers and reduce import dependence.
- 9) Provide national platforms for NARS institutions and stakeholders to coordinate their activities and maximize use of resources.
- 10) Develop knowledge and information management system that delivers real-time new technologies, innovations and market-related information to small-holder farmers.

PART III

AFRICA's AGRICULTURE AND THE IMPORTANCE OF THE CONSULTATIONS

III.

AFRICA'S AGRICULTURE AND THE IMPORTANCE OF THE CONSULTATIONS

III.1 AFRICA'S AR4D LANDSCAPE

The recent two decades witnessed impressive growth in Africa's agriculture and accentuated the pressing need to accelerate growth in agricultural productivity. Despite this growth, sub-Saharan Africa still faces a significant food gap, which is currently being met through imports. These in turn provide a pointer to potential market for African producers to expand outputs, grow incomes and improve livelihoods. For this potential to be realized, there is need for increased production and productivity – in large part from small-holder farmers.

Africa's food and nutrition challenges remain enormous. More than 60% of the continent's 1.1 billion people are still poor and live below the US\$1.25 per day poverty line. MDG 1 had sought to reduce condition of extreme poverty and hunger by half by 2015. Progress was made, but was insufficient. Africa's Agenda 2030 and the Malabo Declaration of 2014, on the one hand, and the UN SDGs 2030, on the other, place emphasis on ending poverty in all its forms and ensuring food and nutrition security for all by 2025 and 2030, respectively. Africa, with the support of the international community, is investing in agriculture and rural infrastructure development to fight poverty and hunger. Over the past five years, significant resources have been invested. Large numbers of small-scale producers in the agricultural value chain have been reached in the sector, access to technology is on the rise and outputs are increasing. All these are however insufficient to meet the food shortage currently facing the continent. At many levels, the right things are being done. But these remain generally inadequate in scope.

Science-based agricultural tools hold considerable promise for tackling Africa's growing food demands. From improved seeds, to modern crop protection solutions, to mobile technology for farmers in the fields and their access to market information, to making foods fresher, safer, and healthier, the African agricultural and food systems of the future can be more productive, more sustainable, more efficient, and more interconnected. Greater investment in and broader adoption of science, technology and innovation can enable the continent to meet the growing demand for food as its population increases.

The World Summit for Sustainable Development (WSSD) and the United Nations Millennium Project task force on science, technology, and innovation had both reiterated the need to harness science and technology sustainably to accelerate development. The development distance between different countries is now being attributed to the extent of use of science and technology in these countries. The critical limiting factor for Africa today with regard to access to science and technology has multiple dimensions: access associated with cost of technologies, and human capacity constrains to access and use of otherwise available technologies. For the promotion of science and technology, we need to create institutions and institutional arrangements that facilitate innovation, diffusion of knowledge and change, in addition to formal institutions for science, technology and innovation. Core elements to this include coordination, reward systems, accountability and governance institutions. Several components of this are in place in Africa. All that is required is reform of the national agricultural research and extension systems on the continent and intensive application of science in agriculture. For these, scaling up of investment in agricultural research, technologies and innovations is a necessity. Unfortunately,

investment in agricultural STI is not gaining the kind of momentum that is required for sustainable agricultural transformation.

After the stagnation of the 1990s, resource allocation to agricultural research and development (ARD) on the continent took a positive upward trend, but remained donor-dependent⁹. Public ARD spending in SSA rose by more than one-third in real terms, from USD 1.2 billion in 2000 to USD 1.7 billion in 2011, measured in constant 2005 dollars. A total of 18 of the 38 countries included in the ASTI analysis spent less than USD10 million on agricultural R&D, and many smaller countries, recorded negative growth between 2000 and 2011. Consequently, ARD funding in many SSA countries remains highly dependent on donor support. The trends in ARD expenditure as summarized in the ASTI Report are mirrored in ARD capacity. SSA's public agricultural research capacity increased by 50 percent during the 2000-2011 period to an estimated 14,500 full-time equivalent (FTE) researchers (ASTI, 2014). However, only three countries - Nigeria (2,688 FTEs), Ethiopia (1,877 FTEs), and Kenya (1,151 FTEs) - employed more than one-third of these researchers in 2011. Ethiopia and Nigeria were responsible for most of SSA's capacity growth during this period. Of the 38 countries included in ASTI's analysis, 10 employed fewer than 100 FTEs each, and growth across countries was primarily driven by the recruitment of junior, Bachelor's degree-level researchers.

Overall, African countries, but especially those in SSA, have not kept pace with the rapid developments in science and technology (more so in sciences applied to agriculture) primarily because of a lack of appropriate human resource capacity. Major challenges include lack of staff training and experience. Moreover, poor remuneration results in high rates of attrition, especially of the best staff. Consequently, despite the apparent growth in absolute number of agricultural researchers in African NARS in recent decades, researcher numbers and qualification levels remain among the more serious constraints facing NARS on the continent (again, with the situation in SSA being worse than in North Africa). The situation is made worse by the fact that only a small proportion of NARS institutions have near adequate infrastructure and facilities, including ICT connectivity and reliable access to electricity and water supply as well as functional laboratories with adequate equipment and supply of chemicals and other reagents and consumables. Even what is available is generally poorly maintained because of lack of financial resources to do so.

In North Africa, very large differences were observed across the sample countries (ASTI, 2015). Algeria, Mauritania, Morocco, and Sudan employ relatively few agricultural researchers when taking into account the number of people economically engaged in agriculture. Egypt, on the other hand, employs significant numbers of researchers per farmer. With the exception of Mauritania, ratios of researchers per 100,000 farmers have increased in North Africa. There were also similar challenges related to inadequate operational budgets. For example, salaries accounted for more than 80 percent of total expenditures by the national agricultural research institutes of Algeria, Egypt, and Sudan during 2009–2012 period. The bottom line is that many African countries remain seriously challenged by underinvestment, inadequate human resource capacity, and poor research infrastructure to effectively implement the science agenda for agriculture.

In many African countries, extension systems have undergone profound changes during the last 20 years or so, from a centrally-controlled, top-down approach to one that encourages involvement of different organizations to interact with farmers as equal partners. At the same time 'extension paradigm' has evolved from *dissemination* of technology packages and support services towards a more innovations systems approach. Farmer participation in technology development is now well accepted not as a possibility, but as way of working. These changes need to be reflected in the way AR4D is conceptualized and executed: Extension is no longer what we do *after* research.

Across Africa the levels of collaboration and partnerships between the African NARIs and universities even within the same countries are weak while those between NARIs and foreign institutions in other developing countries and in the developed countries are even weaker. The distance between researchers

⁹ ASTI Synthesis Report, 2014

(in NARIs and Universities) and extension is even worse. This is the context in which the science agenda for agriculture to increase AR4D performance has been framed. At the core of this will be robust mechanisms to generate the required research outputs needed to accelerate agricultural transformation. But this will come to naught, if there is no inbuilt (not separate) mechanism for ensuring that the research products get into the hands of farmers. This will include sufficient and sustainable funding to support strategic agricultural research and development programs in alignment with national, sub-regional and continental priorities, combined with a cadre of well-trained researchers, extension and advisory services personnel.

Box III.1: CHANGING LANDSCAPE OF AR4D IN AFRICA

“In Africa, institutional frameworks for agricultural research have shifted significantly, and new platforms, coordinating bodies, and processes have been established to increase the relevance and impact of research on development and poverty reduction. Components of the CAADP agenda, including regional, sub-regional, and national agricultural and food security investment plans, have been developed with established goals, targets, and priorities. The Framework for African Agricultural Productivity, developed by agricultural stakeholders in Africa under the leadership of FARA, has encouraged SROs and their partners to broaden their focus by looking into practical, new knowledge on innovation processes ...

The establishment of national and regional agricultural investment plans (NAIPs and RAIPs) and flagship sub-regional agricultural productivity programmes in East, West, and Southern Africa (EAAPP, WAAPP, and APPSA) provide the opportunity for enhanced partnerships between CRPs and SROs. They are also leveraging strong partnerships with NARIs outside Africa, especially the Brazilian Agricultural Research Corporation (Embrapa), and donor support.

Nevertheless, coordination among CRPs, SROs, and NARSs—while seemingly less difficult than before—still fall short of mechanisms to facilitate effective and coherent interactions; hence, the looming issue is establishing the necessary institutional architecture to enable these interactions. With CAADP now into its second decade of implementation, and the RAIP and CRP processes moving into their second phases, the opportunity exists to improve the institutional alignment and linkages among AR4D institutions”

Roy-Macauley et al. (2016)

III.2 FINANCING OF AR4D IN AFRICA – PUBLIC INVESTMENT AND EXTERNAL DEVELOPMENT ASSISTANCE

Sub-Saharan Africa has benefited less from agricultural R&D than other regions of the world because both investment in the development of new technologies and the potential for technology spill-overs from elsewhere are low. Overall, agricultural R&D investment levels in most SSA countries are still well below the minimum target of 1 percent of gross domestic product recommended by the African Union under STISA 2024. Further, agricultural R&D agencies in SSA are more dependent on funding from development partners than counterparts in other developing regions. Such donor funding has shown greater volatility over the past decade compared with government funding, low as these are. Dealing with this volatility requires a long-term commitment from national governments, development partners, and the private sector.

Although many African countries are beginning to show greater willingness to increase agricultural investments, budgetary allocations for AR4D by most African countries are still way inadequate and this is adversely affecting the generation of the required technological innovations needed for productivity growth. Moreover, experience during the first 10 years of CAADP show that some of the declared increases in agricultural budget have been incorrectly stated – e.g. placing of construction of rural roads under agriculture. Thus, in essence, not much has changed even under CAADP!

Overall, development assistance allocated to agricultural research, rural infrastructure, human capital development, and agricultural policy reforms has shown positive returns in terms of the contribution of agricultural development to poverty reduction and economic growth¹⁰. In general, the returns to agricultural development assistance have been positive, despite occasional failures, mostly associated with poor project designs and policy environments.

The Ford Foundation and Rockefeller Foundation – who are considered visionaries of their time - were the drivers behind the creation of an international agricultural research system in the 1960s and 70s focusing on major staple food crops (rice, wheat, and maize). The World Bank and other members of the bilateral and multilateral donor community invested in the creation of a broader research network under what became the CGIAR umbrella. However, despite the many successes in Asia, Africa, and Latin America—donor assistance declined dramatically in the mid-1980s (Pingali, 2010). The so called ‘lost decades’ in funding began from a peak in 1983–1986 when yearly ODA disbursements to agriculture, forestry, and fishing averaged \$21.4 billion¹ (in constant 2005 terms) and declined to a low of \$4.5 billion by 1997–2000. For the science agenda to be successfully implemented, the national consultations must lead to strong commitment by African governments in its implementation.

A combination of factors, notably the nudging arising from global commitment to the MDGs and the advent of the Comprehensive Africa Agriculture Development Programme (CAADP), has helped to rekindle public sector interest in, and support for, agriculture. While CAADP has not necessarily been as transformative as may have been expected based on the frenzy that surrounded its launch, it has certainly created increased awareness, and African ownership and leadership of a Programme that has played a key role in putting AR4D on the national and regional development agendas. The roll-out of S3A must define its own momentum and galvanize national, regional and international efforts and financing towards a science-led agricultural transformation in Africa.

The private sector is another potential source of increasing funding and efficiency of agricultural research system. However, the private sector involvement in AR4D in Africa remains fairly small – domestic private sector content is low. Moreover, because of their focus on commercial farming, it has been considered that the priorities of the big multilateral companies operating in agriculture space in Africa are largely incongruent to the smallholder focus of the public sector AR4D programming. However, this need not be the case as is beginning to become evident, with some companies trying to tap into the huge market presented by the millions of smallholders on the verge of commercializing production. So, there is opportunity here as well. Clearly, on top of the resource mobilization agenda should be innovative financing of agricultural research and extension, including exploring models for payment for AR4D services. Thus, while traditional advocacy targeting public sector is needed, transformative financing will require innovative thinking to explore the wide range of potentials and options for mutually beneficial partnerships for potential investors in agriculture.

¹⁰ World Bank, 2007a

PART IV

THE REGIONAL CONSULTATIONS – MALAWI, RWANDA AND GHANA

IVa.

THE REGIONAL CONSULTATIONS – MALAWI, RWANDA AND GHANA

IVa.1 OVERVIEW

IVa.1.1 Organization of Consultations

As mentioned earlier in section I, three regional consultations, which cover the entire five regions on the continent were held. These took place in Malawi for Southern Africa countries; Rwanda for countries in East Africa; and Ghana for West and North Africa countries.

The Malawi Regional Consultation was organized jointly with CCARDESA and hosted by the Government of Malawi. A total of 10 out of 13 countries in the sub-region participated, namely, Angola, Botswana, Lesotho, Malawi, Namibia, Seychelles, South Africa, Swaziland, Zambia and Zimbabwe. The meeting was declared open by Dr. Albert Changaya, Comptroller of Agricultural Extension and Technical Services on behalf of the Permanent Secretary of the Ministry of Agriculture and the Government of Malawi. The opening session was also addressed by the Executive Director of FARA, Dr. Yemi Akinbami and Acting Executive Director of CCARDESA, Dr. Simon Mwale.

The Rwanda Regional Consultation was organized in collaboration with ASARECA and hosted by the Government of Rwanda. The meeting was declared open on behalf of the Government of Rwanda by Dr. Mark Bagabe, Director-General of the Rwanda Agriculture Board. Opening remarks were also presented by Dr. Irene Annor-Frempong, Director of Research and Innovation, representing FARA; and Dr. Cyprian Ebong, Interim Executive Secretary of ASARECA. A total of eight (8) countries participated in the East Africa regional consultative meeting. These are the Democratic Republic of Congo, Ethiopia, Kenya, Madagascar, Rwanda, South Sudan, Sudan and Uganda.

The regional consultations for West and North African countries were held in Ghana in association with CORAF/WE CARD and NASRO. The meeting was hosted by the Government of Ghana and attended by twenty-two (22) countries, namely, Benin, Burkina Faso, Cameroon, Cape Verde, Central Africa Republic, Chad, Congo – Brazzaville, Cote d'Ivoire, Equatorial Guinea, Gambia, Guinea – Conakry, Guinea Bissau, Liberia, Mali, Mauritania, Morocco, Nigeria, Sao Tome & Principe, Sierra Leone, and Togo. Also present were representatives of Farmers Organization, Universities, NGOs, CGIAR and development partners.

The opening session was presided over by Hon. Mrs. Patricia Appiagyei, Deputy Minister for Environment, Science, Technology and Innovation (MESTI) on behalf of the Hon. Minister of MESTI, Ghana, and delivered the opening address. The opening session was also addressed by the Executive Director of FARA; Director-General of CSIR, Ghana, represented by Dr. Mina Quaye, Deputy Director, CSIR-STEPRI; the Chairperson of CORAF/WE CARD Board, Dr. Alioune Fall; and the Executive Director of NASRO, Prof. Mahmoud Medhany. In the course of the proceedings, FAO Assistant Director-General and Regional Representative for Africa, Dr. Jean Baptiste Bahama, had an opportunity to address the meeting and share information on some current interventions by FAO, especially on the

devastation that the army worm scourge is causing to crops in the Southern Region and the speed of its migration.

IV.1.2 Participants at the Consultative Meetings

Participants consisted of Executive Directors, Director of Research and Innovation and Senior Professional staff of FARA, AFAAS, ASARECA, CCARDESA, CORAF/WECARD and NASRO; Directors-General, Directors of National Agricultural Research Organizations, National Agricultural Research Council, Agricultural Research Board and related organizations and agencies. Also in attendance were representatives of International Agricultural Research Organizations (CIAT, CIMMYT, IITA), Farmers Organizations, Universities, NGOs, African Union Commission, NEPAD Planning and Coordinating Agency and development partners.

IV.1.3 Sessions and Presentations

The plenary sessions at the Malawi meeting had as chairs of sessions Dr. Wilkson Makumba, Dr. Lefulese Lebesa, Dr. Pharaoh Mosupi, Dr. Dansile Hikwa, Dr. M A Magadlela, Dr. Nelson Jude Charles and Dr. Keogaile Molapong. For the consultations in Rwanda, the chairpersons of the sessions were Prof. Amand Mbuya Kankolong, Dr. Mark Bagabe, Mr. Victor Silvano Bennet, Dr. Ambrose Agona, and Dr. Dorothy Mukabe. The session on presentation of Country Action Plans was facilitated by Dr. Brian Isabirye, Program Officer, ASARECA. For the West and North Africa consultations, the chairs of the sessions were Dr. Walter Wiles, Dr. Hamidou Traore, Dr. Patrice Adegbola, Dr. Ansumana Jarju and Dr. Ayesha Hakeem.

Presentations at all the regional consultations were made by Dr. Irene Annor-Frempong, Director of Research and Innovations, FARA who led the consultations with a detailed overview of the trajectory in the development of the S3A and its present status. Dr. Annor-Frempong also led the meetings in the plenary presentation on the “Alignment of Regional and Sub-Regional Mega Initiatives to S3A Roll-Out” with illustrations using the Technologies for African Agricultural Transformation (TAAT), the African Agricultural Research Program (AARP), APPs, among other initiatives. Dr. Yvonne Pinto of Agricultural Learning and Impacts Network (ALINE), Dr. Enock Warinda, Lead Monitoring and Evaluation Specialist, FARA and Ms. Cassidy Travis of ALINE guided the meetings through the “Emerging S3A Theory of Change and Results Framework”, while Dr. Benjamin Abugri of FARA and Mr. Max Olupot of AFAAS made the presentations on the “Emerging Knowledge Management Plan of the Science Agenda”.

These presentations were followed by background papers, which provided pre-requisites for the realization of the vision of the S3A at the country level. The presentations were made by Dr. Paul Boadu of FARA on “Creating a Favourable Policy Environment for Science in Agriculture (using PPI); Dr. Amos Gyau of FARA on “Strengthening Human and Institutional Capacity for Science in Agriculture”; Dr. Fatumbi Oluwole, Lead Specialist at FARA, on “Country Level Implementation Platforms for S3A; Prof. Mandi Rukuni, FARA Institutional Advisor on the S3A, on “Effective Modalities for Collaboration at all Levels – National, Regional and International” and lastly, the Facilitator of the Meetings, Dr. Genevesi Ogiogio, who examined sources and options for “Sustainable Financing of the Science Agenda”.

At the regional consultations, three presentations were made by the host countries, which highlighted *Country Profiles and National Level Success Factors in Agriculture*. Dr. Wilkson Makumba, Director, Ministry of Agriculture of Malawi presented the Country Profile for Malawi; Dr. Mark Bagabe, Director-General for Rwanda Agriculture Board, gave the presentation on Rwanda, while Dr. Mina Quaye, Deputy Director, CSIR, Ghana, outlined the Country Profile of Ghana’s Agriculture.

Each of the regional consultations featured a Panel Discussion and Break-Out Sessions. The issues examined by these sessions are in Annexes II and III, respectively.

On the last day of the consultations, participating countries presented their emerging Country Action Plans with milestones in the implementation of the science agenda in their respective countries. They also put forward possible areas of support they would like from FARA and the SROs to facilitate implementation. A total of 41 countries across all five regions presented their draft Action Plans.

The consultative meeting in each region was brought to a close with a presentation by the SRO for the hosting region on the “Next Steps and Action Planning” and closing remarks by FARA, SRO of the host region and the representative of the host country.

The presentations made, issues raised and perspectives put forward during the sessions formed the basis of the conclusions and recommendations presented in this synthesis report.

IV.2 THE PRESENTATIONS

IV.2.1 The Science Agenda, Theory of Change and Knowledge Management

Two major plenary presentations examined the issues in this topic. The first outlined the path to the development of the science agenda and the progress so far made, of which the regional consultative meetings in the roll-out of the agenda is a part. The second presented the elements of a theory of change for the science agenda, the S3A results framework and the knowledge management strategy. The second set of presentations then formed the basis of a break-out group session, which examined in greater depth the implications of the S3A ToC, the RF and the KM system.

(a) Development of the Science Agenda and Status of Progress: The development of the S3A was commissioned by the AUC and NEPAD Agency in 2012 through an extensive sub-regional and continental consultation process¹¹. Its inceptions or seminal thoughts can however be traced back to what has come to be known as the *2011 Dublin Process* that provided a framework for strengthening alignment of CGIAR investments in Africa with the CAADP agenda. Fig.1 provides the timelines and milestones in the development of the S3A. The S3A has evolved into a framework for enhancing application of science, technology and innovations to achieve CAADP goals, with a focus on improvement of productivity. It is a framework for achieving priority 1 (eradicating hunger and achieving food security) of the AU STISA 2024. It is a response to the demands on Africa’s agriculture and food systems, which call for the following, among others:

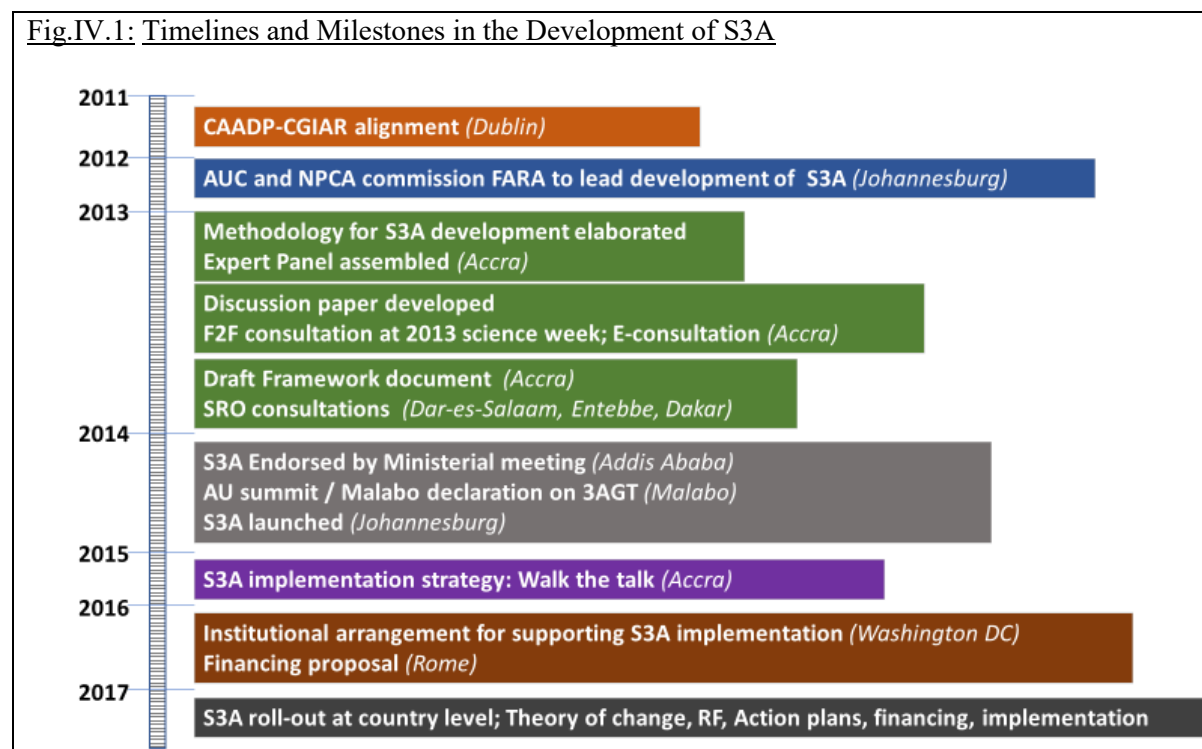
- 1) Production of significantly more food on less land, with less water, in conditions of increasing unpredictable climate and markets and with less manual labour
- 2) Reduction of the amount of waste and post-harvest losses
- 3) Production of more nutritious and safe food
- 4) Movement up the value chain (processing and marketing industry to grow twice faster than production)

Essentially, the S3A is an instrument for mobilizing the physical, human, institutional, financial and policy resources required to increase the application of science, technology and innovation to achieve agricultural development goals and targets. Its *vision is that “By 2030 Africa ensures its food and nutrition security; becomes a recognized global scientific player in agriculture and food systems and the world’s bread basket”* There are three dimensions to the strategic goals of the S3A. In the short-term, it seeks to increase public and private sector spending and create the enabling environment for sustainable application of science in agriculture. Over the medium term, it will build basic science capacity at national and regional levels with special attention to youth and women empowerment. For the much longer-term, S3A is expected to double current level of agricultural productivity by 2025 through the application of science in agriculture.

¹¹ The AUC and NEPAD Agency mandated FARA to lead the development of the science agenda working with the Sub-Regional Research Organizations – ASARECA, CCARDESA, CORAF/WECARD and NAASRO.

The S3A is built around four thematic areas of foci. These are 1) sustainable productivity in major farming systems; 2) food systems and value chains; 3) agricultural biodiversity and natural resources management; and 4) mega trends and challenges in agriculture in Africa.

Fig.IV.1: Timelines and Milestones in the Development of S3A



Sustainable productivity in major farming systems will support interventions that transform production systems, enhance crop improvement and protection, improve livestock production and productivity, boost productivity of aquatic systems and fisheries, promote agroforestry and forestry, and scale up agricultural mechanisation.

Food systems and value chains will improve food and nutrition security as well as post-harvest handling, food processing, safety and storage.

Agricultural biodiversity and natural resources management seeks to promote conservation and enhancement of agricultural biodiversity as well as land and water resources, irrigation and integrated natural resources management.

Mega trends and challenges in agriculture in Africa will tackle issues of climate change, variability, adaptation and mitigation; responses to policy and institutional shifts; responses to changes in livelihoods of rural communities; and Gender.

In addition to the four major thematic areas, S3A addresses three areas of intervention that are *cross-cutting*. These are sustainable intensification, biosciences, information and communication technologies and foresight capabilities.

Fig.2 defines the link between the themes and the goals of S3A, while Fig.3 summarizes the S3A implementation process.

Fig.IV.2 Realizing the S3A vision

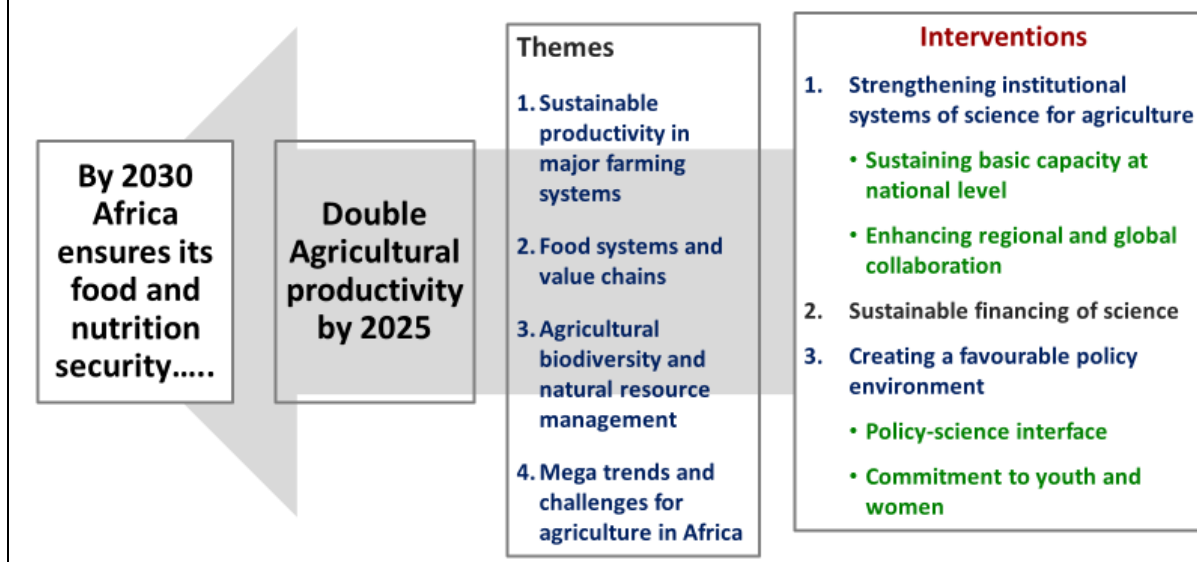
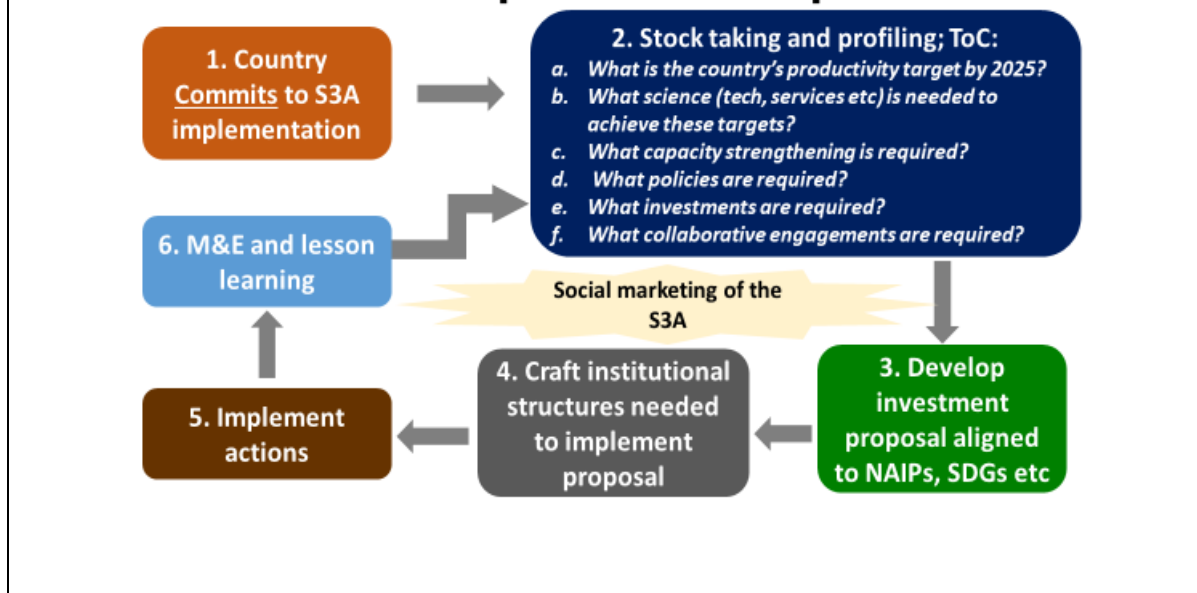


Fig. IV.3 The S3A implementation process



(b) S3A Theory of Change: The presentation outlined the process in the development of the ToC for the S3A. It linked the expected results to the CAADP 2015-2025 Results Framework, which consists of three levels of results. The ToC is guided by the following key elements:

- 1) S3A vision for agricultural transformation on the African continent
- 2) Key objectives
- 3) S3A activities
- 4) Main outputs expected from those activities
- 5) Expected outcomes of S3A implementation
- 6) Key actors and actors' outcomes
- 7) Main impact pathways
- 8) Precondition/external conditions for outcomes and impacts to be realized

Key Objectives and Cross Cutting Themes

Objectives: The ToC is being developed over four key objectives, namely:

- 1) Sustainable productivity in major farming systems
- 2) Food systems and value chains
- 3) Agricultural biodiversity and natural resources
- 4) Responses to megatrends and challenges for agriculture in Africa

Cross-Cutting Themes: The ToC takes into consideration three cross-cutting issues, namely:

- 1) Sustainable intensification
- 2) Modern genetics and genomics
- 3) Foresight capabilities

Fig.4 presents the emerging ToC for S3A, while Table 1 outlines the Measurement Framework to guide monitoring, evaluation and learning (MEL) in the implementation of the science agenda.

Table IV.1: Structure of the Monitoring, Evaluation and Learning Framework

Outcome	Evaluation/ Learning Question	Indicator/ Evidence	Source	Who Collects	Tool	Frequency	Processing	Use	User

(c) Knowledge Management for S3A; FARA Data and Information Systems (FARADataInforms): The presentation outlined the importance of generating and connecting people to knowledge, which has both explicit and tacit components. It placed a premium on providing the right knowledge to the right people at the right time. The seven (7) thematic areas in which S3A knowledge management system is being developed consist of the following:

- 1) Productivity in major farming systems
- 2) Food systems and value chains
- 3) Agricultural biodiversity and natural resource management
- 4) Response to mega trends and challenges
- 5) Sustainable intensification
- 6) Modern genetics and genomics
- 7) Foresight capabilities

Fig. 5 presents the schematic links in the S3A knowledge management system.

FARADataInforms is one component of the KM system that is already fully developed. It consists of an Online Repository; provides relevant science, technology and innovations metrics; presents analytical features; and focuses on country level data. Fig. 6 sets out the S3A Observatory and Africa AR4D. Inputs into the emerging KM system include:

- 1) E-RAILS – the Regional Agricultural Information and Learning System (<http://www.erails.net>)

- 2) E-RAILS 2 – <http://www.erails2/erails/Home>
- 3) E-Capacities - <https://e-capacities.com>
- 4) About Innovation Platform Agribusiness Portal (IPAbP) – <http://ipabp.org>
- 5) PAEPARD – Platform for an Africa-Europe Partnership for Agricultural Research for Development – <http://paepard.org>

In terms of approach to the development of the KM system, this consists of the following, among others:

- 1) Web site links
- 2) Virtual social networking platform
- 3) Meetings, e.g., AFAAS Extension Week.

It is expected that the S3A KM system, on completion, would improve access to relevant information on STIs, enhance access to planning and implementation frameworks; strengthen access to policymaking tools (PPI), increase access by stakeholders to STI knowledge; raise access to planning data through foresight studies; step up and better target AR4D investments.

(d) Alignment of Regional and Sub-Regional Mega Initiatives to S3A: The presentation on the linkage between S3A and major regional and continental initiatives on agriculture demonstrated strong alignments with Malabo 2014 commitments, CAADP and STISA 2024 as well as the Africa-EU Research and Innovation Partnership Program. S3A builds on existing initiatives and the its Results Framework provides a basis for reporting against targets. Fig. iv.2 outlines some of the existing initiatives and the intersection with S3A.

IV.2.2 REALIZING S3A VISION

Under this rubric, there were five brief presentations, which provided outlines of the requirements for implementation of the science agenda. These are: *Creating a Favourable Policy Environment*;

(a) Creating a Favourable Policy Environment for Implementation of S3A: The importance of the policy environment at national level was examined by means of a Country Self-Assessment Tool for STI Policy Formulation and Implementation. The tool is based on a strategic approach, which supports country self-assessment, self-administration and self-correction; the use of local experts; and national stakeholder review and validation of findings. Areas assessed consist of research, extension, education and training. The tool assists to create an enabling STI environment that facilitates increased productivity, profitability and enhanced social welfare of small-holder farmers, producers and entrepreneurs. Central to a country's enabling policy environment is a culture of STI Policy Practice, which is a key driver for achieving agricultural development targets. An effective Policy Practice defines the policy formulation and implementation process; articulates the human and institutional capacity required; and defines the policy instruments for achieving set targets. It therefore provides a framework for identifying and responding to gaps in the areas of policy, investment and capacity, among others. The Country Self-Assessment Tool is currently being tested in Tier 1 Pilot Countries – Malawi, South Africa, Rwanda, Ghana and Senegal.

(b) Capacity Development Action Plans for Implementation of the Science Agenda: FARA seeks to approach the capacity needs of the S3A with a focus on three areas, viz:

- Capacity for implementing the agenda
- Capacity of stakeholders to commercialize agriculture
- Capacity for foresight work

The aim is to facilitate the development of national agricultural capacity building strategies that are geared towards improving skills, competencies and knowledge of leaders, managers, decision-makers and institutions required for and to mainstream gender in agricultural transformation and sustained growth. The capacity is also meant to help countries to develop and strengthen national systems of innovation and domesticate science, technology and innovation in agriculture.

At present, FARA already has in place interventions, which address these areas of capacity needs. On implementation capacity, there is the Africa Human Capital, Science, Technology and Agri-preneurship for Food Security Framework (AHC-STAFF) that is responding to capacity deficits in 18 African countries; eCapacity Platform, which provides customized web-based solutions for future capacity needs; capacity (consisting of platforms, consortia, trusts, exchange programs, etc) for agribusiness development; capacity in support of partnerships development and implementation. As regards capacity for foresight work, there is progress in the establishment of African Chapter of the Global Foresight Academy. Foresight serves as a strategic tool for better decision-making in research, policy and investment in agriculture.

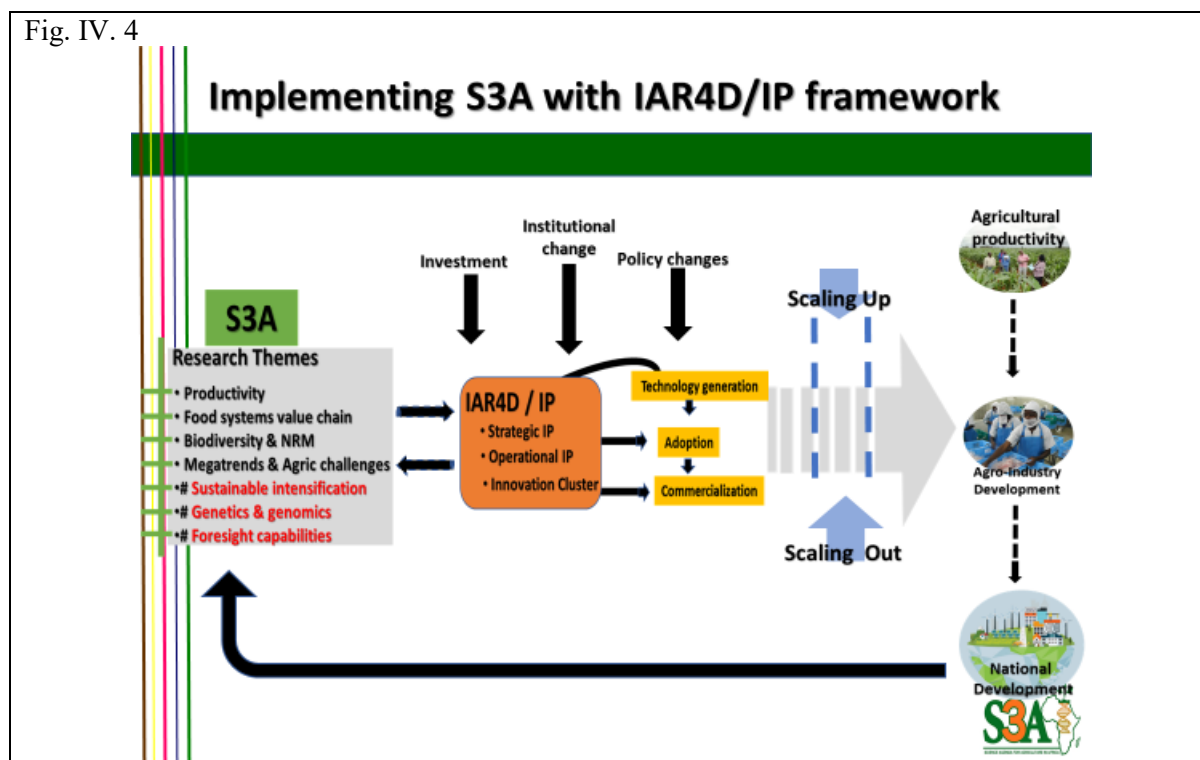
(c) Country Level Implementation Platforms for S3A Implementation: The presentation emphasized the role of research in innovation, change, promotion of sustainable livelihood and national development, which are results beyond publications and knowledge generation. Central to the agricultural innovation system is the practice of integrated agricultural research for development (IAR4D). It integrates the perspectives, knowledge and actions of different stakeholders around a common theme. When stakeholders work together, knowledge is shared and innovative solutions generated. This is essentially the foundation of the IAR4D practice, which integrates analysis, action and change as well as promotes productive public-private partnerships. It engages all stakeholders, including policymakers along the entire spectrum of the research and development process, which leads to new technologies and innovations. Inputs by stakeholders in an IAR4D process are investments, which give rise to returns. The Innovation Platform (IP) offers a mechanism by which an IAR4D process is translated into practice.

The IP is typically a physical or virtual forum established to facilitate interactions and learning among stakeholders selected from a commodity chain analysis. The application of IPs has been a game changer in the AIS and the uptake of new technologies (Box IV.1). About 40 countries on the continent currently apply the IPs. Among the Tier 1 countries under this regional consultation meeting, Ghana has 27 IPs, Rwanda 12, Malawi 11 and Senegal 3.

Box IV.1: Uptake of New Technologies

- Adoption can increase by 50% (DONATA, FARA)
- Income can double (IAR4D, FARA)
- IP reaches 800 households/farmers as direct participants (IAR4D, FARA)
- Each Incubator can create 300 direct jobs per year (UniBRAIN, FARA)
- Varieties/practices on 23% of cultivated area (K. Brooks, IFPRI)
- 60% of population farmers
- Cost of creating one job under an incubator = \$300 (UniBRAIN, FARA)
- Cost of setting up an incubator = \$95,000 (UniBRAIN, FARA)

Fig. IV. 4



Source: FARA, 2017

The presentation proposes the following actions at country level to implement S3A:

- Institutionalization of a National Agricultural Innovation System and establishment of Strategic IPs.
- Scaling up of AIS by strengthening capacity of stakeholders, especially public-sector actors to participate effectively on the IPs
- Development of affordable financing for small scale enterprises in agriculture
- Development of modalities for vocational training in agriculture
- Scaling up and scaling out AIS at national level
- Mainstreaming of AIS in S3A and other regional and continental frameworks, including country level NAFSIPs
- Development of capacity building strategy to scale up AIS, especially direct training, training material development and training of trainers.

(d) Issues in Sustainable Financing of Implementation of S3A: The presentation on sustainable financing review the present financial resource context, factors in the funding of institutions and programs, potential sources of finance for the implementation of the science agenda, possible financing mechanisms with lessons from similar programs and proposed potential sources.

The present financing context is characterized by high-level of donor dependence and declining ODA. A number of African countries, regional and continental institutions depend on development assistance for the financing of up to 80% of their program budgets and public-sector investment programs. Total net ODA from OECD/DAC donors in 2016 amounted to US\$142.62billion (US\$143.33billion in constant 2015 prices). This represents an increase of 8.9% on 2015 figures. While most donors saw an increase in their reported ODA from 2015 to 2016, some key donors recorded a decrease. Bilateral aid to least developed countries (LDCs) fell from US\$25billion to US\$22.4billion (US\$22.5billion in

constant 2015 prices)¹². This is an indication of potential challenge and the need for the continent to begin to look inward for long-term sustainable resources for the implementation of its development programs.

As regards factors in the financing of institutions, projects and programs, a number of factors are considered by donors. Among these are legitimacy and weight of institutional mandate, institutional ownership and accountability for results, as well as the goodness of fit of the program within the broader country, regional and/or continental agricultural development agenda and framework. In other words, what is the expected measurable influence of S3A on agricultural development policy, strategy and investments?

With respect to potential sources of finance for the implementation of S3A, it was noted that these could consist of the following, among numerous others:

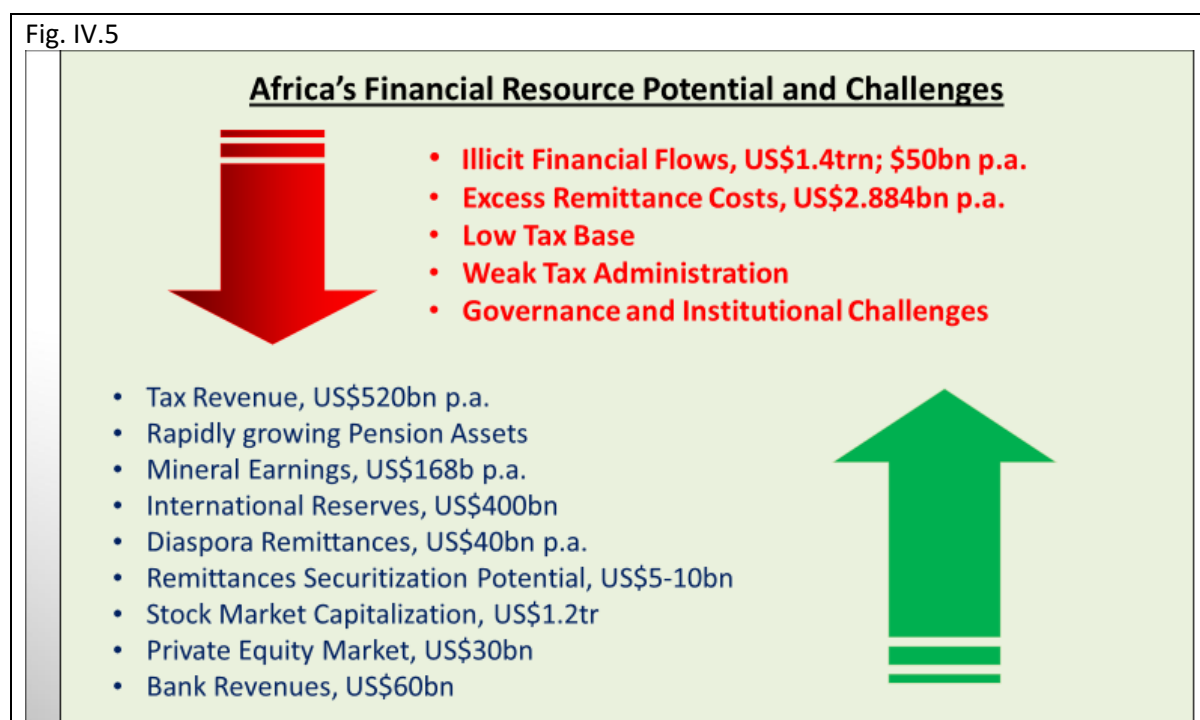
- Contribution of core funds by development partners – this will need to draw on traditional and non-traditional donors and explore the possibility of creating sponsoring agencies platform to spearhead mobilization of funds.
- Institutionalization of country-level contributions.
- The use of special and sponsored programs and projects
- Promotion of co-financing of projects and programs
- Pursuit of demand-driven programs and projects (with full cost recovery)
- Development of partnerships-based interventions
- Promotion of internally-generated resources
- Creation of endowment fund

With respect to financing mechanism, the possibility of creating a Science for Agriculture Trust Fund was examined. The Trust Fund is proposed as a main entry point for the financing of agricultural science, technology and innovation projects and programs and could incentivize country-level contribution if it supports country-specific activities under the S3A.

Fig. IV.5 sums up Africa's financial resources potential and challenges.

¹² OECD/DAC, Aid spending by Development Assistance Committee (DAC) Donors, 2016; April 12, 2017 Factsheet.

Fig. IV.5



As regards sources from which S3A could be financed, it was proposed that:

- All farmers could be registered and encouraged to contribute about a minimum of US\$1 bi-annually by small-holder farmers and much more by medium to commercial farmers.
- An agriculture value added tax could be explored
- All countries could be advised to ring-fence agricultural science, technology and innovation (ASTI) share of STISA 1% of countries' GDP.
- Central/Reserve Banks could be encouraged to set up National Innovations Fund to which the Central/Reserve Bank, commercial and development banks, IT companies, commercial farmers, multinational corporations, private sector, among others, could contribute.
- Appropriate instruments could be developed to facilitate support by the private sector for agriculture science, technology and innovations and reward and recognition programs be put in place to appreciate contributors to the National Innovations Funds and private sector sponsorship of ASTI.
- A National Innovations Supporting Institutions (NISI) Award Program could be institutionalized as part of the reward and recognition system for contribution in the advancement of ASTI. This could consist of a Presidential Award, Invitation to Membership of a National Private Sector Consultative Council (a Private Sector Advisory Council to the National Executive Council of Ministers), and naming of major national research projects after major contributors.
- Bond financing for agricultural investments could be explored. This could consist of CAADP bonds, STISA bonds and ASTI bonds, which could be supported by a National, Regional or Continental Credit Guarantee Funding arrangement for the implementation of national investment plans.
- Suitable financial products could be developed to encourage investment of Diaspora remittances in bonds issued by the agriculture sector.
- A Continental Science, Technology and Innovations Fund could be explored, which could be financed from the more than 750 million mobile phone services subscribers on the continent. A charge of US\$0.22 levied per month on each subscriber would generate US\$165million per month and US\$1.98billion annually in support of ASTI across the continent. A portion (about

30%) of the Fund could be dedicated to supporting young farmers and the same principles, in terms of source and uses of the Fund, could be applied to the National STI Fund.

- Governments could directly commission the NARIs by transferring research projects and funds of the ministries of agriculture and related agencies to the research institutes.
- External development assistance, though falling, still presents a major source of funding that should be drawn on.

IV.2.3 PANEL DISCUSSION

Members of the panel consisted of the representatives of the Host Country (Ministry of Agriculture, RBA, CSIR), Executive Directors of FARA, AFAAS, ASARECA, CCARDESA, NASRO and representatives of CGIAR, Farmers Organizations and NGOs. The panel discussions across the three regional consultations examined the following issues:

- An operational definition of a National Innovations System (NIS) in the context of the application of science in agricultural transformation
- The main actors in an NIS and key players at the regional and international levels
- Responsiveness of actors in NIS
- Requirements for actors to play effective roles in NIS
- Proposals on the roles of FARA, AFAAS, SROs, CGIAR in agricultural innovation systems and the implementation of the S3A
- Panel's proposal for collective action by actors to drive NIS and the implementation of S3A
- Concluding remarks

In all three consultations, the panels had very lively discussions, provided in-depth analyses of the issues and put forward recommendations. The panels saw S3A as an initiative whose time has come. They cautioned on the need to be mindful of the power of the market in the uptake of innovations, called for exploitation of low hanging fruits by re-organizing existing systems and practices to reach out to farmers with what already exists, allow effective demand to drive innovations. They pointed to the following, among others, as key requirements in the implementation of S3A:

- Visionary national leadership, commitment and political will
- A common vision among national and regional institutions
- Assignment of coordination responsibility to an institutional driver or facilitator
- Adherence to the principle of subsidiarity, especially among regional institutions and the need for FARA to empower the SROs
- A need to look inward for the mobilization of financing
- A recognition of farmers as a driving force whose voices need to be effectively incorporated
- Development and implementation of working partnerships among stakeholders
- A strong outreach program to promote visibility

IV.2.4 BREAK-OUT SESSIONS

The working groups discussed and presented recommendations on the following topics:

- S3A Implementation Opportunities and Challenges
- S3A: Enhancing Access to Data and Information Systems
- Country Engagement Process for S3A
- Creation of Favourable Policy Environment for S3A Domestication and Implementation
- Strengthening of Human and Institutional Capacities for S3A Implementation
- Sustainable Financing for S3A Implementation at National Level

A number of observations, comments and recommendations were made by participants at the Break-Out Sessions. Central among these were the following:

- A comprehensive agricultural knowledge and information support system (AKISS) should be developed in the implementation of S3A. This should explore the possibility of creating a One-Stop Platform for Africa's Agricultural Statistics.

- In strengthening the knowledge management system, there is need to be clear about the kinds of knowledge that is required, by whom and for what; instruments by which the knowledge is shared; and a process by which its effectiveness and utility are measured and evaluated.
- FARADATaInformS is an excellent initiative and should be strengthened. There is however limited information about the initiative on the continent. Awareness should be raised.
- The issues examined did not include technologies like Nano Technologies, even though these are not widely used due to limited GPS and locational information capacities on the continent. Also not adequately featured is the issue of post-harvest losses.

IVb.

THE REGIONAL CONSULTATIONS – DISCUSSIONS AND EMERGING ISSUES

IVb.1 The Science Agenda and Status of Implementation: Participants were pleased at the progress being made in the roll-out of the S3A, noting that the process has been intensely consultative and inputs are being drawn from a wide range of stakeholders across the continent and beyond. The meetings however noted that it has taken too long to launch implementation of the agenda and called for acceleration of efforts. Key issues raised included the following, among others:

- The need to be very clear about what is different in S3A that will drive countries' buy-in. Essentially, what value is S3A bringing into present STI interventions in Africa's agriculture. S3A value-added should be clarified.
- Commitment to implementation is vitally important. How appropriately should commitment be measured and incentivized?

IVb.2 Theory of Change: Participants took away a very strong impression of the desirability for the elaboration of ToC for the S3A and called for the following, among others:

- Acceleration of the completion of the ToC at the continental level
- Clear definition of activities, expected outcomes and impacts of the S3A as against those of the CAADP Results Framework.
- Clarification of the conditions and assumptions being made by the ToC for the expected outcomes to be achieved
- Delineation of the outcomes pathways more clearly and identification of what brings about a change
- Presentation of a more stakeholder/user-friendly schematic presentation of the ToC.

IVb.3 Results Framework: Monitoring, Learning and Evaluation Framework: Participants were clear about the matrix of inputs-activities-outputs-outcomes-impacts presented by the Results Framework. They called for completion of the Framework and M&E indicators. Also requested is the alignment of the S3A RF to the CAADP RF, which current exists, and support for the development of the S3A RF for each country. The meetings called for the need to be clear about what to monitor and evaluate, the time interval for doing so and who should be responsible at continental, regional and national levels. Also, to be clarified is the use to which findings and recommendations from the M&E system would be put.

IVb.4 Knowledge Management System: Participants called for the development of a comprehensive Knowledge and Information Management System that goes beyond FARADaInFormS. This should address the following, among others:

- Provision of tools and instruments, in addition to existing platforms to capture tacit and explicit knowledge
- Hosting of the agricultural knowledge and information support system (AKISS) at all levels – continental, regional and national
- The need for the continental AKISS to provide access to authoritative data and information with links to external sources as may be required.
- Arrangements for sharing of bookmarks

IVb.5 Country Action Plans: Forty-one countries presented country action plans. These provided a profile of the state of agriculture, key strategic framework documents guiding agricultural development, policies and legislations on which issues from seeds to storage are addressed, key priorities of the agriculture sector and ongoing initiatives, areas in which support is needed and timelines for the completion of a fully-fledged country action plan. The presentations identified three key areas that could be regarded as growth drivers in the implementation of the science agenda. These are areas in which science application is required; capacity needs; as well as governance, management and institutional reforms. Table 3 provides a summary of these growth drivers.

Table IVb.1: Growth Drivers Identified by Countries

Areas for Research and Science Application	Areas for capacity development	Areas for Government, Management and Institutional Reforms
<ul style="list-style-type: none"> Seed quality and breeding cycle Stress testing Crop varieties development and adaption Climate resilient seeds and nutrient dense crops Maintenance of germplasm Post-harvest management technologies and value addition Grain quality improvement research Mechanisation – labour saving devices Soil fertility/nutrients and water management technologies and systems Improved weather forecasting Agro-processing technologies Management of post-harvest losses Control of pests and diseases Cattle fever vaccine 	<ul style="list-style-type: none"> Better management of and sustainable use of land, water, forestry and wildlife resources Access to and participation in domestic and export markets through development of efficient agricultural marketing systems Development of early warning system for droughts Promotion of conservation agriculture Capacity of institutions to support agricultural marketing, appropriate legislations and policies Shortage of farm labour Building capacity of smallholder farmers and farmers' organizations Strengthening of ministry of agriculture at national, units at provincial and local levels Strengthening capacity of NARS staff Strengthening capacity for agricultural extension 	<ul style="list-style-type: none"> Access to agricultural finance Rural infrastructure especially in areas of agricultural surplus – feeder roads, rail transport services, electricity, storage and communication facilities Limited market access to producers

A summary of the country-specific areas for science application is presented in Table IVb. 2

Table IVb. 2: Summary of Countries' Areas of S3A Intervention Need

No.	Country	Areas of Need
SOUTHERN	AFRICA	
1	Angola	<ul style="list-style-type: none"> FARA and CCARDESA to undertake mission to country to raise national stakeholders' awareness of S3A Strengthening of NARS to participate effectively in regional and continental initiatives

2	Botswana	<ul style="list-style-type: none"> • Need effective coordination of science, technology and innovations-based research • Need for guidance by FARA and CCARDESA on strategy for coordination of institutions in the country • Soil fertility management • Drought tolerance (crops & livestock) • Sustainable Pest & Disease Management strategies • Efficient irrigation equipment • Animal nutrition • Rangeland management • <i>In situ</i> conservation of germplasm • Development of research capacity • Technologies packaging • Technology impact assessment
3	Lesotho	<ul style="list-style-type: none"> • Assistance is required for the establishment of a formal National Agricultural Research System • Capacity for effective implementation of on-going regional agricultural development initiatives
4	Namibia	<ul style="list-style-type: none"> • Genetic characterization of local and indigenous breeds (small & large stock) • Conservation and development of indigenous & local breeds/types • Animal Nutrition • Bush encroachment • Mutation breeding for early maturing, high yielding, drought tolerant crop varieties e.g mahangu, maize, cowpea, sorghum • Conservation agriculture • Product development • Upgrading of STI Innovation • Capacity building
5	Seychelles	<ul style="list-style-type: none"> • New bloodlines for piglets and goats • Capacity building for effective implementation of the National Policy and Strategy for Science, Technology and Innovations, 2016-2025
6	South Africa	<ul style="list-style-type: none"> • A ten-year National Innovations Plan is in place • National Agricultural Research Forum is active • Capacity of historically disadvantaged group in STI is required
7	Swaziland	<ul style="list-style-type: none"> • Need to address fragmentation of research and establish innovation platforms • Need for FARA and CCARDESA to assist in sensitization of major national stakeholders • Participatory germplasm evaluation and selection • Research on Climate smart agricultural systems and practices • Tissue culture germplasm production for potato, banana and pawpaw • Water harvesting intensification for downstream agricultural project development in drought prone prime agricultural areas • Strengthening SPS measures to enhance trade • Molecular and phenotypic maize germplasm characterization
8	Zimbabwe	<ul style="list-style-type: none"> • Enhancement of the operational effectiveness of the existing Science and Technology Policy Forum

		<ul style="list-style-type: none"> • Reinforcement of on-going IFAD-supported Smallholder Productivity Promotion Program with a focus on research and development to diversify from maize and mining into: cassava, rice and beans • Reinforcement of objectives of Agricultural Productivity Program for Southern Africa (APPSA) – which aims to improve availability of agricultural technologies to participating countries in Southern Africa region • Support for uptake of new technologies and innovations
EAST	AND CENTRAL	AFRICA
1	Democratic Republic of Congo	<ul style="list-style-type: none"> • Conventional and bio-fortified crops • Soil fertility management • Multi-stress tolerant germplasm • Low uptake of technologies
2	Uganda	<ul style="list-style-type: none"> • Challenge of heavy reliance on organic farming, and low-fertilizer use agriculture. • Soil fertility management due to heavily degraded soil • Low uptake of new technologies
3	Madagascar	<ul style="list-style-type: none"> • Capacity for the implementation of the National Strategy for Scientific Research • Capacity to scale up Bio-pesticides production, which is an innovation
WEST	AND NORTH	AFRICA
	Benin	<ul style="list-style-type: none"> • Need to strengthen relationship between universities and research centres • Low uptake of new technologies and innovations • Declining research capacity due to departure of scientists to neighbouring or regional institutions • Inadequate funding
	Burkina Faso	<ul style="list-style-type: none"> • Strengthening of existing national framework for coordination • Improvement of yield gap between research organizations and farmers
	Guinea-Conakry	<ul style="list-style-type: none"> • Low researchers per million population

IVc.

THE REGIONAL CONSULTATIONS – CONCLUSIONS, RECOMMENDATIONS AND WAY FORWARD

IVc.1 CONCLUSIONS AND RECOMMENDATIONS

(a) Conclusions and Recommendations from Presentations and Discussions

Based on the presentations and the discussions that followed, the deliberations at the regional consultations led to the following conclusions and recommendations

- There is a need to clarify what is different in S3A that will drive countries to buy into the agenda. Essentially, the value-added of S3A needs clarification.
- In calling for commitment to S3A, what constitutes commitment should be defined operationally and measures provided. Additionally, how to incentivize commitment is needed.
- Accessibility of FARADATAInforms should be improved. The platform or service should be linked to other public domain data such as those by IFAD, FAO, World Bank, etc. It should be developed into a One-Stop Agriculture Statistics and Information platform for Africa and continental awareness significantly enhanced
- Knowledge sharing program should identify and classify countries according to their research capacity and strengths by crops so that there is a database that supports knowledge and information exchange
- A framework for and regular assessment of the rate of return to research should be derived and assessments reported regularly
- Need for shared research competencies, leveraging of knowledge, skills and experiences from countries that are well endowed by those that are less endowed. Crop competency profile of countries.
- Promote shared knowledge and experiences in the transfer of germplasm, seed policy and commodity standards
- Need to raise knowledge of S3A among stakeholders, particularly at senior policy levels.
- Need for S3A not to be entirely productivity centred. Technologies alone do not lead to improved productivity. There are other factors. The issue of adoption or uptake rate is critical. This is a function of good and stable prices, access to markets, availability of transport to move produce from farms, cost and availability of farm labour, cost of fertilizers which make it uneconomic as farmers will produce at high cost and sell at low prices, access to and cost of new improved varieties and seeds, availability of agricultural extension services, availability of water/irrigation facilities in a largely rain-fed agriculture system easily devastated by drought, and access to credit facilities to procure some of the inputs mentioned above.
- There are serious challenges facing most NARIs, which will have to be addressed, if they are to play the required role in connecting science to increased agricultural productivity. Most NARIs are faced with shortage of qualified scientists and researchers; infrastructural facilities, laboratories and chemicals are critically in short supply; condition of service for staff in institutes is poor; provisions are hardly available for access to new knowledge on techniques, discoveries, meeting like-minded researchers and scientists for joint projects due to inadequate resources; poor funding base making proper operation difficult and to carry out decent research;

government policies that are counterproductive as they do not support products from domestic research and rather prefer imports. There is also the issue of inadequate collaboration among NARIs across countries and research organizations within countries to complement rather than compete with each other. Proactivity by NARIs and need to step up trust in the quality of domestic science and findings are important. It will equally help strengthen national science, if governments have institute national rewards for breakthroughs. And the work of NARIs will be aided, if training offered by universities are directly linked to real agricultural challenges, the development of new technologies and innovations.

- S3A should place some emphasis on developing capacity for precision agriculture, including the use of drone technology.
- S3A implementation by SROs should:
 - Create regional learning and knowledge sharing platforms for countries to share knowledge and learn from each other's experiences, explore collaborative arrangements and joint projects and programs. Learning, Knowledge Exchange and Information Sharing Platforms for NARIs should be created by SROs
 - Develop regional databases of countries' S3A profiles to provide easily accessible information countries and areas in they have leading edge capabilities, policies, genebanks, germplasms on particular crops, livestock, poultry products on which others could draw
- Mobilize resources to target re-building of NARIs capacity, based on a comprehensive capacity building model.
- Breeding system should improve seed production systems and scale up production
- Improve quality and accuracy of databases
- The attention has largely been on crops and livestock. Bring in dairy production
- Clarify value added of S3A to existing frameworks and strategies
- A special meeting should be convened to sensitize policymakers at the level of PS, Directors-General of MoA and Ministers
- Develop Country Implementation Guides for application of S3A at the country level
- Key Priorities for S3A should include the following, among others:
 - Biotechnology development
 - Drought-resistant or tolerant varieties (crops and livestock)
 - Soil fertility – nutrient loss – management
 - Pest and disease management
 - Animal nutrition
 - Conservation of germplasm
 - Genetic characterization of local and indigenous breeds
 - Conservation and development of indigenous and local breeds
 - Animal nutrition participatory germplasm evaluation and selection
 - Climate smart agricultural systems and practices
 - Tissue culture germplasm production for potato, banana and pawpaw
 - Molecular and phenotypic maize germplasm characterization
 - Conventional and bio-fortified crops
 - Multi-stress tolerant germplasm
 - Scaling up of bio-pesticides production
- While there are potential challenges in ensuring S3A is backed by high-level commitment, a number of countries offer a strong sense of assurance. In Rwanda for instance, there is the National Commission on Science and Technology and the National Research and Innovation Fund. These report directly to the President. Thus, countries such as Morocco, Rwanda, Kenya, South Africa are among very promising countries for commitment to the implementation of S3A.
- FARA should share the IP practices more widely across countries on the continent to scale up adoption and application to various commodity chains. The IP concept has been successfully proven. It is now an innovations-generating practice that should be widely disseminated.

(b) Recommendations from Break-Out Sessions

- There is coordination among institutions in AR4D. This is however weak
- There is more of competition and duplication of efforts than of coordination
- Cost of developing and maintaining up-to-date databases and accessibility are challenges
- Sustainable Financing: On the financing of the implementation of S3A, the working groups called for the science agenda to be mainstreamed as opposed to having it projectized. They proposed the following sources among others:
 - Sourcing funds through competitive grants.
 - Proposal development to source more funding from donors.
 - Conducting joint research/partnership with institutions that have funds for research such as academic institutions.
 - Getting in kind support through secondment where salaries of staff are paid elsewhere but the people conduct research.
 - Co funding arrangements
 - Partnership with commodity organizations.
 - Partnership with CGIARs.
 - Namibia has private sector, NGOs, institutions of higher learning which can provide support. NGOs can be partners in sourcing funds. Public private partnerships
 - South Africa has a private sector which is still untapped in terms of funding science and technology.
 - Generally, royalties from intellectual property rights can also help in financing S3A.
 - Establishing consortia like the Science in Agriculture Consortium to promote joint funding of projects

(c) Conclusions and Recommendations from Panel Discussions

- Collaboration with international agricultural research and development institutions and agencies is just as important as among national stakeholders. One reason for this is that knowledge is without boundaries. An NIS needs access to global knowledge and databases for innovations.
- An NIS is only responsive to agricultural development challenges to the extent of its funding, the quality of science the country supports or has access to and capacity to utilize, leadership and trust among stakeholders on implementation of commitments made. Well-funded NIS and capacity to undertake respectable science that engenders trust in the applying community go a long way in the development of responsive NIS.
- There is growing working relationship between farmers and researchers across the continent. This is due to productive extension services, practice of IAR4D, IPs, APPs, forums and associations, among other platforms. This needs to be stepped up and Public-Private Partnerships extended to embrace farmers more directly through Public-Private-Producers (PPP) Partnerships. With one extension service officer to about 1,500 farmers, there is still a lot to be done to bring extension services, new technologies and innovations to small-holder farmers and promote uptake of new technologies, which is still very low across the continent. It is also worth noting that a policy of free agricultural extension services is increasingly becoming untenable. But for donor funding support, not many African countries provide resources for extension services. A policy of “Free to Fee” AES is inevitable.
- Science must be demand-driven and must be profitable to make investment in it worthwhile. However, given that Africa’s agriculture relies largely on outputs of the numerous small-holder farmers a significant amount of investment in science may have to be supported on public-good basis to contribute to uptake of new technologies.
- On concluding remarks, views were expressed that:

- a. Quality science is paramount to an NIS that generates results, promotes uptake and encourages investment by stakeholders, including farmers who are the ultimate beneficiaries of innovative technologies that enhance productivity and profitability.
- b. An NIS must pool collective capacity of institutions of a country to work together as a system. At present, institutions that have the mandates and capacity to support agricultural transformation across the continent are not working together adequately. Not enough knowledge is documented and shared.
- c. Science must be purposefully connected to a systematic and collective process of agricultural transformation. The question of “what science is required for what” is still not clearly articulated in countries’ agricultural transformation strategies and plans.
- d. Conceptually, FARA still has to clarify what constitutes a National Innovations System in agriculture. Agriculture stakeholders do not currently share a common knowledge of the concept, its practice, processes in its establishment and management, what it produces, how its outputs are used and how its effectiveness is monitored and evaluated.
- e. For responsiveness and operational effectiveness, participation of decisionmakers in NIS is vitally important. A strategy in this direction would be worthwhile.
- f. The IPs do not seem to be strong participants in NIS at present. Their stakeholder composition and operational strength need careful attention.

(d) Conclusions and Recommendations from Country Action Plans Presentations

The countries in their presentation of the emerging country action plans put forward the following proposals and recommendations:

- Need for country team to drive the country action plan (CAP)
- Need for stakeholder validation of CAP
- Infusion of the S3A into NAIP
- After regional consultation meeting, participants are to brief their principals in the Agriculture ministries and other relevant key stakeholders
- FARA and relevant SRO need to visit countries to reinforce importance of S3A. Countries that made direct requests are: Angola, Botswana, Swaziland
The mission or country visits will essentially be sensitization meetings for policymakers and legislators; senior government and private sector officials; farmers and farmers’ organizations
- Assistance by FARA and SRO to countries like Swaziland to establish platform to advocate for S3A
- Assistance for the establishment of national Innovation Hubs and sensitization of policymakers as requested (Botswana)
- Guidance and guidelines in the creation of National Research and Innovations Fund
- Sensitization of policymakers (Botswana).
- Facilitation of participation of key experts for better and deeper understanding of the science agenda, the theory of change, IAR4D and Innovations Platforms and Systems.
- Southern Africa countries put forward the following timelines for the submission of their completed and validated country action plans

IVc.2 WAY FORWARD

At the end of the consultations, participating countries and institutions emerged with a good knowledge of the Science Agenda in Agriculture in Africa, were clear about what it entails and seeks to achieve and the role expected of institutions and countries in its implementation. There was also an appreciable understanding of the implementation framework. The preferred option is to have the agenda mainstreamed in existing strategies, policies and programs of countries as opposed to being projectized as a special intervention.

The following were raised as areas of immediate follow-up:

(a) Clarification of Concepts and Finalization of Frameworks

- FARA should develop a value-added statement for the S3A to clearly articulate the value it brings to current frameworks, policies and practices.
- Clarification of the concept of Innovations Platform and development of implementation guides for National Agricultural Innovations System and the Innovation Platforms
- Finalization of the complete theory of change for the S3A at regional and continental levels
- Finalization of the results framework for the S3A at regional and continental levels, including a performance (implementation) monitoring and evaluation strategy, system and indicators

(b) Development of Implementation Arrangements and Programs

- Development of a comprehensive knowledge and information support system for the implementation of the Science Agenda, building on the framework offered by FARADATAInformS.
- Elaboration of a comprehensive capacity building and strengthening program for the implementation of the Agenda at national, regional and continental levels. This should help strengthen NARIs, develop partnerships, support high quality scientific research, among others.
- Articulation of financing strategy and instruments for mobilizing resources for implementation of the Agenda at all levels – national, regional and continental – and launch of a resource mobilization drive. Resource requirements should take into consideration individual country circumstances and assistance to launch implementation of the Agenda over the immediate 2-3 years. The needs assessment should be based on Country S3A Needs Assessment or Country Profiles and priority areas of needs.
- FARA to develop clear Country Implementation Guidelines (CIG) and Framework for Reporting on the implementation and performance of the agenda. The CIG should provide countries with options in respect of implementation framework for the Agenda.

(c) National Focal Points and Champions and Sensitization Missions to Countries

- Conduct of sensitization missions by FARA and the SROs to countries that made formal request during the consultations, namely, Angola, Botswana, Madagascar, Swaziland...
- Countries should advise FARA of their focal points in the implementation, coordination and reporting on the agenda. Efforts should be made to identify and cultivate champions of the Agenda at national and regional levels.

(d) S3A Communication and Advocacy Strategy and Program

- Review, editing and standardization of the presentation of all Country Action Plans for upload on FARA, SROs and AFAAS web sites
- Development of portals for S3A documentation, information and news on FARA, SROs and AFAAS web sites.
- Production of an Annual Implementation Report on the Agenda
- FARA should provide participants access to all materials presented during the consultation meetings
- An S3A communicating plan should be developed to systematically raise awareness of the Agenda at national level across the continent. This should draw on the use of national, regional, continental and international platforms, conferences and meetings such as Science and Technology (S&T) Platforms, Scientific Conferences, Briefings of political leaders, among others.

PART V

TIER 1 NATIONAL CONSULTATIONS – RWANDA, EGYPT, MALAWI, SENEGAL AND GHANA

V.

TIER 1 NATIONAL CONSULTATIONS – RWANDA, EGYPT, MALAWI, SENEGAL AND GHANA

V. INTRODUCTION

The National Consultations were a follow-up on the regional consultations. They aimed to deepen knowledge of the science agenda among country-level stakeholders, identify countries' AR4D priorities, define the contributions that S3A would make to the country's AR4D and National Agricultural Innovations System (NAIS), outline how implementation would be undertaken in the specific country context and clarify requirements for successful implementation. The country consultations were also to enable countries to define and measure the results that implementation of S3A would lead and the sources from which the results would be generated. To benefit from S3A a country is expected to provide a profile of the state of its agriculture with respect to AR4D and NAIS, present current or ongoing major AR4D projects and scientific research, clearly define its challenges and entry points for S3A and outline expected results.

What follows are the reports of the National Consultations for Rwanda, Egypt, Senegal, Malawi and Ghana, which constitute the Tier 1 countries.

V.1: RWANDA NATIONAL CONSULTATION

ROLL-OUT OF THE SCIENCE AGENDA FOR AGRICULTURE IN AFRICA

1.1 OVERVIEW

The Rwanda National Consultation on the roll-out of the Science Agenda at the national level was the first among the five (5) tier-one countries identified to lead the implementation process. The consultation was held at the Hotel Villa Portofino, Kigali, Rwanda over the period 19-23 June 2017. It was attended by the Director-General for Rwanda Agriculture Board (RAB), the Interim Executive Secretary of ASARECA and national representatives from the Ministry of Agriculture, Ministry of Finance, the Private Sector, and the University of Rwanda. Also, in attendance, were representatives from the CGIAR and Farmers' Organization.

The national consultation sought to achieve five (5) objectives. These were to:

- 1) Sensitize participants on the status and strategy of the S3A
- 2) Craft a national theory of change and results framework, emphasizing science priorities, needs, baselines and expected change resulting from mainstreaming of S3A in Rwanda.
- 3) Set up a process for deepening Rwanda's engagement with S3A implementation
- 4) Refresh Rwanda's National Agricultural Investment Plan (NAIP) with respect to STI preparedness to deliver CAADP-Malabo targets.
- 5) Provide the information base for the Rwanda-driven proposal to IFAD for implementation of S3A.

Earlier, following extensive discussions among participants from targeted sectors and sub-sectors, Rwanda drafted plans to help it mainstream S3A in its agricultural innovation systems. Among the key steps identified to enhance fast tracking of this process are:

- 1) Deepening understanding and current level of knowledge of S3A in the country, including the agriculture-related sectors and sub-sectors through advocacy and communication.
- 2) Conduct of country assessment to understand existing programmes/projects/activities and opportunities for application of S3A approaches. The assessment will also identify possible challenges to S3A mainstreaming, existing capacities and capacity needs, institutions and institutional arrangements, and available policy and legal frameworks.
- 3) Development of operational modalities for the implementation of S3A. This will include country-specific guidelines in line with the objectives of S3A, based on a clear theory of change. A team has been set up to follow up on the vital processes towards actualizing S3A implementation.
- 4) Support targeted institutional and systemic arrangements within the country to outline the institutional base upon which implementation is to be pivoted, including comprehensive identification of all actors in the agricultural innovation system. This also will include resource mobilization and the management of already secured resources.
- 5) Implementation, reporting and learning of crucial findings of ongoing interventions that are likely to contribute to the rapid implementation and adoption of S3A. This includes efficiency and effectiveness of resource use that is directed towards output-outcome and impact orientation with documented evidence for learning and sharing

- 6) Strengthening of linkages and capacities to facilitate rapid up-scaling of S3A in the country, including supporting initiatives towards the operation of the proposed science for agriculture consortium (S4AC). This is expected to enhance visibility of S3A implementation in Rwanda, in addition to enhancing maintenance of political interest, prioritization of S3A capacity strengthening and engagement with other ASARECA member countries to upscale the science agenda – with Rwanda serving as the benchmark.

The five-day interaction resulted in enhanced understanding of S3A and the development of requisite modalities for its implementation. This national consultative meeting supported the adoption of the Agricultural Innovation Systems (AIS) approach as the overarching framework for the country S3A implementation mechanism. It also proposed the strengthening of existing strategic innovation platforms and the strengthening of existing ones, which are to be followed by the operational innovation platforms as well as the scaling-up and out of innovation clusters.

During the five-day deliberations, Rwanda came up with a series of carefully selected actions designed to accelerate S3A implementation. Among these were the following:

- 1) Organization of further national consultations with extended group of actors. This is anticipated to ensure active engagement among a larger team or group of stakeholders, including those that could not attend this workshop. It is also anticipated that the expanded stakeholder group will further engage the non-traditional partners, including policy makers, universities, ministry of education, as well as actors in the private sector, especially manufacturers, financial institutions, farmers, input dealers, among others.
- 2) Enhanced targeted communication with policy-makers to ensure their understanding and buy-in. Rwanda anticipates that the discussion would start from the impact end to the required action, having carefully explored the anticipated impacts and outcomes of current interventions. This process is expected to also provide information on specific trade-offs and opportunity costs of prioritized interventions.
- 3) Conduct of rapid situation analysis to provide information on the status of S3A implementation, gaps as well as country implementation readiness. This is in addition to seeking to identify specific promising interventions. This process is expected to further minimize duplication of efforts, promote effective mainstreaming and lesson learning.
- 4) Infusion of the S3A into the National Agriculture and Food Security Investment Plan.
- 5) The need to continue to develop the capacity required for the implementation of the science agenda.
- 6) Liaison with the already identified partners to provide requisite support to new members in seeking to fast track S3A mainstreaming in the country.

1.2 PROCEEDINGS OF RWANDA NATIONAL CONSULTATION

(a) Opening Session

The opening session of the Rwanda National Consultation was chaired by Dr. Cyprian Ebong, the Interim Executive Secretary (IES) of the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA). He welcomed all present and expressed his happiness to be with the team from FARA again, having just concluded the Regional Consultation. He identified the meeting as an opportunity to raise questions in the minds of all actors of AR4D as a way of sharing thoughts on where FARA, the SROs and Rwanda are going. While recognizing that there are a number of scepticisms around S3A, he assured all the participants that there is hope for an uptake of S3A in Rwanda. He reiterated that there were partners ready to support the uptake of S3A, including the readiness of Rwanda government to support the S3A implementation. However, he decried the situation in which despite huge resources available, Africa continues to have highest poverty levels, serious disease outbreaks as well as increasing food importation and expenditure on commodities that could be

readily produced. He stated that S3A should also focus on, and document, the impacts of Climate Change in each country.

He further indicated that all over the world, 60% of the arable land is not utilized, while up to 80% of arable land within ASARECA member countries is not utilized. He indicated that it is paradoxical for African countries to ignore utilization of what they have, and rather prefer to buy from outside and to borrow to feed its people. It is time for Africa to use the available technologies and innovations it has generated in order to avoid exporting its sweat. He stated that the utilization of these available technologies and innovations will enable Africa in general, and Rwanda in particular, to participate in the global market for commodity exchange, service delivery and knowledge sharing. In ASARECA, the team is prepared to partner with member countries to contribute to S3A work. He expressed gratitude to RAB and congratulated them for taking leadership in seeking to spearhead the implementation of S3A in the sub-region. He also thanked FARA for allowing RAB to take leadership of the process in rolling out S3A. He declared that nobody, including the farmers at the grassroots, would be left out in S3A implementation. He emphasized the need to take the sessions seriously, as the consultation would lead to the development of an S3A business case that would help in the engagement with governments and donors to support its implementation.

The Executive Director of FARA, through his representative, reiterated the importance of S3A and the role that high-level commitment is meant to play. He stated that the rate of S3A implementation in Rwanda would heavily depend on the country's commitment. He indicated that FARA looks forward to the development of a fundable proposal that would be consolidated alongside proposals from other tier-1 countries in July 2017 in Accra during a continental synthesis and validation meeting.

The Executive Director further stressed that FARA was mandated to coordinate the development and implementation of the science agenda, given its comparative advantages and the S3A has been endorsed by the Heads of States and Governments. Efforts towards the establishment of S4AC will further provide good institutional arrangement to support the implementation of the S3A at country level. The fact that S3A process has gone through several consultative processes during its development shows that its adoption by the Tier 1 countries will help drive its implementation, thereby deepening the application of science to transform agriculture in Africa.

The above points were also emphasized by the Director-General for RAB. He stated the need to ensure that the S3A is home-grown and implemented. Currently, Rwanda uses key strategies and plans to guide its agricultural activities, especially *Plan Stratégique pour la Transformation de l'Agriculture / Strategic Plan for the Transformation of Agriculture in Rwanda – Phase 3 (PSTA-III)*. This is a seven-year program succeeding the current PSTA-II (2013-2017). PSTA-III is currently being developed, and will be expected to cover the period 2018 – 2022. It is also expected to fit with the goals of S3A and SDGs 2030.

(b) S3A Implementation Process

The Rwanda meeting concurred that S3A would be implemented on the basis of a scaled-up process. Being the first among the Tier 1 countries, Rwanda's approach in the implementation of S3A would offer an opportunity for learning, evidence and impact assessment. Like all others, the Rwanda National Consultation involved six interrelated but cyclical steps, viz: Country commitment to S3A implementation; Stock-taking and profiling leading to a national level Theory of Change (ToC); Development of an investment proposal aligned to the country NAFSIPs and SDGs; identification of institutional structures required for implementation of S3A; Implementation planning; M&E and lesson learning.

(c) Theory of Change/Results Framework and Knowledge Management

The sessions on Theory of Change, Results Framework and Knowledge Management discussed elements that should constitute Rwanda theory of change for the science agenda, given successful

mainstreaming and implementation of S3A and the development of the required knowledge management support system, among others.

The theory of change provides the modality of change in the transformation process and outcomes pathways. Some of the key drivers of change discussed included stakeholder consultation and buy-in; strategic direction and leadership; technical and financial resources; capacity; partnerships; and effective functioning of AR4D institutions. There was a strong realization of the need for continuous monitoring and evaluation of these systems, processes, procedures and practices, review and lesson learning, knowledge sharing and redesign of approaches. It was stressed that M&E is critical to achieve set objectives, intermediate and overall outcomes of S3A.

The logical model of the theory of change (ToC) was also discussed in detail. This was developed based on the CAADP results framework. The ToC encapsulate four major levels. At the core of it is the required activities/inputs that include national agricultural investment plans and sector development plans; strengthening institutional systems, regional and continental integration; high quality science and foresight aligning megatrends; innovation platforms and agribusiness, value chains and food markets; policy engagement and processes; and alignment of science and agriculture. These translate into strengthening sustainable capacities and the application of science to deliver results at national and regional levels. Further, they stimulate agricultural transformation and sustained inclusive agricultural growth that finally results in the overall goal of Africa being food secure, a global scientific player, and the world's breadbasket by 2030 through doubling of public/private sector investment in AR4D.

(d) Knowledge Management

The role of knowledge management in the agricultural transformation process was central in the discussions. FARA proposed to generate and connect people to the required knowledge. The thematic areas in which knowledge will be generated to support effective implementation of S3A discussed at the meeting included:

- a) Productivity in major farming systems.
- b) Food systems and value chains.
- c) Agricultural biodiversity and natural resources management.
- d) Response to megatrends and challenges.
- e) Sustainable intensification.
- f) Foresight capacities (to understand trends and future challenges).

FARA shared ongoing development of an online repository of data and information systems (FARADDataInformS) to provide Science, Technology and Innovation (STI) metrics with analytical features for discussion and inputs. The knowledge management system will also draw on existing data sources and knowledge and information support systems for the agricultural transformation process.

The consultative meeting recognized four major challenges that could hinder S3A implementation in Rwanda, namely:

- a) *Inadequate Resources* - Resources in terms of funding, human and institutional capacities and infrastructure to facilitate the implementation process.
- b) *Existing Policy Environment*- While some countries do not have adequate policies to back some aspects of their agricultural transformation strategy, policy implementation was also questionable in countries where they have been developed.
- c) *Limited Knowledge*- knowledge of exhaustible natural resources (e.g. water, energy), production and post-harvest handling of commodities; and knowledge of production and use of biogas (trade-offs between fuel versus food).
- d) *Inadequate Data* -the meeting discussed challenges facing agriculture data on the continent. Data on crop yields, soil quality, commodity prices, demand and supply trends, pest and diseases, stakeholders value chains and national capacities are still limited and thus posed challenge to planning on the continent. The need to improve infrastructure (capacities, gadgets,

internet connectivity, etc.), standardization of systems and processes and human resources capacities were emphasized as necessary to ensure data availability to support the transformation process.

(e) Linkage between S3A and Mega Initiatives

Following plenary discussions and group deliberations, participants confirmed that there are many initiatives within the African continent that should be used to build and implement S3A. Among the relevant initiatives that situate S3A in key African frameworks include: CAADP, STISA, and PAEPARD, besides other initiatives that strengthen partnership on food and nutritional security as well as sustainable intensification. Among the key issues worth considering at the continental level regarding implementation of S3A include: (i) promotion of initiatives focused on ensuring transformed agriculture and sustained inclusive growth; and (ii) supporting the strengthening of systematic capacity to implement and deliver results. Rwanda shows commitments in linking up with these mega initiatives, and it has embarked on the identifying key actors that can be used to catalyse the process.

(f) Required Science in Achievement of S3A Targets

In order to achieve the goal of ensuring food and nutrition security by 2030, Rwanda is committed to doubling its current agricultural productivity by 2025. It aims to achieve this through joining other teams in mobilizing resources and putting these resources into S3A implementation. Currently, Rwanda has a very favourable policy environment for agricultural research, development and transformation.

The country appreciates the fact that there is a very urgent need to further commit the youth and women in S3A implementation. In order to achieve this, there is a need to support the translation of productive agriculture into income generation, thereby changing livelihoods. In addition, Rwanda seeks to enhance agricultural biodiversity through S3A implementation. This is expected to enhance agricultural productivity and value addition. Rwanda anticipates taking advantage of the several existing initiatives in FARA and SROs such as PARI, Biomass Web, APPSA, TAAT, AARP, ATONU, Africa-Brazil, AHC-STAFF, ECoSIB, among others.

It is noteworthy that in as much as increased productivity will not occur by chance, S3A implementation is a promising instrument to actualize it. The SA3 seeks not only to increase the application of STI in agriculture, but also to optimize the utilisation of resources. This is because most of the current initiatives have lifespan that ranges from three to five years, and thus are completed before any clear outcomes are recorded. To address this, Rwanda endeavours to promote local ownership and commitment to the development of science in agriculture in the country.

To further realize S3A vision at the country level through creation of favourable policy environment for science adoption, FARA currently coordinates interventions aimed at supporting Rwanda to develop policy practice index. This tool will help the country assess the extent of implementation of STI.

In addition to the Policy Practice Index tool, Rwanda expressed the need for enhanced:

- Human capacity development
- Promotion of capacity to commercialize agriculture, especially by the youths
- Utilization of e-Capacity among the targeted actors
- Capacity of targeted groups to domesticate foresight work.

One of the key challenges faced in the implementation of agricultural development initiatives in many institutions is difficulty in accessing public data for informed decision making.

(g) Capacity to commercialise agriculture

Rwanda readily supports the strengthening and/or establishment of business incubation centres. The current South-South Innovation Marketplace for exchange of information technologies between African

businesses and other parts of the world is regarded as a potential avenue for promoting S3A implementation. However, there is still a need to identify research needs in S3A.

(h) Innovation Platforms

Rwanda already has functional Innovation Platforms. However, there is a need to not only resuscitate the weak ones, but also to establish new ones. The country recognizes the role of S3A in achieving continuous improvement in productivity through the innovation platforms. Its implementation needs to be sustainable and create new work opportunities. For effective implementation pathways, Rwanda intends to mainstream new ways of doing business, especially through the youths and women.

As part of interventions to enhance the adoption of innovation platforms at the country level, Rwanda has taken the following initiatives, among others:

- Recognized the need to institutionalise the AIS for implementation of its research initiatives.
- Intends to scale up agricultural innovations systems.
- Seeks to develop affordable financing for SMEs in agriculture.
- Aims to develop modalities for vocational training in farming. Teams have been set up to design approaches of achieving these.

(i) Strengthening Human Capacity and Institutional System

In as much as there is a need for institutional linkages among NARES to enhance utilization of the human and institutional/infrastructure capacities, Rwanda needs to clearly identify the key actors as well as heighten their engagement in promoting S3A implementation. It is further recognized that in as much as human capacity may exist in Rwanda, these capacities may not be aligned to the short and long-term needs, and thus should be clearly articulated and aligned.

It is further recognized that an MoU is in place for NARES collaboration. However, this MOU needs to be reviewed and the achievement emanating from its implementation documented. Rwanda recognizes that there is a very urgent need to optimize human resource utilization across the country. There are several skilled personnel whose skills need to be tapped and directed towards enhancing S3A implementation.

The meeting noted that there is inadequate framework for system linkages and planning and human resource allocation to bridge the users. This needs to be addressed by developing implementable frameworks at the sub-national and national levels.

Given the need to enhance youth participation, Rwanda recognizes the importance of enhancing youth skills in the areas such as technical soft skills and ICT in agriculture and processing of agriculture products. In addition, there is a need to ensure increase in institutional technical skills.

Rwanda recognizes the need to enhance technology adaptation and adaption. It has embarked on developing specific strategies for enhancing productivity of selected commodities. In order to ensure that, Rwanda seeks to encourage effective communication and extension of what works well, where and how to scale it up.

The country expressed strong awareness of the recurrent problem of post-harvest losses. These are attributed mainly to increasing infrastructure needs by farmers, processors and transporters, as well as by key players along the agriculture value chain.

The National Consultation confirmed that Rwanda's M&E system needs support, especially in ensuring effective tracking of impacts of interventions. There is need to develop adaptable tools and instruments for collection and analysis of comparable data.

(j) Sustainable Financing of Science, Technology and Innovation in Agriculture

The consultation pointed to the need to create conducive environment for accessing new funding opportunities for its research. Some organizations have already received funds for specific tasks other than research. For instance, the Rwanda's Green Fund (FONERWA) is a ground-breaking environment and climate change investment fund that has shown that it is possible to generate funds for the green growth in Rwanda, in Africa and around the world. The fund invests in innovative public and private-sector projects that have the potential for transformative change and that align with Rwanda's commitment to building a strong green economy. The Green Fund also provides expert technical assistance to ensure the success of its investments.

Rwanda recognizes that science, technology and innovation can play very significant roles in innovative financing models for agricultural research; impact assessment and showing value for money in project implementations; and priority setting and budgeting for agriculture research.

(k) Creating Favourable Policy Environment

Rwanda recognizes that the use of assorted technologies has the potential to reduce human bias. The participants recognized that some of the policies, laws and regulations in Rwanda were rather vague, and thus needed clarity. They further realized that there is need for policy makers to assess current policies related to the use of drones and plastic papers in agricultural research and assessments. There is need to identify who gives the license for new technologies such as the breeders' seeds and technologies. Currently, the laws guiding seeds need to be assessed and revised / reviewed. The principal question is how to assist agro-processors in packaging so that they compete with external markets. This calls for effective value addition activities.

There is a recognized need to enhance the regulations on environmental stewardship. This should be reviewed to balance the need for innovation that foster development and scaling out of new technologies and innovations. Currently, all GMO-related activities in Rwanda is housed at REMA. It is unclear how to promote scaling out of these technologies that are housed / managed under the Ministry of Agriculture.

Participants observed that Rwanda's engagement in policy reviews leading to their approval and implementation is vital for the enhancement of S3A implementation. However, the following issues need to be observed and addressed in order to enhance S3A in Rwanda:

- In as much as existing policies are good, their actual implementation at the lower level is needed. This will ensure that they are useful and implemented as intended, thereby fostering science and technology development and agricultural transformation.
- Policy feedback loop is important to ensure that there is development and changes that are in tandem with scientific development. There is therefore need to enhance feedback among the stakeholder through this loop.
- It is important to have well-coordinated research and development for a common scientific agenda, thus Rwanda needs to establish / strengthen its core unit for research and development.
- There is need to enhance active and regular forecasting capabilities to predict productivity and reduce risks.
- There is urgent need to ensure that the current status of agriculture financing is reviewed. This includes the need to review the criteria for accessing the funds, especially FONERWA's funding modalities.
- There is a need to ensure linkages across the national and sub-national institutions to ensure informed decision-making.
- Rwanda, through its Ministry of Agriculture and RAB, needs to review and assure its clientele on effective crop and livestock insurance mechanisms.
- It is valuable to identify schemes that support access to and utilization of appropriate technologies and innovations to the smallholder farming households.

1.3 RWANDA COUNTRY AGRICULTURAL PROFILE AND ISSUES IN THE IMPLEMENTATION OF THE SCIENCE AGENDA

(a) Table V.1.1 summarizes Rwanda's present agricultural development profile.

No.	Indicators	Present Situation	Expected Situation 2025/2030
1	Country Population	11,840,000	14,369,183
2	Gross Domestic Product (GDP)	USD 8.6 billion	USD 21.57 billion
3	GDP Per Capita	USD 748	USD 2,759
4	Agricultural Ecological Zones	12	9
5	Size of Arable Land	1,387,860 ha	1,850,000 ha
6	Cultivated Land	1,247,799 ha	1,750,000 ha
7	Irrigated Land	75,000 ha	250,000 ha
8	Number of Farmers	5,280,000	4,500,000
	• Small-holders	85%	50%
	• Medium	10%	30%
	• Commercial	5%	20%
9	Nature of Farming Systems	(1) Intercropping of two or more crops is mostly practiced, (2) commonly used rotation of tubers-legume-cereal, (3) fallow practice is limited due to shortage of land, (4) Agroforestry and forestry are important component of agricultural system, (5) All traditional modern and mixed livestock systems exist are practiced	(1) Adoption of monoculture, (2) Dominance of modern livestock system
10	Dominant Crops	Potato, Cassava, bean, Soybean, rice, maize, sorghum, banana, sweet potato, coffee, tea	Potato, Cassava, bean, Soybean, rice, maize, sorghum, banana, sweet potato, coffee, tea, and horticulture crops
11	Major Livestock	Cattle, goat, pig, sheep, poultry	Cattle, goat, pig, sheep, poultry
12	Dairy Products	Milk, yogurt, and cheese	Milk, yogurt, cheese and butter
13	Yield Per Hectare	Potato (30.7 t ha ⁻¹) Cassava (25 t ha ⁻¹) Bush bean (1.7 t ha ⁻¹) Soybean (2 t ha ⁻¹) Rice (6.2 t ha ⁻¹) Maize (5 t ha ⁻¹) Wheat (3.35 t ha ⁻¹) Banana (18.6 t ha ⁻¹)	Potato (35.7 t ha ⁻¹) Cassava (30 t ha ⁻¹) Bush bean (2.5 t ha ⁻¹) Soybean (2.5 t ha ⁻¹) Rice (7.5 t ha ⁻¹) Maize (6.5 t ha ⁻¹) Wheat (4.5 t ha ⁻¹) Banana (24 t ha ⁻¹)
14	Fertilize Use Per Hectare	29 kg/ha	45kg/ha
15	Rate of Technologies Adoption	Monoculture practice 38.8% Use of organic fertilizers 64.7% Use of inorganic fertilizers 22.0 % Use of improved seed 18.2% Use of irrigation 2.4% Practice of anti-erosion 73.2% Use of pesticides 10.6%	Monoculture practice 75% Use of organic fertilizers 80% Use of inorganic fertilizers 75% Use of improved seed 70% Use of irrigation 25% Practice of anti-erosion 95 % Use of pesticides 60%
16	Major Food Imports	Rice, wheat	Wheat
17	Major Agricultural Exports	Coffee, tea, livestock products	Coffee, tea, livestock products and horticulture crops
18	Major Agricultural Extension and Advisory Services Required by Small-holder Farmers	Agriculture extension services,	Strong with ICT Agriculture extension services,

		Animal resources extension services Land husbandry, irrigation, and mechanization agricultural extension services	Animal resources extension services Land husbandry, irrigation, and mechanization agricultural extension services
19	Nature of the Agriculture Policy Environment	(1) The global, (2) international, and (3) regional treaties and protocols which Rwanda has ratified, (4) National Agricultural framework and policies	National agricultural framework and policies aligned to global, international, and regional treaties
20	Major Agriculture Policy Frameworks	(1) The Millennium Development Goals (MDGs), (2) New Partnership for African Development (NEPAD), (3) Common Markets for Eastern and Southern Africa (COMESA) and East African Community (EAC), (4) Vision 2020 (5) The Economic Development and Poverty Reduction Strategy (EDPRS), (6) The Strategic Plan for the Transformation of Agriculture (PSTA)	Powerful monitoring and evaluation to assess impacts of major Agriculture policy frameworks including (1) The Millennium Development Goals (MDGs), (2) New Partnership for African Development (NEPAD), (3) Common Markets for Eastern and Southern Africa (COMESA) and East African Community (EAC), (4) Vision 2020, (5) The Economic Development and Poverty Reduction Strategy (EDPRS), (6) The Strategic Plan for the Transformation of Agriculture (PSTA)
21	Researchers Per Million Population	16	25
22	No. of (Full-Time Equivalent) Researchers in Lead or Coordinating National Agricultural Research Institution	114	250
23	Technologies and Innovations Patents filed by the Country	Zero (0)	10
24	Number of Technologies Awaiting Adoption	-	-
25	Number of Major Research Institutions in the Country	4 major research institutions are in place: Rwanda Agriculture and Animal Resources Board (RAB), University of Rwanda (UR), National Industry Research Development Agency (NIRDA), Institute of Policy Analysis and Research (IPAR)	8 major research institutions will be in place
26	Quality of Research Infrastructure and Facilities	Quality of research infrastructure and facilities not sufficient	Sufficient quality of research infrastructure and facilities
27	Quality of Scientific Research – number, experience of researchers, access to new knowledge	Quality of scientific research is improved but gaps are noticed in some areas: number of researchers is low, access to technology and knowledge is very low	Improved quality of scientific research. High number of researchers, and high access to technology and knowledge
28	Existence of Institutional Framework or Arrangement for Coordination of AR4D Activities Among Institutions	(1) National commission for science and technology, (2) Rwanda science and technology council, Directorate of Science and technology, (3) Rwanda Agriculture and Animal Resources Board in charge of research and extension, technical sub-groups	Strengthened the research capacity of (1) National commission for science and technology, (2) Rwanda science and technology council, Directorate of Science and technology, (3) Rwanda Agriculture and Animal Resources Board in charge of

			research and extension, technical sub-groups
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(b) Issues in the Implementation of S3A

In terms of the current challenges facing agricultural transformation, the National Consultation pointed to the following, among others, as summarized in Table 2:

Table V.1.2: Rwanda Agriculture: Challenges, Present Situation and Expected Position, 2025/2030

No.	Challenges	Present Status	Expected Position, 2025/2030 or Target Date
1	Financing of AR4D		
	Areas of AR4D and their funding		
	• Government Funding	69%	80%
	• Private Sector Funding	0%	5%
	• Donor Agencies	31%	20%
	• Projects (through government, like One Cow)	21.5%	30%
	• Donor presence	AGRA, ASARECA, CIAT, CIP, JOFCA, IFDC, BTC, FAO	Number of donors to increase by 50%
2	Annual National contribution to Agriculture	7.4%	10%
3	• Annual National S&T Expenditures as % of GDP	0.89%	6%
4	• % Contribution by Government to Financing of Agricultural Extension and Advisory Services (AEAS) to Small-holder Farmers	90%	85%
	• % Contribution by Private Sector to Financing of AEAS to Small-holder Farmers	0%	5%
	• % Contribution by Donors to Financing of AEAS to Small-holder Farmers	10%	10%
5	Soil Fertility Management	Proportion of funding to NRM research and extension is below 5% now	To increase by 15%
4	Others (specify)	Funding of core research in labs (high tech) is below 5%	To increase by 10% (for example, for biotechnology and disease diagnostic, quarantine, trans-border control)

(c) Value Add of the Science Agenda

The Science Agenda is an instrument for mobilising the physical, human, institutional financial and policy resources required to ensure healthier, safer and more nutritious foods by increasing agriculture production on less land, with less water, chemicals and waste, and by generating lesser GHGs for sustainability need to protect the environment. The S3A has a vision that “by 2030 Africa ensures its food and nutrition security; becomes a recognized global scientific player in agriculture and food systems and the world’s bread-basket”. S3A is expected to provide guidance to the financing principles that would guide funding levels and priority areas of investments in science, and make the case for strengthening the people capacity, institutions, processes and requisite infrastructure that are necessary

to transform Africa's agriculture into a dynamic economic sector capable of shouldering the historic roles expected of it in the development process.

The S3A is aligned under the Comprehensive Africa Agriculture Development Programme (CAADP) which is the African Union and NEPAD/NPCA's continent-wide Framework within which African countries plan how to use agriculture-led development to (1) accelerate economic growth, (2) eliminate hunger, (3) reduce poverty, (4) enhance food and nutrition security, and (5) enable expansion of exports. To meet the CAADP target the Government of Rwanda has set very determined agriculture policies targeting an annual average growth of 8.5%. These policies and their implementation are well documented in the pillars of Vision 2020, Economic Development and Poverty Reduction Strategy (EDPRS), and in the Strategic Plan for the Transformation of Agriculture in Rwanda - Phase III (PSTAIII). They clearly outline the principles to create a commercially viable, environmentally responsible and sustainable agricultural sector. Some of the key principles supporting the sector are increasing productivity and competitiveness, environmental sustainability, participation and ownership of activities, and a market driven agriculture. A number of strategies including the National Agricultural Extension Services Strategy, the Agricultural Mechanization Strategy, the National Post-Harvest Staple Crop Strategy and the Agriculture Gender Strategy have been put in place. These strategies aim to transform Rwanda farming system into a productive, high value, and market-oriented sector by modernizing 50 per cent of its agriculture by 2020 and thereby improving livelihoods of the rural population, achieve food security and increase exports of agricultural products as it was stipulated by the millennium development goals (MDG) and New Partnership for Africa's Development (NEPAD).

The basis of all these strategies and any agriculture investment is a strong agricultural research. The mission of agriculture research in Rwanda involves developing agriculture and animal husbandry through their reform, and using modern methods in crop and animal production, research, agricultural extension, education and training of farmers in new technologies. The S3A will contribute to achieve Rwandan goals in agriculture by supporting all efforts to reduce poverty and income inequality, increase GDP and improve human development by supporting capacity (human and infrastructure) building, establishing and strengthening capacity for planning, implementation, monitoring and evaluation, though strengthen data and statistics units for efficient coordination of reporting.

(c) How S3A will be implemented in Rwanda - Projects, Mega Programme

S3A will be implemented in Rwanda through a Mega Programme based at RAB but involving all partners in agricultural research and extension. This will be done through running of infrastructure/core/strategic funding of core/key/national level themes and a competitive but domain-quoted restricted fund similar to FONERWA (for example a percentage of funding should be reserved for high tech lab research, NRM research, efficient scaling out approaches etc...)

(d) Key Stakeholders and Major Policies in Rwanda AR4D

The key stakeholders in Rwanda AR4D are: Rwanda Agriculture and Animal Resources Development Board (RAB), Institute of Policy Analysis and Research (IPAR), Public University (University of Rwanda), Private Universities (Byumba Polytechnic, University of Kibungo, Jomo Kenyatta University), Ministries (Ministry of Agriculture and Animal Resources, Ministry of Finance and Economic Planning), CGIAR (CIAT, IITA, CIP, ICRAF).

The existing strategies and policies for AR4D are: Rwanda Vision 2020; and the Economic Development and Poverty Reduction (Eradication) Strategy Phase Two (EDPRS II, 2015-2019). There is also the Strategic Plan for Agriculture Transformation Phase Three (SPAT III, 2013-2018). Beside these policies, there are also agricultural research strategies, including RAB strategy (2013-2018), RAB Research Strategy.

(e) Requirements for Successful Implementation of S3A and Expected Results

Table V.1.3 summarizes baseline indicators of Rwanda agriculture, expected results by 2025 and key actions that will be undertaken to achieve desired results.

Table V.1.3: Baseline Indicators, Expected Results and Key Actions

Key Area of Value Addition	World Average/Sub Saharan Average	Baseline in Rwanda	Expected change, 5years or (2025)	Key Actions required
Yields of key commodities	Potato (13.48 t ha ⁻¹) Cassava (15.94 t ha ⁻¹) Bean (0.89 t ha ⁻¹) Soybean (0.45 t ha ⁻¹) Rice (3.06 t ha ⁻¹) Maize (2.50 t ha ⁻¹) Wheat (2.01 t ha ⁻¹) Banana (5.6 t ha ⁻¹)	Potato (30.7 t ha ⁻¹) Cassava (25 t ha ⁻¹) Bush bean (1.7 t ha ⁻¹) Soybean (2 t ha ⁻¹) Rice (6.2 t ha ⁻¹) Maize (5 t ha ⁻¹) Wheat (3.35 t ha ⁻¹) Banana (18.6 t ha ⁻¹)	Potato (35.7 t ha ⁻¹) Cassava (30 t ha ⁻¹) Bush bean (2.5 t ha ⁻¹) Soybean (2.5 t ha ⁻¹) Rice (7.5 t ha ⁻¹) Maize (6.5 t ha ⁻¹) Wheat (4.5 t ha ⁻¹) Banana (24 t ha ⁻¹)	(1) Development of new, adapted, high yielding crop varieties resistant to various biotic and abiotic stresses, (2) Development of new pest and disease management technologies and good agronomic practices
Production/ Output of key commodities		Potato (369,691 MT) Cassava (405,961MT) Bean (151,715 MT) Soybean (12,346 MT) Rice (49,430MT) Maize (300,330 MT) Wheat (4,365 MT) Banana (1,005,934 MT)	Potato (450,000 MT) Cassava (550,000 MT) Bean (200,000 MT) Soybean (20,000 MT) Rice (60,000 MT) Maize (400,000 MT) Wheat (6,000 MT) Banana (1,500,000 MT)	(1) Development of new, adapted, high yielding crop varieties resistant to various biotic and abiotic stresses, (2) Development of new pest and disease management technologies and good agronomic practices
Research and Policy Interface	(1) Millennium Development Goals (2) CAADP (3) S3A	(1) Rwanda's Vision 2020 (2) EDPRS (3) PSTA-III	Country policies aligned to S3A	Set up scientific based policies aligned to worldwide and regional policies
Demand and determination of Research		Number of research is very low (114) with only 19 PhD. Only three functional laboratories (plant and soil lab, Plant pathology lab, and in vitro lab) Scattered extension services (crop production, animal husbandry, crop intensification, and water management and mechanization)	(1) Upgrading research capacity and institutional streamlining of research to better play its pivotal role of driving agricultural transformation, (2) Improving soil health and resilience to environmental stress for increased productivity and improved livelihoods, (3) Increasing animal resources productivity for current and future demands for livestock products in the	(1) Human Capacity Development, (2) Upgrading Research Infrastructure, (3) Increasing research funds, and (4) Development of one stop center for agriculture extension

			domestic and export markets, (4) Increasing crop productivity through innovative crop improvement and husbandry technologies for sustainable food security & income generation, and (5) Postharvest processing	
Funding for research (diversity and volume) – Privates sector		Research funds come from Government, and external donors, no research fund is given by private sector	Increase the research fund from Government, strengthen public-private partnership in funding research	Design and carry out research that respond to end users' needs
M&E infrastructure, tools and use		There is a Planning Unit at ministerial and institution levels, and performance contract (IMIHIGO) at all levels of public institution	Strengthened Planning Unit, and establishment of functional M&E units at ministerial and institution levels with modern ICT	(1) Human Capacity Development, (2) Upgrading Research Infrastructure
Patents registered		Zero	At least 10 patented technologies	Set up a regulation body of property right
Access to quality agricultural statistics	FAOSTAT	National Institute of Statistics of Rwanda (NISR)	Set up a centralized agricultural data collection and storage system	Establish a functional centralized agricultural data collection and storage system
Donor coordination		Ministry of Finance and Economic Planning (MINECOFIN)	Ministry of Finance and Economic Planning (MINECOFIN)	Increase the budget allocated to agriculture research

(f) Moving Forward Post-National Consultation

In moving forward at the end of the National Consultation, participants pointed to three crucial steps, viz:

- Collation of information needed for country proposal for the implementation of S3A.
- Development and submission of a proposal to development partners for resource mobilization.
- Commencement of mainstreaming of S3A into all AR4D activities.

(g) Rwanda's Implementation Arrangement for Rolling Out of S3A?

National AR4D planning will align with S3A. A platform for S3A will be established and an entity for monitoring, learning and evaluation. Rwanda also, intends to should have a focus person in charge of S3A.

(h) Support Rwanda Expects from FARA and ASARECA

(i) **Coordination and Alignment**

- Coordination with major organizations with mandates and resources for AR4D. these include Rwanda Agriculture and Animal Resources Development Board (RAB), Institute of Policy Analysis and Research (IPAR), and CGIAR (CIAT, IITA, CIP and ICRAF).
- Alignment with Platforms for Planning, Accountability and Review: At country level, there is an agriculture sector working group (ASWG) bringing together development partners, ministries and implementation institutions in charge of planning, accountability and review of policies and strategies for better delivery of AR4D.

(ii) **Priorities for Investment in Research, Science, Technology and Innovations in Rwanda**

Table V.1. 4 Provides Outlines on Ongoing, Pipeline and Targeted Research in Rwanda

No.	Research domain	On-going Research (coverage is country wide according to agro-ecological zones)	Pipeline Research	Targets to be met (based on PSTA, S3A, RAB strategy, CAADP)	Partner Institutions in Conducting of Research	Status and plan for up-scaling (prioritize if applicable)
1	Crop	i) Enriching germplasm diversity ii) Development of superior varieties, which are high-yielding and resistant to biotic/abiotic stress; iii) Development/validation of best-bet agronomic practices iv) Development/optimization of diseases diagnostics and characterization protocols	Use of biotechnology tools (molecular markers, double haploid, mutation breeding, etc.) to accelerate breeding	<u>Yield of commodities (2018 national targets):</u> Rice: 7t/Ha Potato: 30t/Ha Wheat: 3.5t/Ha Maize: 4t/Ha Cassava: 35t/Ha Bush Beans: 2.2 t/Ha Climbing Beans: 3.5t/Ha Soybean: 2.5 t/Ha Banana: 19.7t/Ha	Farmer organizations, Private sector, CGIAR centers (IITA, CIP, CIAT, IRRI, CIMMYT, ICRISAT and Africa Rice), NGOs, AGRA, ASARECA, FARA, FAO	i) Mass seed production of superior varieties (improved seed); ii) Packaging and disseminating best tailor- made agronomic practices
2	Livestock	i) Enriching animal genetic resources diversity; ii) Animal resources genetic improvement; iii) Improving animal feeds, feeding and nutrition; iv) Animal diseases diagnostics and surveillance	i) Selection of breeds using residue feed intake; ii) Developing crop residue feed formulations	i) Number of improved forage species: 7 ii) Number of feeding tools: 1 iii) Milk yield: 12 litres/cow	Farmer organizations, Private sector, ILRI, CIAT, NGOs, ASARECA, FAO	i) Artificial insemination; ii) East cost fever vaccine; iii) Improved forages and feeding formulas
3	Dairy Product	Mainly under private sector	N/A	N/A		

4	Soil	i) Developing fertilizer recommendations; ii) Develop integrated soil fertility management (ISFM) options; iii) Diagnosis and mapping soil nutrient deficiencies	Development of bio-fertilization technologies	i) Fertilizer recommendations: 7 ii) Number of ISFM options: 4	Farmer organizations, Private sector, NGOs, ASARECA, AGRA, IPNI, CIAT, IFDC, FAO	i) Fertilizer recommendations for specific crops and sites; ii) Soil amendment technologies
5	Finance & Agrolistics	N/A	N/A			
6	Water Management	i) Development of rain water harvesting technologies ii) Developing solar energy-based irrigation technologies	Exploring underground water systems		Farmer organizations, Private sector, NGOs, ASARECA	Rain water harvesting technologies
7	Natural Resources Management	i) Development of soil erosion management technologies; ii) Developing technologies on integrated crop-livestock and tree farming systems; iii) Conservation agriculture			Farmer organizations, Private sector, NGOs, ASARECA	i) Improved water catchment technologies; ii) New crop-livestock integration farming systems

1.4 CONCLUSIONS, RECOMMENDATIONS AND THE WAY FORWARD

(a) Conclusions and Recommendations

The key research priority areas for Rwanda include, but are not limited to:

- Breeding for resistance to pests and diseases of economic importance
- Breeding for tolerance to abiotic stresses, e.g. drought
- Integrated Pest and Disease Control
- Strengthening of seed production, supply and delivery systems
- Soil fertility improvement and other soil and water management options
- Developing and strengthening enabling policies, especially Agriculture Policy, Irrigation Policy, Fisheries Policy, Seed Policy
- Reviewing / developing other relevant bills such as Breeders' Rights Bill, Seed Bill, Fertilizer Bill, among others.

Rwanda National Consultation proposed that S3A mainstreaming into existing agricultural innovation system would require (i) Building institutional capacities, including training and improved infrastructure; (ii) Strengthening of intra and inter institutional relations; (iii) Formation of national consortia; and (iv) Creation of crop specific innovation platforms e.g. Roots and Tuber Crops Development Trust and Legume Development Trust.

In the country, the mainstreaming S3A is to be anchored on prioritized areas that seek to accelerate implementation of existing Rwanda Agricultural Investment Plans. Among the targeted activities to be undertaken include:

- Setting S3A priorities for all sectors and sub-sectors. It is worth stressing that this prioritisation should focus on themes that accelerate implementation of Rwanda's NAFSIP and CAADP Compact.

- Enhancing advocacy activities within Rwanda through RAB, including aggressive discussion and negotiation with Ministry of Finance (MINECOFIN) for approval of selected budgets.
- Interactive national consultation through ASARECA's support to rally and enlist more stakeholders for S3A implementation.
- Enhanced communication with various stakeholders through four teams put together to spearhead selected activities.
- A need for stakeholders at the National Consultative meeting to serve as key focal points and agents of change in the implementation of S3A.
- The need for Rwanda action plans to mainstream S3A in its agricultural innovation system.
- FARA and ASARECA to encourage member countries to take the lead in rolling out the S3A by registering strong commitment.

(b) Way Forward

Rwanda to also seek to address:

- Strengthening existing innovation platforms as well as establishment of new ones in provinces and regions that have not been fully represented. This is to enable targeted farmers to effectively convene meetings and share new technologies and innovations with the key actors. It is also anticipated to promote engagement by the neglected farming households.
- Given that improved market access and relationships result in greater equity between farmers and traders, Rwanda needs to focus on enhancing market access by the targeted farming communities that are currently excluded.
- Ensuring active collaboration on shared research priorities results in the production of cost effective and high-quality research.
- Enhancing linkages between research, academia and the field personnel to enable research to have practical impact and technology uptake.
- Promoting linkages between research, academia and other actors, especially professionals in agricultural value chains and field personnel for enhanced practical impact.
- Supporting information and knowledge exchange, both at the local and regional levels using appropriate knowledge sharing pathways and processes.
- Enhancing ICT application in agriculture, especially utilization of relevant applications and software and technologies. This will need to focus especially on the youths and women.

V.2: EGYPT NATIONAL CONSULTATION

ROLL-OUT OF THE SCIENCE AGENDA IN AGRICULTURE IN AFRICA



Participants at Egypt National Consultation, 9th – 12th July 2017, El-Gezira Hotel, Cairo, Egypt.

2.1 OVERVIEW

Egypt National Consultation to roll out implementation of the science agenda in the country's agriculture was organized jointly by the Forum for Agricultural Research in Africa (FARA) and the Agricultural Research Centre (ARC) from 9th -12th July 2017. It was the second among the national consultations in the five Tier 1 countries. The consultation was held at the El-Gezira Hotel, Cairo, Egypt.

The Science Agenda (S3A) outlines guiding principles to help Africa take charge of science to transform its agriculture. It refers to the science, technology, extension, innovations, policy and social learning Africa needs to apply in order to meet its evolving agricultural development goals. It also presents a suite of high-level actions/options for increasing and deepening the contributions of science to the development of agriculture at all levels on the continent. The S3A is based on the recognition of the game-changing potentials of science for the continent's agricultural transformation agenda encapsulated in the Comprehensive Africa Agriculture Development Program (CAADP) and the roadmap strategy for implementing the 2014 Africa Union (AU) Malabo Declaration on Accelerated Africa Agricultural Growth and Transformation.

Egypt has a huge scientific legacy to draw on (Ibn Al-Haitham, Ibn Al-Nafis Al-Azhar University). Today, there is no question about the capacity of Egypt's research community – which consists of more than 120,000 basic and applied scientists in 19 government universities and 198 research centers and a resourceful diaspora with whom to connect. The World Economic Forum's Global Competitiveness Report 2011-2016 ranked Egypt 124th out of 144 countries on the quality of its scientific research institutions, and 83rd on its capacity for innovation.

Over the past four decades, Egypt's Academy of Scientific Research and Technology (ASRT) has been largely responsible for shaping the country's science and innovation system. The academy was founded in 1972, responsible for drawing up STI strategies to tackle Egypt's problems and assessing their impact. Until 2007 it controlled the budget for R&D in universities and research centers. Today it is no longer a financing body but plays a central role as a think tank and policy adviser to the science ministry. It coordinates the country's research programs, and brings together scientists and other experts from universities, research institutes, NGOs and the private sector in Egypt on its 15 specialized scientific councils, where participants debate critical issues and plan research studies that serve the country's development priorities and feed into government policy.

2.2. EGYPT COUNTRY AGRICULTURAL PROFILE AND ISSUES IN THE IMPLEMENTATION OF THE SCIENCE AGENDA

Egyptian population stands at around 90 million, 95% of the land in desert, 3.3 million hectares, where water, and not land, is the limiting resource, innovation needed to be developed to address the water challenge so that water productivity can be increased substantially. Science can help to solve the problem by collecting data and developing solutions for the problems to save water and increase productivity. At ICARDA, one of the solutions emerged in the form of mechanized raised bed, an IP based strategy which with research impacts property and has increased water efficiency greatly. Other strategies include use of waste water for irrigation, marginal water and the use of remote sensing

Egypt is a diversified middle-income economy and one of the most developed and dynamic economies in North Africa and the Middle East. It is richly endowed with natural resources (fertile plains of the Nile valley, coal deposits, oil and gas resources) and benefits from a central location for international traffic (Suez Canal). Although agriculture contributes significantly to national GDP, economic growth has been driven largely by the expansion of industrial and services activities. Table V.2.1 presents elements of Egypt's agricultural profile.

Table V.2.1: Egypt's Agricultural Profile

No.	Indicators	Present Situation	Expected Situation 2020
1	Country Population ¹³	95.69 million	103.4 million
2	Gross Domestic Product (GDP)	336.30 US\$ billion	335 US\$ billion
3	GDP Per Capita	2724.40 US\$	2850 US\$
4	Agricultural Ecological Zones ¹⁴	5.8 million ha	
5	Size of Arable Land	2,670,000 ha	
6	Cultivated Land	3.48 million ha	
7	Irrigated Land	4.1 million ha	
8	Number of Farmers	51 million	
	• Small-holders	44 910 million	
	• Medium	3.5 million	
	• Commercial	1.5 million	
9	Nature of Farming Systems	Conventional	
10	Dominant Crops	wheat	
11	Major Livestock	Cattle	
12	Dairy Products	Milk, cheese	
13	Yield Per Hectare (Cereal)	7,230.8 Kg/ha	
14	Fertilize Use Per Hectare	662.532 Kg/ha	
15	Rate of Technologies Adoption		
16	Major Food Imports	Cereal	
17	Major Agricultural Exports	Citrus fruits, Rice and dried onion	
18	Major Agricultural Extension and Advisory Services Required by Small-holder Farmers		
19	Nature of the Agriculture Policy Environment		
20	Major Agriculture Policy Frameworks		

Table V.2.2: Egypt Current/Ongoing Major Agricultural Scientific Research

No.	On-going Research	Lead Institution	Partner Institutions in Conduct of Research	Status
1	Crop	Field Crops Research Institute	Food Technology Research Institute	
2	Livestock	Animal Production Research institute	Food Technology Research Institute	
3	Dairy Product	Animal Production Research institute	Food Technology Research Institute	
4	Soil	Soil, Water and Environment Research Institute	Food Technology Research Institute	
5	Water Management	Soil, Water and Environment Research Institute	Food Technology Research Institute	

¹³ Trading Economics, World Bank, July of 2017

¹⁴ FAO

2.3 PROCEEDINGS OF EGYPT NATIONAL CONSULTATION

(a) Opening Session

The opening session of the National Consultation commenced with remarks by Dr. Mahmoud Medany, the President of ARC, who welcomed all participants and briefly introduced FARA. He then gave an overview of NASRO and its relationship with FARA as well as other SROs. He proceeded to give a brief introduction on S3A and encouraged all Egyptian participants to fully get involved in the activities and discussion in the hope that everyone will contribute towards its actualization. He lamented the fact that Egypt is one of the countries yet to subscribe to the CAADP framework, has been left out for too long and missed several funding opportunities to promote AR4D in Egypt. He however expressed optimism and hope that the roll out event will offer the country an opportunity to come on board. He congratulated FARA for organizing the meeting and wished success to the synthesis meeting expected to come up by the end of the month in Accra, Ghana.

In a speech by the Executive Director, FARA, Dr. Yemi Akinbami, who was represented by Dr. Olowole Fatumbi, the ED's commended ARC for taking the challenge to organize the event and highlighted the long relationship between FARA and NASRO. He gave a brief history of S3A and demonstrated how the framework has come to a critical point in which it needs to be fully owned by African countries. He pointed out that agriculture cannot grow without science, which generates technology leading to innovation. While admitting that North Africa may be marginally ahead of other regions within Sub Saharan Africa, the challenges of agriculture across the entire continent remain the same and it is difficult for any country to act in isolation in the move to address them. He therefor stated that Africa must position itself to grow agriculture with science in the face of these challenges. As the strategic continent with the available land and natural resources to meet the growing challenge of feeding an increasing global population, the risk of ignoring science to promote agriculture may lead to serious consequences not the least of which is the phenomenon of land grabbing. Outlining the four thematic areas of S3A, the ED pointed out that S3A has gone through several consultations (about 10) and it is now time to swing into action and walk the talk as he urged participants to take the opportunities offered by the meeting to come up with country specific proposals. He added that mainstreaming S3A will depend on its effective domestication at country level as that is the only way it can go beyond and scale up so that science delivers to smallholders. He concluded by stating that this S3A is for Egyptians and they have to make it work as he thanked IFAD and ARC for their contributions.

(b) Plenary Session 2: An overview of the S3A: Status and Strategy

The main objectives of this session were to: (i) refresh Egypt's knowledge of S3A; (ii) examine S3A implementation framework; (iii) define implementation capacity requirements; (iv) propose sustainable financing for S3A; (v) develop a framework for accountability for results; (vi) propose a framework for knowledge and information sharing and lessons learning for S3A implementation.

Dr. Enock Warinda of FARA presented an overview of S3A, its development, strategy & progress so far. He started his presentation with the S3A genesis during CAADP agenda, Dublin process 2011. S3A framework is aiming to enhance the application of Science, Technology & Innovation to achieve CAADP goals, with focus on improving productivity. Also, this framework is targeting to achieve Priority 1 (*Eradication of hunger and achieving food security*) of the Science, Technology and Innovation Strategy for Africa (STISA). Dr. Enok highlighted the rational S3A to decrease the gap between actual yield and potential yield in Africa especially with the population projections increase. He mentioned that agriculture remains a major source of income in Africa; however, untapped potential has resulted in persistent poverty and deteriorating food security. Then, Dr. Enok concluded his presentation with some remarks that S3A is a vital instrument in the transformation of African agriculture, which starts at country and household level. The realization of S3A vision therefore depends on the success of its roll out to countries. He ended his presentation that FARA is counting on Egypt to be a trailblazer in S3A roll-out as the country did in setting the pace for the CAADP compact process.

Several questions and comments were raised and Dr. Warinda gave his feedback. Dr. Ramzy Steno, University professor and former Minister of Scientific Research, invited everyone to give S3A their very best as we are all

together on this. Another comment raised by Dr. Mahmoud Roushdy, DED, Strategic Relations of Egyptian Exporters Association, who mentioned that rather than attempting to eradicate of hunger, S3A should address yield gaps. In addition, Dr. Magdy Khalifa, CAADP representative, appreciated the introduction on S3A and also mentioned that the focus should be on eradication of hunger and not eradication of poverty. He asked the presenter to further elaborate on the vision and mission of S3A, its contents, level of implementation, ways of dissemination in North Africa, costs and if there were any achievement in S3A in North Africa.

On his feedback Dr. Warinda Agreed that S3A on its own cannot end hunger and that's why S3A is encompassing and engaging all players and actors from various ministries and not just agriculture; concerning the potential & actual yields, he responded that the S3A is about bridging those gaps, needs assessment is being carried out. While on the point of implementation he added that science has been applied all along, but S3A seeks to integrate, mainstream and scale up for impact while taking into consideration costs and investments required.

(c) Plenary Session 3: Country Profile and National Level Success Factors

This session was chaired by Dr. Shaban Salem, Director of the Agriculture Economic Research Institute and it was set to provide an opportunity for vital information and statistics on the status of agriculture in Egypt from different stakeholder perspectives, and how S3A can be integrated into their different activities. The session started by a presentation on the Role of MOALR in Advancing the Egyptian Agricultural sector and in Meeting the CAADP Targets provided by Dr. Magdy Khalifa, CAADP representative. Following the introduction of CAADP and AU, he demonstrated clear understanding of CAADP, having worked with AU for 12 years; he identified science as the missing component to addressing hunger in Africa. The long neglect Egyptian AR4D suffered and the consequence of that were complicated by insurgency and Arab revolutions, which have made it very clear that the country needs a sound agricultural investment strategy to address the challenges. He emphatically stated that Egypt needs to sign up to CAADP, and therefore S3A, as that is the only way to address the growing challenges.

The presentation was so much appreciated by the participants and several questions were raised. Among these were: *How can CAADP increase the adoption rate of technology? What did CAADP contribute to Africa's agriculture after spending such huge sums? Since Egypt didn't sign to implement CAADP, what was the alternative plan/program and how did the country report? What are the challenges in adopting the S3A and what are the success stories in CAADP?*

All these questions were answered by the presenter who said that in other countries there is a good relation between research centres and ministries. Technology is transferred through capacity building, investment and creating technical conditions in the fields. Through working with CAADP, two kinds of training were used; class training and on-job training. The training is costly and CAADP monitored closely. This should be adopted in the Egyptian S3A. CAADP spent on coordination, technology transfer, adaption and follow up on the assessment of impact of the technologies. Many countries have improved not only in agriculture but in other areas. Egypt has all the technologies and capacities to go ahead with S3A, but sustaining them requires availability of Fund which Egypt currently doesn't have. So the main challenge is the limited resources. S3A offers the opportunity to mitigate that challenge.

The next presentation discussed the Role of ARC in the Implementation of S3A as well as in the Egyptian Agricultural sector. It was provided by Dr. Mohamed Soliman, ARC Vice President for Research. Following the introduction of ARC, giving its mandate and vision the presenter proceeded to highlight its roles and how it serves as the brain of Ministry of Agriculture. With 16 research institutes, 12 laboratories, 3 information centers, 10 regional stations and 53 research stations, ARC has strived towards increasing Egyptian agricultural productivity, increasing farmers' income and wealth creation. The coordination and implementation of AR4D in Egypt by ARC has led to several achievements spanning the period from 1986 to 2015 in terms of the development of high yielding varieties, with more than 500 cultivars and hybrids made public for use by farmers in the last 3 decades, which have been distributed through technology transfer. A sound Agricultural Policy for Strategic Crops, namely wheat, bean, soybean, sugar crops: sugarcane and sugar beet and cotton. The problem of yield gap and other issues are being addressed.

Discussions started with participants raising a number of questions. Among these are questions on ARC strategy to minimize yield gaps; means or measures to show the contribution of research in outcomes; priorities for investment if Egypt is to adopt S3A; and whether productivity targets are national or those of ARC.

In his response to the questions and issues raised, the presenter said as for the strategic crops, despite the abundance of genetic base, there is limitation for delivery of better agronomic packages due to poor extension services. Currently, there is a new initiative involving national campaign and on-farm demonstrations. Concerning the new tools for developing new varieties, defining genomic package, etc. the productivity of all crops greatly increased. On the other hand, addressing the limitations posed by land and water implies the development and adoption of new technologies for saving water while generating early maturing varieties. He finally added that the targets of productivity are national, as ARC is the think tank of the Ministry of Agriculture. Another group of questions were raised by the participants which were as follows:

- How is Egypt handling postharvest losses since these account for 45% decrease in productivity?
Dr. Mohamed answered that choosing suitable cultivar and applying the best agronomic package, including post-harvest losses mitigating strategies that start from land preparation helps in handling these losses.
- The yield gaps vary between actual, potential and on experimental field and on farmers level as well so how is this addressed?
The answer was that by scaling up and optimizing the use of agronomic packages developed by ARC.
- What is the nature of agricultural extension framework in Egypt, when do farmers come in and how can S3A come in?
He clarified that by weekly visits to demonstration fields, inviting farmers to learning events based on hands-on training and data collection and assessment by the farmers themselves.
- What are the implications of climate change concerning changes in precipitation, extreme temperatures, changes in climatic zones, shorter growing seasons, and mainly in the dry area, which occupies 41% with 1.7 billion people characterized by fragile eco-system: draught and salinity?
Looking at 35-year pluvial on precipitation trend history of draught with 3-year tendencies show decreased productivity.

The following presentation was on “The Role of CGIAR in the Egyptian Agricultural Sector”. It was made by Dr. Aladdin Hemawieh from CGIAR. It covered all regions where ICARDA works in the dry areas with 15 outreach offices. He said that the Egyptian population stands at around 90 million, 95% of the land is desert, 3.3 million hectare, where water, and not land, is the limiting resource, innovation needed to be developed to address the water challenge so that water productivity can be increased substantially. Science can help to solve the problem by collecting data and developing solutions for the problems to save water and increase productivity. At ICARDA, he added, one of the solutions emerged in the form of mechanized raised bed, an IP based strategy which with research impacts property and has increased water efficiency greatly. Other strategies include use of waste water for irrigation, marginal water and the use of remote sensing.

The impact value of the research by CGIAR is Food security and Agribusiness support as well as nutrition (child mother). This includes the introduction of new technologies, integrated crop management, new germplasms, water research, socioeconomic studies, small ruminants, and capacity building, among others.

He identified strategic crops such as fava bean, lentil, chick pea and wheat as the gateway to self-sufficiency as among the crops under research at the center. A key project involving almost 1,000 scientists has initiated and involves gene pyramiding as a tool for developing and identifying new and improved genotypes with desirable traits for coping with water scarcity, salinity, and ability to utilize underground water. The project is supported by the International Water Management Institute (IWMI).

In responding to questions raised, the presenter made the following points:

- 1) Waste water technology has already been developed in other places like Australia although cost can be challenging.
- 2) Technology transfer takes into consideration the different regions and the historical trajectory of technological evolution and development.

- 3) The job of CGIAR is to deliver the new varieties to ARC, which then takes them forward down to the farmers.
- 4) There is rain water harvesting systems for regions with extremely low precipitation using crops such as cactus.

(d) Plenary Session 3-2: Country Profile and National level success factors

The Role of NGOs was presented by Dr. Edgar Boutros Taweil, the representative of Bashaier, an Agriculture Knowledge & Marketing System Innovator NGO that links small farmers with knowledge. Dr. Edgar presented the Case of El Bashaier and its experience. Recognizing the shift to knowledge economy, Bashaier seeks to help the 7 million farmers in Egypt with limited access to land. The objective and strategy of the NGO is to galvanize inclusive business approach to provide rural entrepreneur. Bashaier was established as the agriculture digital marketing network fulfilling the farmers' primary need for sustainable marketing solutions. It offers ICT tools such as mobile and web platforms to support marketing. As part of the Egypt Agri-food Digital Network, Bashaier offers ICT for marketing through multi-stakeholder and PPP. Bashaier has recently launched its first online agricultural marketplace and links small farmers to market through call center, SMS and internet. He also highlighted that the most notable challenge so far is due to price fluctuations, which is mitigated by projection in contractual agreement.

Several questions were raised regarding how is Bashaier helping farmers to address the price fluctuations. The answer was that it is taken care of within the contract by allowing for appending or creating special conditions. For example, if the price is high, and contract has already been signed based on low price, the farmer may be advised to block certain percentage for selling under the higher price. For example, 80% to meet contractual agreement and 20% for high price. Participants also asked if NGOs will replace the middlemen and he said that the contracts allow for flexibility in negotiations and Bashaier is neutral allowing market forces to play role in determining prices.

The following presentation discussed the role and Opportunities of the Private Sector in the Egyptian Agricultural Sector it was given by Dr. Mohamed Waer, a consultant at Dina Farm, a huge company working in the field of agribusiness. Dr. Waer particularly concentrated on the role of Animal production in Egypt due to its importance in the increase in population and pressure on agriculture sector in rural areas. He said that unfortunately small holder animal farms represent 75% of national production while 25% is commercial. This is problematic from the point of view of planning, as there is paucity of information on the identity, information on nutrition and health status of animals. Thus, an ecological pressure caused has been created where there is a competition between people and animal on agricultural lands in the desert region (presentation annex 5).

The last presentation discussed the role of Universities in the Advancement of Egyptian Agricultural Sector; the developmental issues in Egypt revolve around agriculture and effective water use as presented by Dr. Waheed Megahed, a professor in Ain Shams University, faculty of agriculture. He said that universities are expected to engage in research to address these problems. Unfortunately, the systems have been crippled by years of neglect, inadequate funding, poor maintenance budget and poor linkage with international centers of learning. The impact of research from the university is near zero. It seemed like participants disagreed with this point, as some of them opposed the idea and raised question on how possible is it that there is no impact of research from university? Dr. Megahed replied that there is no concrete agenda, but there are trends and indicators. There is no significant budget. The current demand is 70 L.E./person/annum. However, universities have merely become centers for acquiring degrees and not learning. Although there are few serious research projects in some units of the universities, their impacts are minimal as they depend mainly on international funding, which is grossly inadequate. Another inquiry was about the kind of science that is being carried out in the universities. And Dr. Megahed answered that essentially none, due to lack of budget and funding. Currently the trend is that private companies pay international consultants for advice and research as universities have largely been abandoned.

A general comment was made by Dr. Fatumbi Oluwole who highlighted some of the immediate areas of concern within the Egyptian agriculture, to which the S3A, as a continental initiative, may be applied to respond to water problems, yield gaps, funding, land fragmentation, market and institutional capacity. Moreover, Dr. Raymond Jatta gave a preparatory guide on the parallel sessions for the second day of the meeting. The overall output for the consultations is to produce an investment proposal and financing plan for S3A implementation in Egypt.

He stated that the objectives are to:

- 1) Deepen S3A implementation based on the country situation analysis.
- 2) Assess how adequate ongoing and pipeline research is to support national agricultural transformation goals
- 3) Identify the value add of S3A to current situation in Egypt.



Egypt National Consultation in Pictures

(e) Day 2: Monday, 10/7/2017

Elements underpinning Country Action Plans for S3A implementation

Dr. Hala Adel started the recap by thanking the participants for the great efforts they have made during day 1. She said that about 10 presentations were introduced and a fruitful discussion took place, in addition, she gave a brief introduction to day 2 activities.

Plenary Session 4: Realizing Egypt Vision of the S3A

The session was chaired by HE Dr. Hania El Ireby, former president of ARC and the Director of the Egyptian Gene Bank.

The first topic was on Creating a favorable policy environment for Science (using PPI) presented by Dr. Paul Boadu who highlighted the thematic areas of the S3A and introduced policy practice index (PPI), as a mechanism of breaking existing and gap identification. PPI has been designed as tool for country self-assessment of the STI policy formulation and implementation.

After the presentation ended an important discussion took place where the participants commented that each country has its short, medium and long-term strategy on policy for developed so how can PPI be applied without conflict? The answer was that the PPI will be developed based on country's SML term plan. Policies are generally similar but differ in dimension. However, it is designed to address the policies based on themes. For Egypt, there will be a formulation of dimension based on which scores will be developed and all will be scaled to be comparable from country to country.

Second topic was strengthening human and institutional systems of Science for Agriculture, presented by Dr. Amos Gyau where he highlighted the role of capacity development in S3A in the form of AchSTAFF. He described CD as the process through which individuals, groups and organizations, and society deploy, adapt, strengthen and maintain the capabilities to define, plan and achieve their own development objectives on an inclusive, participatory and sustainable manner. Dr. Amos stated that capacity development is core to the realization of S3A. In addition, the strong partnership to link national, sub regional and global organization, private sector, universities is needed. Question on capacity development included: The model of institutional arrangement spoke of 3 components, what about the indigenous/local knowledge? The speaker answered that the CD is participatory and can be domesticated.

Third topic that was discussed was outline on the role of M&E in realization of S3A in Egypt. The presentation was given by Dr. Enock Warinda, who started by probing the level of competency in M&E within participants. Up to three experts in M&E were identified in the group. From the Egyptian experience in a 2013 agricultural strategy, a special unit on M&E based on logical frame matrix was established. There is a good team within ARC and for every program there is M&E, working with Ministry of Planning to look at all sectors. Dr. Khalifa reported being in charge of M&E in AU where he was part of group working with an M&E tool known as AMREW.

A report from AUC concluded that M&E is weak, outcomes and impacts in projects are uneven and delayed, statistics are outdated, and data on key indicated, not calibrated or are inconsistent. S3A leads to harmonization of country's M&E strategy and roadmap for 2025 (CAADP). The way forward is to strengthen M&E system, establish reliable data, develop data tools and track country TOC.

The fourth topic was concerned with Emerging Knowledge Management Plan for the S3A. This was presented by Benjamin Abugri who introduced FARA DataInformS to drive the process of S3A, regarded as an KM system to connect people to knowledge generation. Then, he explained the Data and information systems (Data forms) and proposed concept for KM for S3A. Abugri illustrated some

existing platforms for KM like ERAILS, E-Capacities, and FARA Group. He ended his presentation by showing how the KM drives the country targets.

Dr. Khalifa reported that there is no KMS in Africa and Benjamin commented that a lot of knowledge is generated by projects and for this reason the KMS component of S3A is relevant as it is able to embrace all projects developed to address agriculture.

(f) Parallel Sessions

1.1. Session on Planning and Coordination:

The Parallel session discussed the following sub themes

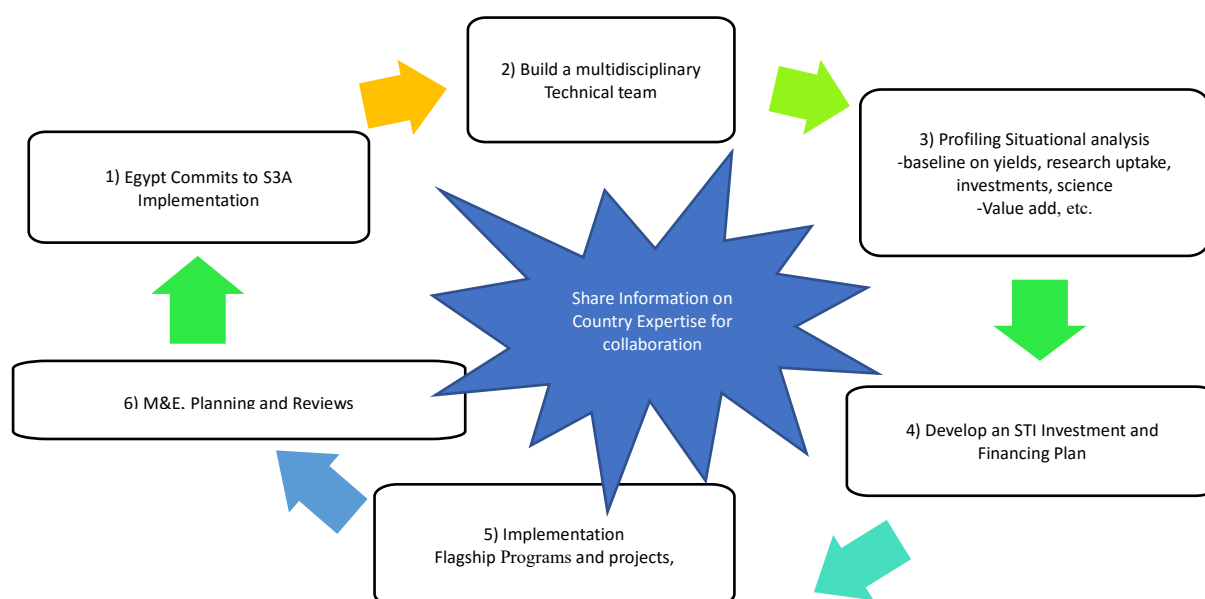
- 1) Country Engagement Strategy for S3A in Egypt
- 2) Value add for S3A
- 3) Research priorities for S3A in Egypt. Mapping ongoing and emerging research to national priorities
- 4) Sustainable financing strategy for S3A

The Parallel sessions took the form of joint presentations of about 10- 20 minutes (prepared by an official assigned by ARC and Dr. Raymond Jatta of FARA. The presentations were then followed by discussions.

The First topic discussed during this session was the Country Engagement Strategy for the implementation of the Science Agenda.

The session seeks to define a stepwise process of engagement, formulation and implementation of the science Agenda in Egypt. A priority issue is that the implementation of the S3A will be aligned to ongoing processes of CAADP and its implementation structures. Egypt is committed to participating in the drafting and implementation of the S3A as a Tier One country. In addition, Egypt has not yet signed the CAADP Compact and thus does not have a country implementation team. However, a process of annual engagement is led by ARC and involving key stakeholders in designing Research Priorities. This process and the stakeholders involved should be mainstreamed and be used a permanent structure/Platform for planning, review and implementation of S3A in Egypt. On the country Engagement Process, the following process was agreed.

Fig. V.2.1: Egypt Country Engagement Process



The key issue was that during the development of the S3A investment and financing plan, key strengths of different countries should be identified and a program for collaboration should be designed based on the different strengths and challenges of implementing countries.

Countries with experiences and expertise in some areas can be linked to other countries with challenges in those areas.

The second Discussion was around the value add of Science Agenda. This discussion aimed at identifying key indicators of success for which the Science Agenda implementation can improve. In other words, in which areas will S3A impact. The following indicators were agreed as possible value adds of the S3A:

- 1) Production and Productivity:
 - Yield of key commodities in Egypt.
 - Production (output and Area) under sustainable production.
- 2) Financing of STI:
 - Funding for Agriculture, Research (diversity and volume) – Privates sector, National and Continental
- 3) Natural Resources Management:
 - Hectares of Land reclaimed.
- 4) Technology generation and uptake:
 - Technologies produced, shared and adopted.
 - Patents registered.
 - Integration of Innovation Platforms– Number and quality.
- 5) Donor coordination
 - Planning, M&E and KM (tools and structures for Aggregation, creating evidence).
 - Access to quality agricultural statistics
- 6) Research and Policy Interface
 - Demand and determination of Research
 - Research Sharing/ Network among countries

The third topic that was discussed during the parallel session was about Priority Research. This session aimed to discuss priority research, science technology and innovation, which can be included as part of the implementation of S3A in Egypt. The group will assess ongoing, and pipeline research mapped against national targets and emerging mega trends to assess the adequacy of research. This will show the research priorities – for new research or to upscale ongoing research. Egypt has recently developed a national STI strategy - The Strategy of Sustainable Agricultural Development 2030. This strategy is managed by Agricultural Research & Development Council. ARC is a member of council. It was clarified that the Southern Africa Development Community (SADC') vision is “To achieve a comprehensive economic and social development based on a dynamic agricultural sector capable of sustained and rapid growth, while paying a special attention to help the underprivileged social groups and reducing rural poverty”.

Table V.2.3: Priorities for STI in Egypt – 2030

<ul style="list-style-type: none"> • Sustainable utilization of natural agricultural resources; • Improvement of the agricultural productivity of both land and water; • Realization of a higher degree of food security with regard to the strategic commodities; 	<ul style="list-style-type: none"> • Strengthening the competitive ability of agricultural products at national and international markets; • Improving the agricultural investment climate;
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	<ul style="list-style-type: none"> Improving the standard of living of the rural population and reducing the rates of rural poverty.
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Egypt Priority Programs and Projects

- 1) Rationalizing the use of water Resources for optimal efficiency.
- 2) Maintaining and raising the efficiency of agricultural land resources.
- 3) Improving field crops.
- 4) Improving fruit and vegetable crops.
- 5) Animal production.
- 6) Social and economic development of rural areas.
- 7) Modernization and improvement of marketing and agro-industrial products.
- 8) Agricultural research, extension and technology transfer.
- 9) Settlements, investment in agricultural projects, and integrated programs.
- 10) Supporting the competitive capabilities of agricultural products in national and international markets.
- 11) Building the human development capabilities of those working in the agricultural sector.
- 12) Supporting and enhancing information and communication technology use in agricultural Development.

New Tools for Science and Technology Improvement in Egypt

- 1) Remote sensing, GIS/GPS
- 2) Biotechnology/genetic engineering.
- 3) Genetic and Proteomics
- 4) Simulation modelling.
- 5) Information Technology/ Expert System/Advanced artificial intelligence.
- 1) Renewable energy: solar, wind, biofuel, etc.
- 2) New energy-saving techniques for desalination and water transportation.
- 3) Nanotechnology, (Biosensors – Bioprocessing – Nano-materials).

Session on Knowledge Management in Egypt:

This session introduced the knowledge management mechanisms aimed at ensuring S3A implementation in Egypt. It proposed a framework for knowledge sharing and lessons learning for S3A implementation. The knowledge management session started with an overview of FARA DataInformS, whose purpose was to establish a repository of relevant Science and Technology Indicators (STI) metrics based on CAADP to develop an observatory for S3A. Its three phases, are:

- 1) Research & planning, information architecture, Design, prototyping & Documentation,
- 2) Building necessary APIs for existing data systems within FARA and,
- 3) Building the outcome of previous system.

While looking at the assumptions and constrains the system offers, the first Egyptian feedback on its development came in the form of suggestions by the group and these are:

- 1) The systems should be envisioned to serve as the agricultural information for Africa.
- 2) FARA DataInformS should be robust based on a template of relevant topics that can be unified model and applied in all countries.
- 3) Search hits must be filtered to generate precise and accurate information.
- 4) Additional languages (beyond English and French) should be used in accordance with UN criteria as well as funding and sustainability.
- 5) The system should have an in-built quality assurance mechanism and caveat for ethical practice.
- 6) Examples may be drawn from internationally recognized data base systems such as Gene Bank (NCBI), Climate etc.

Knowledge Mapping in Egypt

Mapping the data and knowledge sources in Egypt, in response to the questions raised by FARA, the group identified the following as the principal sources of information on agriculture in Egypt:

- 1) VERCON: A FAO model of information source.
- 2) REDCON: Links extension and rural development.
- 3) NARIMS: Information system consisting of 5 components detailing all components of ARC, including projects, programs, researchers, publications and 5 research centers
- 4) HORTISON: Information system on horticultural agricultural system, providing data on researchers, companies, NGOs etc.
- 5) Expert system: Provides information on suitable land, cultivars, management etc.
- 6) CAPMOS: Central Agency for Public Mobilization and Statistics, using outreaches available in all Ministries)
- 7) Every Ministry has an economic and planning unit that generates field data.

Current Status of KMS in ARC

Currently, there is a plan to modernize ARC and management of Information system is one of the key components of the reform. The plan is to upgrade its KMS to meet current challenges. Experts from EU region regularly come to assist in the reform exercise and the project is expected to end by September 2017. Thus, the roll out of S3A is coming at the right time

Methodologies for Generating Data in Egypt

On the methods used to generate data, the session recognized two sources of data: primary and Secondary. The two are connected through design and administration of questionnaires by researchers and publications of research findings. Depending on research theme and technology required, the methods rely on two systems: Agricultural Knowledge & Information System (AKIS) and Participatory Rapid Appraisal for Agricultural Knowledge System

Metrics/Indicators in Egypt

The principal metrics/indicators in the agricultural sector of Egypt are mainly those around agricultural growth productivity indicators, inflation and national benchmarks. In the last three years, efforts are being made to resolve conflict in data using key performance indicators classified into qualitative and quantitative indicators as well as into results and impacts. The management of these data is being tailored to take into consideration the timespan of data collection so as to allow for modelling and projection, cost-effectiveness of data collections, geographic sensitivity (data collected in northern Egypt may be different than that collected from southern Egypt even if they respond to the same result). In addition, the data must be dependent concerning aims and objectives and should have high level of consistency and observation at farm level (sometimes conflicting information may be obtained from farmers when compared to facts on ground).

Stakeholders in KMS in Egypt

The stakeholders that are considered most important by the group are private sector actors, cooperatives, poultry and dairy associations, cooperatives, AOAD-Arab League States, ICARDA, ACSAD, GIZ, FAO regional office, IFAD, IFPRI, Central Agency for Public Mobilization and Statistics

Needed Activity

The group unanimously agreed that the immediate activity needed after the consultation is national workshop on FARA DataInformS.

Session on Policy and Innovation Platform:

Dr. Paul Boadu, (Research Associate-Data Analysis and Econometrics-FARA) started the session with a brief presentation about the Policy Practice Index “PPI”. The purpose of PPI is a tool for Country Self-assessment of STI Policy Formulation and Implementation.

The Strategic Approach of PPI Tool:

The elements consist of Country self-assessment, self-administering and self-correction; Assessment by local experts; Stakeholder Review and Validation; AIS defined to include- Research, Extension, Education and Training. Overall the PPI is aimed at creating an enabling environment science, technology and innovation that supports smallholder farmers, producers and entrepreneurs increase their productivity, profitability and social welfare. He mentioned the expected impacts using PPI as follows:

- Building greater commitment to STI policy implementation and strengthening agricultural policy practice.
- Reducing cost of implementation; increasing confidence by governments to implement using existing resources
- Greater commitment to use of administrative, existing data for policy analysis
- Provides a solid foundation for continental policy frame-working by AU Agencies and FARA.

Dr. Boadu ended his presentation with the way forward to PPI that Breakout sessions with Key policy implementation partners (including all actors in the AIS) to develop PPI and Policy Assessment tool for Egypt.

Discussion was very effective. Dr. Steno summarized the stakeholders' dealers of agriculture are research centres, Universities, Ministry of Agriculture and Land Reclamation, NGOs ending with small farmers. Therefore, He proposed if we could join all these dealers to avoid a kind of duplication between researchers and Universities. In addition, he added, "we will get a good relationship with NGOs to reach small villages". He also added that with the lack of enough sociology and no extension, researchers could not reach farmers and agriculture experts, therefore, come from abroad to give their updated knowledge. There isn't a complete database of researchers.

Dr. Mohamed Eid, on the other hand, noted that there is a deferent policy between agriculture and innovation. Some aspects are related to knowledge dissemination and knowledge management. Therefore, if you deal with farmer you mean extension sector and it will be different when working with industries at the production level.

Dr. Waheed Mogahed mentioned that there are many strategies until 2030, and these take into consideration all the stakeholders from researchers, universities, etc. In addition, he said that we have to think of science for agriculture in different specialties. Dr. Mohamed Waer remarked that data is very important to see the actual image, planning, implementation, and build information. Dr. Mohamed Negm, a researcher in Food Technology Institute of ARC, mentioned that linking bridges between stakeholders is the way to reach farmers and deliver the research outputs, which are based on their needs. There was consensus of opinion on the need to build a trust and cooperation between researchers, farmers and industries.

In his response to questions and comments Dr. Boadu stressed the need to have data policy developed at country level and a system to coordinate data at this level could be shared to avoid duplication; knowledge management system by forming teams; capacity building; and the development of information platforms.

Dr. Paul Boadu continued his presentation on PPI and its implementation through Malabo goals and CAADP process. He introduced the assessment criteria and legal framework as well as criteria for assessing institutional framework for effectiveness of policy and implementation, criteria for assessing financing modalities, criteria for assessing monitoring and evaluation of mutual accountability.

During discussion, Dr. Steno call for attention to be paid to means for raising funds to implement proposals put forward. Dr. Hania El-Itriby mentioned that there is a loan system from EDP as a resource support system.

Finally, Dr. Boadu concluded by looking at the policy dimensions based on four CAADP themes, thereafter he closed his presentation with the Agricultural Innovation System Policy Practice Index Methodology five steps, which consist of assessment by local experts, stakeholders review, sector review, validation and capacity strengthening.

Round Table on Food and Nutrition Security

The National Consultation featured a roundtable discussion that was facilitated by Dr. Magdy Anwar, a Chief Research at ARC, and guided by Dr. Abdulrazak Ibrahim and Dr. Paul Boadu from FARA. Following the presentation of a background paper on FNSSA by Dr. Ibrahim and Dr. Boadu, discussions commenced with Dr. Noaman, a Chief Researcher at ARC, Field Crop Research Institute, giving background information on biofortification, introducing the concept, providing global status and as well as the opposition directed at the intervention. He defined biofortification as a strategy of breeding crops with additional beneficial nutrients.

Regarded as an upcoming strategy for dealing with deficiencies in nutrients, biofortification has potential measurable impacts on human health. He cited the example of golden rice, which is rich in beta-carotene generated through genetic engineering and commercially available elsewhere. Although he provided little information on the current status of biofortification in Egypt, Dr. Noaman pointed out that there is biofortified rice and orange flesh potato in circulation. He recognized the challenge facing biofortified crops in Egypt as that of rejection of the methods through campaigns led by anti-globalization movements. In addition, the unacceptability is due to cultural reasons.

Dr. Mahnoud Medany gave a global view on FNSSA from the Egyptian perspective. He reported being part of a European Commission expert working group that generated a report titled Agri-monde. The group was tasked to come up with workable solution on food security based on the assumption that the world had a population of 6 billion people and 80% available arable land. The task posed therefore is, what if the global population increases to 9 billion, which represents 50% increase in population!! Since the remaining arable land would be 20%, the question then arises, how can that 20% meet the demand created by 50% increase in population? At the end of the 4-year project of Agri-monde, available options were studied and it was clear that the world would be faced with a big dilemma. A clear imperative was that increasing productivity would not be capable of addressing this challenge since the arable land required is absent. The conclusion from that report is that, agricultural production should be improved by enhancing food calories. This means efficient utilization of land and water to produce the right amount of food and nutrient required and not the highest possible crop yield. By this approach, food production required for the expected 9 billion people may even be doubled by simply changing mentality and applying good science. Using calorie maps that look at crops cultivated in specific arable lands, the right amount of food required to feed any population can be projected and achieved, without increasing arable land.

In Egypt, this projection was made by simulation of a population increase from 80 million to 120 million, representing 50% increase in population, using the same land and water available. The simulation was further narrowed to project the calorie requirement using 25% less water. The result is that by looking at the relative advantage of a place and growing the specific crop for which highest available calorie may be generated, the population shall attain FNSSA. If a given population needs carbohydrate, which can be obtained from rice and wheat, and these crops are grown in summer and winter respectively, it may be wiser to select wheat instead of rice since it will give the required calorie using minimum resources. An estimation of how many Kcal can be produced per cubic meter of water and the best choice made using this model is important to know. As such, rice production may be suspended during summer, since three times volume of water is required to produce 1 Kcal, while it is possible to generate the same calorie from wheat using 1/3 of that water. The experience in Egypt

therefore is that, 40% deficiency in food security and nutrition can be improved by up to 120% increased food and nutritional security is attainable by simply adjusting these parameters.

Several questions were addressed throughout the roundtable. Among these were the following:

- **What are the past and current nutritional-sensitive agricultural initiatives in Egypt that can be intensified through S3A in the context of the EU-AU roadmap for attaining FNSSA? The response was that:**
 - a) The current 40% deficiency in food security and nutrition can be improved by up to 120% by adjusting calorie based production system¹.
 - b) There is a program on nutritional pyramid that is taking stock of calories of all foods grown in Egypt.
 - c) School feeding program, considered as a social protection initiative, managed by the Ministry of Education in partnership with other ministries.
 - d) Within the Ministry of Agriculture, there are programs designed to improve nutrition awareness among all farmers and rural women through projects managed by the Ministry
 - e) The Ministry of Agriculture collaborates with the Ministry of Industry to improve rural agriculture to participate in improving nutritional health within the rural region by reduction of food losses.
 - f) Considering the situation of nutrition among children, there is recommendation from a research conducted by IFPRI that oil and wheat is fortified (with vitamins, zinc and iron) and mainstreamed into the school feeding program.
 - g) There is a program on supplementing flour with quinoa for more nutritious bread.
 - h) There is an increased awareness on the consumption of foods rich in red pigments like anthocyanin and other antioxidants.
- **What are the key lessons that can be and need to be shared with other countries?**
 - a) Changing the policy of subsidy reform in what is now known as *Balady Bread* in Egypt, has improved food access and nutrition security among many poor Egyptians. The government has taken measures to ensure that subsidy is channelled to the flour and bread producers by putting in place specific measures that eliminate leakages and food wastage through issuing smart card to families. On each smartcard, there is a specific number of bread available per day. Through this measure, the diversion of subsidized flour for illegal use has been checked.
 - b) Another measure is the change in wheat storage system to minimize loss and over dependence on import. With a national consumption of 18 million tons of wheat, of which 60% is imported, leakages and waste through the supply chain has been checked by shifting from the use of open bunkers to closed bunkers. Thus, 3.9 million tons capacity high standard and centrally controlled storage facility has been established in Egypt.
 - c) There are on-going university projects that target the improvement of milk quality funded by Egyptian Academy of Science to generate milk rich in insulin and antioxidants.
 - d) Diminishing post-harvest losses in horticultural crops in a project coordinated by ICARDA in Upper Egypt. This includes the use of new packaging systems and temperature sensitive harvest system. In the case of onion for example, up to 30% losses are preventable.
 - e) Borrowing from the US and EU regions, Egyptians are beginning to adopt the habit of consuming barley products due to their β -glycan content, which has been reported to reduce cholesterol in the blood. Results from a research project in which flour was complemented with 20% barley show no difference bread produced while maintaining the benefits of the barley. However, acceptability remains an issue especially at the level of ministers.
 - f) Planting strategic crops has been very effective in meeting productivity requirements under water shortage condition.
 - g) In a project titled school farmers, currently running in collaboration with FAO, food losses have been significantly reduced.

- h) In southern Egypt, there is a 4-year-old project on micro garden for food nutrition, where small vegetables and fruits, including historical ones, are grown. Seven demonstration sites are being promoted in the desert.
- **How can existing agricultural sector policies be deployed within the framework of S3A to ensure sustainable nutritional-sensitive agriculture in Egypt?**
 - a) Further advocacy on the role of women in food and nutrition for sustainable agriculture leading to capacity building, learning, creating awareness on good nutritional habits for improved livelihood and health.
 - b) Previously, crop rotation ensured that soil fertility was properly kept and application of science to manage population increase for food production was easy. However, in the absence of effective policies to ensure compliance, this has been discontinued. Currently, the Ministry of Agriculture is making efforts to re-introduce and promote crop rotation.
 - c) Linking plant to its nutritional value should be promoted such that good value for money is achieved.
 - d) Caution needs to be exercised in balancing policies to address nutritional needs and extreme hunger, in which poor farmers often place more priority on the latter.
 - **Which strategic actions may be required to ensure mainstreaming FNSSA for effective delivery of public goods in the context of Egyptian national policy of food security through the S3A and what specific implementation processes / mechanisms should be supported by the FNSSA Road Map?**
 - a) For the last thirty years, extension in agriculture within Egypt has been missing except for a few places in Upper Egypt. Since changing feeding habit is one of the objectives of FNSSA, there is a need to involve extension agents with expertise in sociology to study the target population, interact with them to deliver the public good accruable from the FNSSA initiatives.
 - b) Better role for media.
 - **Which specific resource mobilization strategies are available for the development of nutrition-sensitive agricultural innovation platforms and technologies for sustainable food and nutrition security?**
 - a) Egypt is rich in human resources, having highly qualified and capable hands. With over 10,000 PhD holders, Egyptian experts may even be deployed to other S3A countries.
 - b) Private sector participation.
 - c) There are several national and international funding agencies operating within Egypt such as the Science Technology Development Fund (STDF), Academy of Science, EU, NGOs. However, funding needs trust. Therefore accurate, realistic and sellable proposals must be developed.
 - d) Local mega companies have shown social responsibilities through funding to encourage contribution.
 - e) Animal loans with snowball effect.
 - **Which resources (financial and human) may be available and required to bridge the hunger gap in Egypt through the S3A in the context of the FNSSA Road map?** In addition to the 5 above mentioned, more NGOs and mega companies are supporting basic and applied research. These include companies such as Shura Company, Vodafone and Zicom.
 - **Given previous experiences, could there be any possible biophysical, technological and institutional challenges to biofortification in Egypt?** While there are some research outputs on the use of food additives to enhance food nutrition, there is a near total rejection of biofortification by the panel, even when it was demonstrated that the crops are conventionally bred and the Harvest Plus data on biofortification was shown.

- **Which socioeconomic, cultural and political factors may affect the acceptability or otherwise of biofortification in Egypt?** Dr. Wafa Amer, a university professor in the Faculty of Agriculture, Ain shams University, stated clearly that she is not comfortable with biofortification.

(g) Day 3: Monday, 11 July 2017

Plenary Session 5: Theory of Change and Results Framework for S3A implementation

The third day of the National Consultation started with a recap of what transpired on the second day. It was given by the facilitator who revised quickly what was done during the day and thanked all the participants for their hard work especially in the parallel sessions. She then gave a brief introduction of issues for day 3.

Cassidy Travis, Firetail Consultant, England, started her presentation with an overview of the third day with an introduction to understand the basic principles of monitoring, learning, and evaluation (MLE), including the TOC and its application for S3A. Also, she described where and how S3A can add value in Egypt and where relates to national program and policies currently shaping the Egyptian agricultural sector. As well as the expectations of implementing S3A in Egypt and fears or concerns about the S3A. Then, she gave an example to conduct an MLE workshop, starting from the inputs, activities, outputs, outcomes, and ending with the Impact.

Concerns on S3A: Capacity and commitment to achieve S3A goals; challenge of sustainability; appropriate institutional arrangements for coordination by African counties; Applicability of framework across countries; engagement with countries that are already part of the S3A and those that are not.

Expectations for the S3A

To declare what exists and find out rooms for improvement.
Possibility of opening common market of improved seed.
More adjustments.

Country feedback

Mega trends affecting agriculture in Egypt

1. Insufficient system of crop marketing
2. Migration from rural to urban area
3. Energy shortage
4. Gender and youth imbalance
5. Global economy and trends.
6. Land and water shortage (in the next 20 years unavailable)
7. Poor diet that threatens food system
8. There is need to widen the climate change into stresses
9. Recycling
10. Micro agriculture
11. Implementation of safe agriculture
12. Safer use of microorganisms
13. Water management
14. Climate change (not only global warming but ice age)
15. Empowering cooperative movement in agricultural systems
16. Pollution control in the Nile river
17. Land fragmentation and water scarcity
18. Patterns on consumer behavior
19. The more technology introduced in rural area, the more unemployed is the population
20. Family agriculture
21. Market, price fluctuations, shifts in investments

- 22. Policy engagements and
- 23. Complementarity and cooperation among African nations

1.2. Plenary Session 6: The role of the Science Agenda (group work) Challenges to agriculture in Egypt

Upstream/R&D

- Boosting the contribution of private sector (currently 5% in Egypt)
- Set up a platform of stakeholder as a think tank of R&D (university etc.)
- Seek international expertise in technology transfer (ministry of planning)
- Increase national budget to R&D (0.2% only currently to reach 1% target as set in the constitution)
- Set up R&D policy for compensation and recognition (value inventors)
- Public awareness on R&D
- Research should be market based on demand driven approach
- Research based on multi-disciplinary approach

Roll-out/delivery

- Education (technical)
- Training
- Technical education with support and advice
- Education on market to give insight on local market
- Content marketing
- Training on new technologies
- Women empowerment for effective post-harvest processes
- Lack of impact study

Adoption/usage

- Research recommendation package should be transferred through crop specialists & extension agents
- Strategic crops selection
- Farmer participatory approach should be followed in breeding programs
- Supporting Media and new communication methods for technology transfer
- Lack of extension facility
- Need more qualifications for subject matter specialist
- Increase the number of demonstration field and observatory plots (done only in wheat now)
- Farmer field schools and farmer leader approach (We have a success story on cultivating wheat in rose from 9,900ha to 90,000ha)
- Adoption should be seen as a process with specific adoption pathways based on skills

Value Add of the S3A for Egypt

Improving technology and research adoption and uptake in Egypt

What does success look like?

- Assumption to increase adoption rate from 20 to 60%
- Enhance self-sufficiency of the main crops
- Improving farmers' livelihood
- Narrowing gap between actual and potential yield bridged

Who needs to be involved in making this happen and what do they need to be doing

- ARC scientists
- Extension and farmers' association private sectors, NGOs

What does it look like now?

- Insufficient data base of information

What are the constraints (internal & external)

- Linkages between research and downstream actors not as strong as they should be
- Know-how on proper data collection is not as good

- What role does the S3A play in achieving this success?

- Will offer tangible data for impact

Ensuring that research is demand-driven

What does success look like?

- Assumption of increasing adoption rates from 20% to 60%.

Who needs to be involved in making this happen and what do they need to be doing?

- Main players are private sector, NGOs and ministry for agriculture (extension), university.

What does it look like now?

- Land loss, reduced water, highly saline water, 85% ha depending on underground water

What are the constraints (internal & external)

- Internal: High population and scarce land (2,700 citizen /sq.Km. Increased 2.7 million
- External: Political situations that may destabilize region

What role does the S3A play in achieving this success?

- Produce improved crops with more adaptability to desert
- Impact studies for maxim crop with limited water
- Transfer of technology

Improving M&E tools and infrastructure and increasing their usage

What does success look like?

- Regularly published issues on M and E and distributed among all stakeholders
- Who needs to be involved in making this happen and what do they need to be doing

What does it look like now?

- There is no M & E but a small number of young people have been trained but not assigned to any unit.

What are the constraints (internal & external)

- No financial allocation
- Lack of infrastructure
- Lack of expertise for capacity building
- Low level of awareness within the staff of ARC on M and E
- Weak coordination between ARC and other institutions

What role does the S3A play in achieving this success?

- It will help identify projects to work with
- Guide Egypt to establish national priority
- Help to allocate fund more effectively

(h) Day 4: Wednesday, 12/7/2017

Plenary Session 7:

A presentation was given by Dr. Mohamed Eid, Emeritus Professor at ARC and TMCODirector on “An Overview of Research & Technology in Egypt and Connections between Ministries and Research Centres as well as Private Universities”. He introduced the science technology and innovation management system in Egypt. Dr. Eid highlighted that the Ministry of Higher Education and Scientific Research is managing all research centres whereas the ARC is affiliated to the Ministry of Agriculture. In addition, he pointed out that funding is possible through the Science and Technology Development Fund (STDF). The funding process is according to planned priorities from Science and Technology

Innovation STI. He ended his presentation by introducing the technology management and commercialization office (TMCO), where he clarified the vision, mission and the challenges.

Introduction to Measurement Framework

Travis showed measurement framework table that a project seeks to collect and defines how, when and by whom this data would be collected, managed and stored. She gave a couple of examples of male and female farmers using technologies.

Then, she asked participants to form groups and implement the measurement framework to a specific commodity. The outputs of the groups are as follows:

Group 1: Example Milk (dairy industry)			
Value addition category	What information does Egypt currently collect to assess this? Are there any existing targets?	Who collects this information? What is the source?	What additional information would you like to collect to assess this?
Improvements in Crop quality and crop nutritional value	Increasing milk collection center Objective: to control milk quality, monitoring	ARC Sector of agricultural economy and statistics (MOLAR) Private sector	-Information on genetic improvement of dairy animals -Disease outbreak national regular vaccination program
Optimising use of agricultural and natural resources	<ul style="list-style-type: none"> - Conservation of open grazing area - Maximizing utilization of crops and agro-industry residues into animal feed 	Cooperatives Veterinary services organizations	
Agricultural related policies are evidence based	<ul style="list-style-type: none"> - Increase no. of dairy animals (cow buffalo) 	Cooperatives Veterinary services organizations	

Group 2: Example wheat crop			
Value addition category	What information does Egypt currently collect to assess this? Are there any existing targets?	Who collects this information?	What additional information would you like to collect to assess this?
Increasing the diversity and volume of research funding (including from the private sector)	<ul style="list-style-type: none"> - on going research project - national campaign - Tech transfer activities - Government budget 	ARC, MALR, Academy of Science, Resource, & technology, ADP	<ul style="list-style-type: none"> - Frequency of holding workshops - No. of student fellowships and scientific units and participation - % participation of private sector financing
Improving technology and research adoption and uptake	<ul style="list-style-type: none"> - Cultivated areas - Increasing productivity (ton / acre) - Total production increasing through new technologies - Increasing coverage - No. of Demo + observation plots - No. of field and harvest days 	ARC, FCRI, Wheat Res. Dep Extension Agency	<ul style="list-style-type: none"> - Measurement of % livelihoods of farmers - No and frequency - Amount of stored wheat by farmer from last harvest - Remote sensing to measure areas cultivated

Plenary Session 8: Way Forward and Next Steps

Travis presented an example of Agriculture megatrends and challenges requiring application of science, technology and innovation (Road map). Also, the role of science agenda in Egypt and noticed that there is a need for a platform for all research sites covered by intervention areas.

Consolidation of Draft Theory of Change and Results Framework

Travis put forward the following questions: What is missing from the theory of change? Are there other roles that the science agenda could play in Egypt? What other benefits could science agenda deliver? The groups shared their opinion for additional data that should be added to the proposed data.

Next Steps

Mary Thiong's from FARA summarized the way forward for the outcomes of the National Consultation as follows:

- Preparation of proposal for the implementation of S3A starting with five tier one countries, including Egypt,
- Completion of the reporting template by the rapporteurs and the organizing team.
- Synthesis of all country reports to form a consolidated continental proposal.

And next steps are:

- Participation in the continental synthesis and proposal validation workshop to be held in Accra, Ghana on 26th – 28th July 2017.

- Egypt will be represented by 6 participants and 2 from NAASRO for the continental synthesis and validation workshop
- Egypt will work with FARA to implement the S3A
- During implementation, best practices and lessons shall be gathered to inform the scaling up of strategy to other countries in North Africa.

Final Remarks and Workshop Evaluation

Dr. Hala Adel, workshop facilitator, gave a summary of the activities that took place over the four-day National Consultation. She said that the workshop had 25 presentations in either plenary sessions or working groups, 22 presenters spoke during the four days, either from Egypt or FARA, 11 plenary sessions, 4 parallel sessions and one round table were held and 10 topics were discussed. The total number of participants who attended the National Consultation was 122. She added that the workshop witnessed high participation, extensive and lively discussions based on a strong interactive approach. In addition, she thanked all the participants and the organizers for their efforts and participation, which made the workshop a success.

Dr. Mahmoud Medany, ARC, president, concluded the workshop by thanking all the participants for their contributions. He noted that S3A presents a vital opportunity for funding projects and submitting proposals. He thanked Dr. Yemi Akinbami, Executive Director of FARA, who ensured that the National Consultation was jointly held by NASRO and FARA. The next possible steps, Dr. Medany indicated, would be to initiate one or two projects to launch S3A implementation. One of the lessons learned is the need for new strategies to solve problems based on climate change and food safety issues and given Egypt's challenges, to get successful proposals. He expressed the view that Egypt might put forward two proposals – one on Climate Change and the second on Reduction of Wastes. At the end, Dr. Medany called for a timely and successful follow up workshop, thanked FARA, expressed gratitude to all participants and congratulated ARC team for the resounding success in the organization of the National Consultation.

Workshop evaluation forms were distributed and participants provided feedback on the workshop (see Annex)

V.3: SENEGAL NATIONAL CONSULTATION

ROLL-OUT OF THE SCIENCE AGENDA FOR AGRICULTURE IN AFRICA



Participants at Senegal National Consultation, 17th – 19th July 2017, ISRA, Dakar, Senegal

3.1 OVERVIEW

Senegal National Consultation on the Science Agenda for Agriculture in Africa (S3A) was held at the Research Centre of the Senegal Institute for Agricultural Research (ISRA) in Dakar from 17th to 19th July 2017. Organized by the Senegal Institute for Agricultural Research (ISRA) under the auspices of the Ministry for Agriculture and Rural Equipment (MAER) in collaboration with the West and Central African Council for Agricultural Research and Development (CORAF/WECARD) and the Forum for Agricultural Research in Africa (FARA). It was the third in the series of Tier 1 National Country Consultations. The objectives of the consultation were to: (i) sensitize participants on the progress made on the S3A strategy; (ii) outline a theory of change and a results framework, which highlights S3a priorities, needs and reference data and (iii) launch a controlled process aimed at strengthening Senegal's participation in the implementation of S3A.

Fifty (50) participants took part in the meeting, representing at least thirty (30) institutions (national, sub-regional and regional) working in the field of agriculture, livestock farming, fishery, agricultural advisory services, research, private sector and civil society as well as resource persons. The three-day workshop was marked by plenary sessions and group discussions. The sessions started with an opening ceremony, presided over by the Director of the Ministry for Agriculture and Rural Equipment in Senegal.

3.2. PROCEEDINGS OF SENEGAL NATIONAL CONSULTATION

1 Opening Session

The opening session of Senegal National Consultation featured remarks presented by the Director General of ISRA, the Executive Director of (CORAF/WECARD), the Representative of the Executive Director of FARA and the Representative of the Minister for Agriculture and Rural Equipment (MAER). The Director General of ISRA, Dr. Alioune FALL, welcomed participants by recollecting the context within which the workshop was organized. He also touched on the PRACAS of the MAER and its linkage with the vision Senegal's Head of State outlined in the PSE (Senegal emerging plan). He thanked all participants particularly the S3A Organising Committee. In conclusion, he expressed his wishes for the success of the workshop.

The Executive Director of CORAF/WECARD, Dr. Abdou TENKOUANO, thanked the Government and People of Senegal for accepting to host their head office. He then reiterated the mission of CORAF/WECARD before touching on their strategic and operational plans, which were being revised. He commented on the link between agricultural policies in Africa and S3A. In addition, he highlighted Africa's agricultural potential and the role of STI in agricultural transformation.

The Representative of the Executive Director of FARA, Dr. Jonas MUGABE, welcomed participants. He briefly reminisced on events and on the development process of S3A. He indicated that there is now empirical proof to show that agricultural transformation depends on STI. He expressed his gratitude to IFAD for financing these consultations; and then launched an appeal for other funding partners to support the African continent. In addition, he indicated that the S3A is not a project, rather a framework for the transformation of Africa and a far-reaching programme whose objectives are well aligned with the SDGs 2030. He noted that a step-by-step approach is being used in the implementation of S3A, with five countries on a pilot basis, to ensure continuous learning.

Mr. Modou Mboup, the Representative of MAER, expressed the apologies of the Minister for Agriculture for his inability to preside over the workshop due to a busy schedule. He then thanked FARA for standing by his choice of Senegal for the pilot phase. He stressed on the need to make science for sustainable development, having the potential to improve the living conditions of populations;

which, in his opinion, is implicit in the S3A. Mr MBOUP emphasized the importance of cooperation and creation of synergy while avoiding duplications. He stated that he was happy that Africa had understood the importance of pooling resources in order to achieve sustainable results. He ended his speech by declaring the workshop opened and expressed the hope that the workshop would be a success.

2 Overview of S3A: Strategy and Implementation Status

During this plenary session, five presentations were made by the FARA team, enabling national actors to have an overview of the S3A, its formulation process, plans for implementation in selected countries as well as strategies for attainment. At the end of these presentations, there were discussions on the issues addressed.

2.1.1 Presentations

The first presentation was made by Dr. Enock WARINDA of FARA on an analysis of the Science Agenda for Agriculture in Africa (S3A) highlighting its vision, its origins, its formulation, its ownership and its current implementation status. The vision of S3A is that “by early 2030, Africa will achieve food security, become a global scientific actor and a global breadbasket”. This vision is derived from a comparative analysis of the growth of agricultural productivity in Africa as against the global context (1.9 for Africa and 6.6 for developed countries). The identified gap is worsened by the fact that the agricultural sector is not taken into consideration in public expenditure. To address this situation, the S3A intends to achieve the following in the short term: increase public expenditure on Agriculture; strengthen the capacity of stakeholders, particularly women and the youth; and finally double the level of agricultural productivity in the long term. The choice of Senegal in this pilot phase is justified, according to FARA, by its commitment and level of preparedness to implement the S3A.

The second presentation was made by Jowa Tafadzwa on the creation of an enabling policy environment for science, which outlined the process of policy self-evaluation using the PPI tool, to achieve the Malabo objectives. The analysis was on the policy instruments, policy documents, laws and regulations etc. The guiding principles for the use of this tool are based on: an increase in local expertise with respect to policy evaluation; ownership, constructive and non-evaluative dimension of the tool; the use of a participatory and replicable process; orientation towards action and evidence-based interventions. The methodology for the implementation of this tool comprises evaluation by local experts, validation by stakeholders and re-evaluation by other experts.

The third presentation was given by Dr. Amos GYAU of FARA and it focused on strengthening human and institutional capacities in the use of science for agriculture. The presentation noted that training constitutes a component, among others, for strengthening capacity. According to the UNDP, the latter is an inclusive and sustainable participatory process aimed at making individuals and societies autonomous. However, it is important to note, together with the World Bank, that there has been a failure to achieve the MDGs with respect to this thematic. The capacity strengthening process must start with the involvement and commitment of partners, identification of needs, the definition of strategies to bridge the gap and the efficiency of the monitoring and evaluation system. FARA and its members such as (CORAF/WECARD) can provide technical assistance in the process. There are various capacity strengthening models, according to FARA, among which that of UniBRAIN is a successful incubation model for youth in agriculture, together with public and private actors. To summarize, capacity strengthening as part of an integrated and gender sensitive approach remains an important lever of S3A.

The fourth presentation, also by FARA, came from Dr. Jonas MUGABE. It dwelt on facilitating the creation of S3A implementation platforms at the continental level. The presentation highlighted the Agricultural Innovation System (AIS) which is an effective framework, enabling the S3A to impact the socio-economic life of final users of research results. He shared with participants, the definition of an innovation platform, its classification according to the operational level and results obtained from the practical implementation of this tool. Nevertheless, according to the presenter, there is the need to institutionalize the AIS and put in place a strategic Innovation Platform (PI) for the S3A.

In the fifth presentation by Dr. Benjamin ABUGRI, FARA Knowledge Management Officer, examined the knowledge management requirement for the implementation of the science agenda. It emerged that the latter should not only involve the collection of knowledge but beyond that, it should ensure the connection between all stakeholders to facilitate identification and access to information relevant to S3A. This work will be based, according to FARA, on the national PIs which will be the entry point for the collection of data. Also presented were the structure and four components of the knowledge management system as well as some existing information platforms.

2.1.2 Discussions

At the end of this series of presentations, there were discussions on the following salient points:

- The need to evaluate the various existing innovation platforms in order to draw lessons from their implementation and adaptation to the Senegalese context. It will also be interesting to learn from the experience of consultative frameworks and inter-professional committees such as the one on the Tomato sector with SOCAS which is considered as a successful model. FARA does not propose a model and from experience, there is the understanding that national stakeholders must be given the freedom to define and adapt their own S3A implementation model. The WAAPP innovation platforms can provide lessons.
- The issue of funding mechanism and collaboration strategy among various stakeholders will be mapped and their contributions evaluated. It must be noted that contributions could be in kind for some stakeholders.
- The risks of failure of such a programme will be outlined in collaboration with all stakeholders and will constitute a key element of the logical and theoretical framework for change expected from S3A in Senegal and will certainly be the focus of monitoring and evaluation.
- The question of taking into account the private sector, agricultural advisory, livestock farming and health safety was raised since they are, according to FARA, stakeholders in the project conception process.

2.2 Profile of Senegal and national success factors

In this session, six presentations were made by DAPSA/MAER, FNRASP, AfricaRice, ASPRODEB, INTERFACE and the Head of Research of the Ministry for Higher Education and Research (MESR).

2.2.1 Presentations

The first presentation by the representative of the Director of DAPSA, on the **role of the Ministry for Agriculture and Rural Equipment** in the promotion of the national agricultural sector and achievement of the PDDAA objectives focused on some elements in the agricultural policy landscape. He recalled the Senegal Programme for Agriculture Recovery and Acceleration (PRACAS) which constitutes the agricultural component of the Senegal Emerging Plan. In this presentation, it emerged that Senegal has averaged more than the 10% of its national budget to agriculture stipulated by the CAADP in terms of allocation of resources from the national budget to the agricultural sector. The other elements focused on the livestock farming sector, fisheries, environment and on challenges such as reduction in post-harvest losses, strengthening of governance and availability of certified rice seeds.

The second presentation by Mr. Moussa Fall, Permanent Secretary of the **National Systems for Agro-Forestry-Pastoral Research (SNRASP)**, outlined the role of his institution, which aims to establish inter-institutional cooperation for research and development of agriculture, forestry and livestock in Senegal. According to Mr FALL, various activities have been undertaken to date with respect to, among others, the development of a competence dossier and of scientific and technical potential, the

organisation of exchange programmes and meetings, the creation of a network of journalists to relay results of research and agricultural developments, strengthening of the capacity of researchers and the organization of a conference presided by the authorities (Ministries of Higher Education and Agriculture). The SNRASP still face challenges regarding financial commitment of institutions, de-compartmentalization of researchers and the ongoing legal institutionalization of consultative frameworks.

The third intervention focused on the role of CGIAR in Senegal's agricultural sector based on the example of the African Centre for Rice, AfricaRice created by 11 countries in 1971 before it grew to 26-member countries. The presenter indicated that the mission of AfricaRice aligns perfectly with that of S3A, with the aim to contribute to poverty reduction and to guarantee food security. AfricaRice depends on the mechanisms of CGIAR, action groups and the Hub to work with all stakeholders in the rice value chain. It is in the process of implementing four programmes on: genetic diversity and improvement in varieties (200 improved varieties distributed and 8 million people in 16 countries are considered to be out of the poverty bracket); sustainable improvement in the productivity and management of natural resources; learning system and the rice development sector.

The role of producer organisations in Senegal's agricultural sector was discussed as part of the fourth presentation by Mr Ousmane Ndiaye, which highlighted his intervention in the case of ASPRODEB. A reminder of events enlightened participants on the evolution of the farmer based movement from 1960 – 1976, where the State tried to organize producers, through peaceful coexistence between the Government and agricultural producer organisations (OPA), through to the period of sensitization of these organizations, following the food crisis of 1976. The OPAs achieved 90% agricultural production which was further proof of their important role in the development of the agricultural sector. It is important to note the contribution of OPAs to the Research and Development process without expecting anything from the State. Mr Ndiaye stated that we must therefore build mechanisms for dialogue between OPAs and Research at the local, national, sub regional and regional level based on the principles of understanding, sharing and collaboration to enable science to circulate without restraint.

In the fifth presentation, the President of INTERFACE outlined the role the private sector plays and the opportunities it offers to agriculture in Senegal. INTERFACE, which is a development concept envisaged by African entrepreneurs for the SME-SMIs, is a think-tank for exchange and actions which covers 14 countries in West and Central Africa (WCA) and is considered a response to development problems of a new generation of entrepreneurs faced by a liberal and global context. Madam Almeida indicated that the current state of the national agricultural sector is encouraging, with the obvious existence of political will. There is therefore the need to take advantage of the opportunity to make progress and change the paradigm. The latter relates to, among others, the possibility of technology transfer to move from laboratory to business with respect to renewable energy, organic inputs, the carbon credit market, hydroponics, recycling of waste water, mechanization and robotics. The role of the private sector should therefore be business creation and investment. An appeal was made to concerned actors to create an enabling environment for the development of SME-SMIs and the establishment of financing for Agro-business enterprises.

The sixth and last presentation focusing on the role of the university system in the promotion of the agricultural sector was given by the Head of Research. The presentation brought to the fore presidential decisions on education and training with the aim of making higher education a lever of economic, social and cultural development. A presidential decision was taken to strengthen university education, promote access, diversify training courses offered and ensure the quality of higher education. An example is the city of knowledge, under construction, which aims at bridging the gap among higher education, research and society in order to promote innovation and business creation. In addition, LEAP AGRI, Oil Palm and the Senegal–South Africa Cooperation projects were presented and the Director of Research noted the change in our science culture and the evolution from research to business and trade.

2.2.2 Discussions

At the end of this second series of presentations, the key discussion points focused on:

- The importance of self-financing or of the contribution of actors in agricultural research and development such as what was initiated by ASPRODEB in order not to rely too much on the State.
- The definition of the private sector which is apparently misunderstood in the agricultural sector. Thus the wording adopted in the policies of regional communities and OHADA were recalled. Also, the private sector was defined as all the actors which invest their own resources in activities from which they seek benefits. Thus, cooperatives make up part of the private sector even if they are rightly or wrongly placed in the category of civil society actors.
- The involvement of private sector in higher education which will take effect in professional training institutions (particularly ISEP) according to the Director of Research.

2.3 Achieving Senegal's S3A vision

Following a brief introduction by the moderator and Dr. MUGABE on some principles (group balance among others) and objectives of the work to be undertaken in parallel sessions, four break-out groups were formed based on the following topics:

- **Group 1:** Creation of a favourable political environment for science (using the PPI)
- **Group 2:** Strengthening of human and institutional capacities on the use of science for agriculture
- **Group 3:** S3A implementation platforms at the national level and efficiency of modalities for collaboration at all levels (national, regional and international)
- **Group 4:** New plan for S3A knowledge management

The reports from each of these four topics were presented and discussed during plenary sessions.

2.3.1 Reports from working groups

Group 1, which worked on the **creation of a favourable political environment for science**, listed various policy documents at the Ministries of Agriculture (PSE, PRACAS, PNIA, LOASP etc.), of Livestock Farming (PNDE) and of Higher Education (Programme for the development of Higher Education). Group 1 also reviewed evaluation criteria with respect to modalities for financing and monitoring and evaluation of the implementation of S3A at the national level. In addition, it made proposals on strengthening the contents of the four thematic areas of the S3A programme.

In conclusion, group 1 made two (02) recommendations:

- Constitute groups which will work on policy evaluations between now and the first week of the month of August 2017 with ISRA in charge of implementation;
- Strengthen the capacities of groups which will be constituted with FARA in charge of implementation

Group 2, which worked on **strengthening of human and institutional capacities on the use of science for agriculture**, identified the need for institutional capacity strengthening (irrigation, transport, infrastructure among others) and human capacity strengthening (plant pathology, rural engineering, weed science etc.). This group also tried to outline the reasons for the gap in capacity strengthening and thus made recommendations to bridge this gap: adapt education and training policies to the needs of Agriculture; facilitate access to the factors of production; promote agricultural entrepreneurship etc. Furthermore, this group also addressed the issue of financing of the agenda and highlighted some weaknesses that must be rectified:

- Inadequate communication and dissemination of research results
- Lack of coordination
- Difficulties in the implementation of decisions
- Weak link between research and extension
- Political instability

After the plenary presentation of the report by group 2, some additions and modifications were made on the issue of financing. Thus, it was proposed that international institutions should be taken into consideration and institutions such as CNAAS and Credit Agricole should be removed from the list of institutions which must ensure financing at the national level. In addition to this, it was suggested that the group takes out «water storage» from the key areas where there is the need for capacity strengthening.

Group 3, which worked on **S3A implementation platforms at the national level and efficiency of modalities for collaboration at all levels (national, regional and international)**, defined the notion of PI, in the specific framework of S3A as being an examination of science for agricultural use. To do this, a historical analysis of frameworks and other initiatives were used to identify the CLPA on fisheries, the trade association of the Tomato sector and Research Development units in agro-ecological zones; the weakness of these initiatives being market failure and monopoly of manufacturers. According to this group, prerequisite conditions for the success of a PI must have a connection with: the existence of a secure market place, abundance and diversity of actors, a strong partnership with the State, a participative approach, demand-based pilotage, existence of organized structures and a self-financing strategy.

Recommendations were made to avoid multiple frameworks, to capitalise on existing initiatives, promote success and, depending on existing frameworks, take charge of the vision outlined through innovation platforms and develop a clear strategy and action plan involving all the stakeholders.

After the presentation of the FARAdatInformS platform developed by FARA, Group 4, which worked on **new plan for S3A knowledge management**, identified information portals of ISRA, ITA, e-rails etc. It emerged from their work that regular update, ease of use, easy access and relevance of online data remain the key reasons for high interest in an information platform. To facilitate the exchange of information in the S3A framework, it was decided, among others, to establish a network, sensitize and train managers at the system's focal points and propose an AWPB. It will also be necessary to have the most detailed data possible. With respect to the sustainability of such a knowledge management system, there must be institutional attachment as well as human and financial resources.

2.3.2 Discussions

At the end of the presentation of reports of working groups on the achievement of Senegal's S3A vision, the key points of discussion focused on:

- Consideration of post-harvest activities and of the change in production which is supposed to be as a result of capacity strengthening of stakeholders
- Proven existence of a link between research and extension, particularly with the role being played by the SNRASP;
- Capitalization of stock-taking works of PI and consultative frameworks of Senegal, already attained by PAPA and the consideration of university consultative frameworks;
- Consideration of information platforms already in existence such as ECOAGRIS and the CLM Database
- Recourse to social science such as rural sociology to facilitate the scale up of technologies and innovations and the need to reflect on the certification of agricultural knowledge.

- The importance of knowledge management which, besides being a profession on its own requiring competent human resources, is different from monitoring and evaluation. Thus, it is important to disseminate knowledge to producers.
- The consideration of aquaculture in strengthening capacities since it is currently an alternative for youth employment and revenue growth.
- The need to harmonise and centralise data in the fisheries sector as well as other sectors.

2.4 Change theory and results framework for the implementation of S3A in Senegal

In this part of the workshop, there was only one presentation on the theory of change, which was followed by group work. Discussions were held on the outcome of the group work.

2.4.1 Presentation on theory of change

Mr Enock WARINDA of FARA gave a presentation on the concepts and strategy for outlining a theory of change. It was aimed at enabling all national stakeholders present at this workshop to have the necessary and adequate information to adapt to Senegal's context. Within this momentum, the basic principles of theory of change and its application in the S3A were, to a large extent, discussed.

Theory of Change, initiated in 1970 and implemented in 1990 has the objective of regulating problems encountered by stakeholders on the monitoring and evaluation system with respect to the impact of social projects, the weak relationship between assumptions/risks, the lack of clarity of the change process on long term results. Thus, it is considered as a process for analysis and learning to support the conception, the implementation and the evaluation of development projects and programmes. In addition, it facilitates the mapping of the trajectory of change and the constitution of a measurement framework focused on understanding what must be attained, what is measured and the method of measurement.

Subsequently, the difference between the logical model and change theory was analysed. If the former gives a graphic summary on the results, resources and activities; the latter, beyond this aspect, is interested in the manner in which these elements are linked to produce change. In addition, the logical model is more widely used in the summaries of programmes while the change theory remains more interesting and complex for a rigorous evaluation and planning.

A comparison portraying alignment between the results framework of CAADP and that of S3A has also been done. This enabled all stakeholders to see the level of coherence of regional programmes.

2.4.2 Group work on theory of change

First of all, Dr. Warinda advised the groups to take inspiration from the model provided during the presentation on change theory in order to do the same alignment of S3A with the national programmes in their work. Thus, based on the four (4) topics, five (5) groups were constituted. The work was carried out in two steps based on two series of questions captured in the table.

The outcome of the work of each group were reported during the plenaries and the tables in annex give the essential elements for developing a theory of change for Senegal.

3.3. CONCLUSIONS, RECOMMENDATIONS AND WAY FORWARD

After deliberations during the S3A workshop, the following recommendations were made:

- Reflect on self-financing mechanisms or contributions from stakeholders for agricultural R&D and not rely on contributions from the State.

- Establish working groups tasked with evaluating policies from now till the first week of August 2017 with ISRA as lead implementing institution.
- Strengthen the capacities of the groups that will be formed with FARA as lead.
- Within the framework of S3A capacity building, stress on post-harvest activities and the transformation required to boost production.
- Reflect on how to obtain certification or a formal recognition of the know-how of the farmer.
- Continue to take stock of existing consultative frameworks or platforms. It is recommended, among other things, to contact universities and PAPA who have already capitalized on outcomes in that area.
- Put in place a network, create awareness and train managers or focal points of the system to facilitate exchange of information with regards to S3A.
- Ensure to have data as disaggregated as possible to feed into various information platforms.
- Ensure institutional integration and secure the adequate human and financial resources needed to sustain the knowledge management system.
- It was further recommended to avoid multiple frameworks, capitalize on existing initiatives, value the success, make use of existing frameworks and own the vision as described through innovation platforms as well as develop a clear strategy and an action plan involving all stakeholders.

3 Closing Ceremony

During the closing ceremony of the workshop remarks were made by the following people: Dr Kodjo Kondo of CORAF/WECARD, Dr Jonas Mugabe of FARA and Dr Alioune Fall, Director General of ISRA. The representative from CORAF/WECARD expressed his appreciation for the organisation of this important National Consultation and thanked participants for their relevant contributions which would definitely guide the continuation of the process. The representative of FARA's Executive Director noted the dynamism of the participants, which enabled the realisation of all the objectives of the workshop within 3 days instead of the 5 days it should have been. He expressed thanks to ISRA for organising and hosting the meeting and CORAF/WECARD for its collaboration. Furthermore, Dr. Jonas Mugabe reminded participants that the theory of change remained a process, which requires the commitment of all stakeholders and that activities should therefore not cease after the close of the present workshop.

The Director General of ISRA, in his closing speech on behalf of the Ministry of Agriculture and Rural Equipment, expressed satisfaction regarding the proceedings and outcome at the end of the workshop. He admitted being proud of the choice of Senegal for the first phase of the S3A, which he stated was the result of collaboration between various components of rural development. The great results obtained by Senegal within the framework of WAAPP represent a clear example of the determination of local stakeholders. He thanked CORAF/WECARD for coordinating the programme regionally. As the DG of ISRA, he pledged to disseminate the information to national stakeholders who will be captured based on the relevant thematic areas. In conclusion, he thanked the participants, FARA, CORAF/WECARD as well as the organising committee for the success of the meeting before declaring the national consultative meeting on S3A, closed.

Table V.3.1: Consolidated Outputs of Group Work

Subjects	Activities/Specific Objectives	What is the current situation in Senegal?	What are the underlying causes of the current constraints?	What needs to change through the S3A?	How will these changes be effected through the S3A?	Which internal and external constraints are likely to affect them?
Sustainable productivity in the main agricultural systems	Transformation of the system of production	Two systems: Family farming system (dominant but not effective) Agro-business system (in the start-up phase)	Family System: Low investments Poor application of technical itineraries Low proportion of farmed lands (Land) Climatic constraints Environmental degradation (land degradation, degradation of forest cover, etc. Poor access to and availability of quality inputs (certified seeds, fertilizer...) Granting of unsuitable credit facilities Agro-business Poor involvement of national private entities Difficult access to land Lack of an assistance policy (development investments)	Family System Know-how Mode of transmission of knowledge (training, extension, consultancy support) Change approach to the supply of inputs Change farming and land management practices Agro-business Mode of establishment (Terms and conditions)	Capacity strengthening Facilitate access to information Facilitate access to quality inputs Make a case for the application of the ADHOC Lands Commission	Family System Policy Climatic change (risks and vagaries)
	Crop improvement and protection	Existence of national protection structures (but which only cater for the major pests) Lack of practical means and measures	Lack of knowledge on standards dealing with phytosanitary protection Lack of resources on the part of national structures (DPV) Lack of resources on the part of farmers Lack of product control	Implementation of the protection policy Framework for cooperation between neighbouring countries (modalities for contribution) Exchange of information and modes of control	Meetings Advocacy Strengthening of resources	Mechanism is cumbersome and difficult to be put in place Inadequacy of human resources

		Lack of a framework for consultants with border countries Lack of knowledge on standards	Poor capacity strengthening	Framework for cooperation between neighbouring countries (modalities for contribution) Exchange of information and modes of control		
	Improve livestock production and productivity	Inadequacy of the production of meat and milk Difficulty in the preservation of dairy products Problem of livestock feed Lack of space for grazing Cattle rustling Weakness in value-addition for livestock products Lack of training of stakeholders	Lack of livestock feed Isolation of milk producing areas and inadequacy of logistics Bush fires Inadequate grazing Lack of resources and organization for the procurement of concentrated feed Lack of a land policy Lack of security and illegal slaughtering Inadequate funding Inadequacy of the dairy product value addition policy Inadequacy of training opportunities for stakeholders	Mode of involvement of and information for stakeholders on Livestock management Livestock-related infrastructure Mode of securing livestock	Strengthening of the capacity of stakeholders Strengthening of the short-term participation of livestock stakeholders in the taking of major decisions Increasing investments allocated to the sector to improve equipment and infrastructure Rigorously applying the prevailing regulations Improving collaboration between the security forces and leaders of the FOs	Internal organizational problems Divergence in the approach to certain programmes
	Aquatic and fishing systems	Fishing Overfishing of demersal stocks Signed fishing agreements (tuna, hake) Difficulty in controlling ships for industrial fishing Sustainable fish resource management dynamics (biological recovery, marine protected areas, ...) Demersal species, supply of the international	Overcapacity of small-scale fishing (unrestricted access) Signing of agreements meets socio-economic and political needs Attractiveness of international markets to the detriment of the local market Rudimentary nature of equipment (canoes, ...) Difficulty in access to aquaculture inputs (fry, feed, prophylaxis, technological itineraries)	Proper supply of the internal market through better management and adequate control Improvement in fishing equipment and techniques (standard canoes and nets) Empowerment of stakeholders (training, supervision, extension) Assumption of responsibility of the State for basic infrastructure and Facilitation of access to credit	Knowledge of market needs Access to products by consumers Implementation of appropriate management measures Access to modern and suitable equipment Training of stakeholders and Organization of the sub-sector Facilitating access to credit through the introduction of dedicated windows	Institutional and international market instability Sub-regional geopolitics Lack of control over sources of funding Climatic Change (CC)

		market to the detriment of the local market On-going aquaculture dynamics (ANA, aquaculture farms) as alternatives to fishing Acquisition of research	High cost of basic infrastructure and difficulty in access to funding	Introduction of suitable training curricula	Fulfilling the commitment of the State Facilitating access to basic infrastructure Facilitating access to inputs	
	Agroforestry and forestry	Serious degradation of forest resources Effort towards diversification (reforestation, domestication, declaration as reserved areas , degazetting of old-growth forests) Developments (protected areas) Creation of eco-villages Development of the PFLNL (Contribution to GDP) Acquisition of research	Overutilization, poaching, bush fires, extension of cultivated areas, mining Land pressure Poor involvement of grassroots stakeholders (poor sensitization and empowerment) Poor natural regeneration	Sustainable resource management Intensification of and improvement in agricultural production Promotion of Natural Protected Areas and the RNA Introduction of suitable training curricula	Sensitization, empowerment and organization of stakeholders and sub-sectors Transformation and development of the PFLNL Introduction and reintroduction of suitable species (Multiple uses)	CC Institutional instability Sub-regional geopolitics Lack of control over sources of funding
	Agricultural mechanization	Obsolescence of agricultural equipment Poor handling of maintenance and replacement Hesitant introduction of motorization Poor level of mechanization Acquisition of research	Unsuitable equipment for agro-ecological zones Lack of quality control Lack of qualified HRs Poor access to equipment on the part of farmers Problem of maintenance and repair Inadequacy of funding mechanisms Problem of coordination of the agricultural policy	Introduction of a national mechanization strategy Introduction of a monitoring and evaluation mechanism Empowerment of small holders Facilitation of access to equipment Introduction of suitable training curricula	Establishment of an interest subsidy fund (high interest rate, ...) Introduction of training curricula in agricultural machinery Strengthening of the capacity of small holders Provision of maintenance equipment and modern machinery for small holders Introduction of after-sales services	World prices Institutional instability Sub-regional geopolitics Lack of control over sources of funding

Food systems and value chains	Food and nutritional security	Not yet effective (export < import; poor purchasing power; regional disparities; etc...)	Poor level of use of technological innovations (water and land management, seeds, rudimentary mechanization, capacity strengthening gap ...)	Large-scale promotion of appropriate and sustainable technologies and innovations; Strengthening of the existing Value Chains (VCs); Strengthening of the capacity of the VCs;	Inclusion of proposals in the PNIASAN currently being formulated; Strengthening of the inter-ministerial mechanisms for the coordination of the SAN programmes	Commitment of the authorities; Availability of Resources; Security Crises; Pests, etc.
	Agro-food processing	Strong dynamism of processing, but the sub-sector is dominated by small holders (packaging, stability of products, technologies, ...)	Inadequate institutional strengthening (financial and technical engineering) of micro-enterprises, SMEs, SMIs and big businesses; Difficulty in moving from the small-scale level to the industrial level; Access to Markets;	Including the food processing component in our policies; providing assistance for the transition from the small-scale level to the industrial level	Inclusion in the PNIASAN	Commitment of the authorities; Availability of resources; Food Crises; Pests, etc.
	Food security and storage	Post-harvest losses; Health qualities of products (Aflatoxin, use of pesticides on processed fish products), compliance with storage standards	Ineffectiveness of quality health control systems, Lack of sanctions for offenders	Political will; Strengthening of pressure groups (Consumers' Association, Media); Ethics/Private Sector, Training –Information and Communication-Sensitization of Farmers, Processors and Consumers	Inclusion in the PNIASAN	Commitment of the authorities; Availability of resources; Food Crises; Pests, etc.
	Processing, post-harvest processing and storage	Post-harvest handling, Processing and Storage	High post-harvest losses; High rate of pesticide residue in foodstuffs; Inadequacy of the diversification of packaging possibilities (quality-cost ratio)	Gap in the application of technological innovations; Non-compliance with standards (pesticides, vaccines, hormones); Lack of sanctions for offenders, ...	Promotion of Organic/Ecological Farming, Regulation of the Sector; Control and Application of sanctions	Inclusion in the PNIASAN
Agricultural biodiversity and natural resource management	Preservation of improvement in agricultural biodiversity	1. Existence of structures which manage biodiversity issues (i) State MEDD (Parks Department)	(i) Climate change (ii) Non-ownership of enactments (iii) Anthropogenic activities (Pressure on resources)	Contribute to the removal of constraints	Better governance, advocacy for increased sensitization on the environmental and social culture, strengthening of scientific and technical research	-Internal: Lack of political will -External: Non-fulfilment of commitments by

		MAER (ISRA) MEPA MPEM MIN (ITA) (ii) International Bodies IUCN WWF (iii) Universities (Fac. of Science, IFAN, Fac. of Med. and Pharmacy) (iv) CGIAR AfricaRice 2. Existence of enactments governing the management of biodiversity (LOASP, law on biosecurity, forestry code, environmental code, water code... 3. Existence of sites: Parks Great Green Wall Marine protected areas Constraints 1. Institutional level (i) Institutional changes 2. Regulatory level (i) Non-compliance with laws and regulations 3. Level of the sites (i) Degradation of natural ecosystems				technical and financial partners
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	Land and water resources, irrigation and management of integrated natural resources	Water resources and irrigation: Availability (Ocean, rivers, lakes, retention basins, aquifers...) Land resources: Availability Management of integrated NRs: OMVS, OMVG, MH, local authorities Constraints Difficulty in accessing water Salinity of the water and land Land degradation Land pressure	(i) Depth of the aquifer (ii) Cost of the use of water (iii) Intrusion of salt-laden water (iv) Water contamination (iv) Population explosion (v) Land speculation	Contribute to the removal of constraints	Assess the research outcomes which will ensure a better understanding of the salt-laden water intrusion process and the contamination of water Formulate and introduce a programme for the dissemination of the research outcomes which will ensure a better understanding of the salt-laden water intrusion process and the contamination of water	Internal: Lack of political will External: Non-fulfilment of commitments by technical and financial partners
Trends and challenges faced by agriculture in Africa	Climate change, adaptation and mitigation	Senegal has developed institutional (COMNACC, GTP), policy (resilience strategy, PANA, CNIS/GDT), financial (green fund) and technical (infoclim, GDT technologies, resilient varieties) instruments,	Limited resources (financial, human and infrastructural); Institutional framework yet to be formalized; Poor coverage of the country by the GTP committees	More resources for implementation; Formalize and make the institutional framework operational;	Allocate substantial resources for the implementation of strategies;	Internal: Institutional stability External: Instability in the border countries; Availability of financial resources Occurrence of natural disasters;
	Policy and institutional research, including access to the market and trade	PSE/PRACAS, PNDE, PNIASAN, sectorial policy letters (industry, fishing, livestock, environment, etc.)	Poor inter-sectorial coordination	Improve inter-sectorial coordination	Ensure the functionality and effectiveness of existing frameworks	External: Tariff and customs barriers Application of legislations and regulations

		Regional and international trade agreements				
	Responses in changes in the means of subsistence of rural communities	Farming practices and innovations (micro-credit, lairage, conservation agriculture, etc.)	Vulnerability to climate change Reluctance to accept innovations	Improve availability of and accessibility to CC-resilient technologies Promote the exchange of innovations/technologies	Organize fora, exchange visits, fair, web platform, etc. Strengthen collaboration between research and consultancy	Internal: SNCASP is not functional
	Gender	Law on parity National Strategy for gender equity and equality Social orientation law	Social bottlenecks	<i>Inclusion of gender in policies and programmes</i>	<i>Gender-sensitive planning and budgeting</i>	<i>Internal: Taboos and socio-cultural aspects</i>

Table V.3.2: Consolidation of Group Works

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	What are the expected impacts?
Sustainable productivity within the main agricultural systems	Transformation of the system of production	Research, FOs, extension, private sector and the State	FOs and the private sector	The new technology generation, Dissemination of technological innovation; Provision of quality inputs and adequate equipment; Strengthening of the capacity of stakeholders	Provision of financial and human resources for research; Existence of a good strategy for the dissemination of research outcomes; Existence of adequate seasonal credit; Fresh boost and sustainability of the training and refresher programmes	Number of technologies and innovations; Quality inputs are available	Number of farmers who have adopted these innovations; % of quality inputs placed at the disposal of farmers (certified seeds, agricultural equipment, etc.)	Contribution to the increase in production and productivity	Number of farmers who have adopted these innovations; % of quality inputs placed at the disposal of farmers (certified seeds, agricultural equipment, etc.)

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	What are the long-term outcomes?
					centres for agricultural trades				
	Improvement in and protection of crops	Research, FOs and private sector	Private entities, the DPV	Research, phytosanitary processing, capacity strengthening, control and monitoring of diseases and attacks	Availability of material, human and financial resources	Reduction in attacks and diseases	% of surface area not affected by diseases	Eradication of diseases caused by insect pests	Ab are
	Improvement in livestock production and productivity	The State, FOs, private sector, research/extension	FOs, private sector, research	Strengthening of the capacity of stakeholders; provision of adequate resources to the main stakeholders; improvement in infrastructure and strengthening of logistics	Political will of the State, existence of sound cooperation between stakeholders	Improvement in the livestock system, Better visibility and understanding of stakeholders	Number of meetings, exchanges and shared experiences among all the stakeholders of the system	Improvement in the income of farmers and reduction in imports	%

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	W inc
	Aquatic systems and fishing	Fishermen Fish and sea food wholesalers Processors Industrialists Administration and training and research structures NGOs, CLPA, PTF	Fishermen Fish and sea food wholesalers Processors Industrialists Administration and training and research structures NGOs, CLPA, PTF	Supply the domestic market (better management and adequate control) Improve equipment and fishing techniques (standard canoes, nets) Establish basic infrastructure (The State) Facilitate access to credit Strengthen the capacity of stakeholders (training, supervision, extension,)	Distribution, preservation and political will Membership of stakeholders and financial institutions	Fishing and aquaculture products are available and accessible on the domestic market Fishing is rationalized The safety of fishermen is assured (Reduction in accidents) Stakeholders are better organized and	Rate of supply Catch and consumption rate Consumption <i>per capita</i> Fishery resource rent Number of functional grassroots organizations Number of promotions	Stocks are regenerated Food security in fishery and aquaculture products is assured Contribution to GDP has increased Quality HR is available	Ab Co GL

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	W in
				Introduce suitable training curricula (multi-disciplinary research)		their capacity has been strengthened Suitable curricula have been formulated and implemented			
	Agroforestry and forestry	Forest loggers Processors Industrialists Administration, training and research structures, NGOs, FOs, PTF	Forest loggers Processors Industrialists Administration, training and research structures,	Promote the TAF and TGDT Introduce suitable training curricula	Ownership of technologies	The yields of forestry and agroforestry systems have improved The TAF and TGDT are being applied.	Yield variation Number of TAF and TGDT technologies implemented	Equilibrium of the restored ecosystem	Ec

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	What are the long-term outcomes?
			NGOs, FOs, PTF			Suitable curricula have been formulated and implemented.	Number of trained stakeholders		
	Agricultural mechanization	Farmers Dealers Craftsmen Industrialists Administration, Training and research structures ONG, OP, PTF	Farmers Dealers Craftsmen Industrialists Administration, Training and research structures NGOS, foS, PTF	Establish a national mechanization strategy Introduce a monitoring and evaluation mechanism Strengthen the capacity of craftsmen Facilitate access to equipment Formulate suitable training	Political will and mechanism for the funding of agricultural equipment	A national mechanization strategy has been formulated Checking of imported equipment has been effected Local craftsmen are better prepared to handle agricultural equipment Farmers have access to agricultural equipment	Policy document Number of trained craftsmen Number of promotions Number of functional committees	Supply system has been mastered	Policy document Number of trained craftsmen Number of promotions Number of functional committees

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	W
						Suitable curricula have been formulated and implemented			
Food systems and value chains	Food and nutritional security	See list of stakeholders on the concept paper of this workshop	Farmers, FOs, Private Sector (inputs, processing, trade, transporters, ...), consultancy support services, Teaching and Research Institute	Large-scale promotion of appropriate and sustainable technologies and innovations; Strengthening of existing value chains (VCs); Strengthening of the capacity of VCs	Commitment of the authorities, Availability of resources, Security crises, Pests, etc.	Technologies and innovations suited to the various systems of farming are known and recorded; 80% of farmers know technology; 60 % apply T&Is;	Number of available technologies (disaggregated by farming and agro-ecological system); Percentage of farmers who know technology; Percentage of farmers who apply T&Is;	Yields of the main speculations will double by 2030; Incomes have increased by 50%	Ch yie spe of

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	W
	Agrifood processing	Senegalese Bakers' Federation, Flour-milling Industries of Senegal, ITA, Associations, EIGs and Agro-food Enterprises (Fish, Milk, Juice, Jams, ...); ESP; ...	SMMEs; SMII, EIG, Farmers, FOs ; Consumers; Consumers' Association (ASCOSSEN, ADEC, ...), Supermarkets; ...	Assessment of the agricultural processing industry in Senegal; Structuring of the sector; Strengthening of the institutional and technical capacity of governance organs; Strengthening of priority VCs of the PRACAS, and other competitive VCs (Fish farming, processed fish products); Improvement in the quality of products (health, nutritional, ...) ; Strengthening of	Market disfunctioning; Commitment of the authorities; Availability of resources, Security crises; Pests, etc.	An inventory has been carried out with a reference situation; statutory documents have been drafted and governance organs have been put in place and provided with premises; procedural manuals and code of ethics have been formulated and amended; institutional managers have been given training on their roles and responsibilities.	No. of SMMEs, SMIs, EIGs actively involved in the value chains; Number of statutory meetings; No. of extraordinary meetings; No. of short training sessions organized (disaggregated by subject; No. of seminars and symposiums (disaggregated by subject) No. of persons trained (disaggregated by	Quantities of processed products have increased by at least 50% in the targeted VCs; 100% reduction in the prevalence of diseases linked to the quality of products; At least 80% of enterprises fulfil their commitments to provide products throughout the year; At least	% pro Ch sat de pro the lin of wh co pro VC ISO

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	W
				the capacity of enterprises to meet the needs of the market (availability in terms of both quality and quantity throughout the year without any break in stocks)			gender) No. of enterprises trained (disaggregated by type); Number of certified ISO enterprises	80% of enterprises have ISO certification; Creation of an S3A quality label	
	Food security and storage	CERES LOCUSTOX ; Institut Pasteur; LANAC, etc.	SMMEs; SMIs, EIGs, Farmers, FOs; Consumers; Consumers' Association (ASCOTEN, ADEC, ...), Supermarkets; ...	Strengthening of quality control services; Institutionalization of licences in food production and processing; Determination of the legal levels of fines; Information Communication and	Commitment of the authorities and political will; Availability of resources; Resistance to change, etc.	At least 60% of market garden, poultry, fish and meat livestock farmers are authorized (they have a licence); Effective financial autonomy of the control and certification	% of authorized farmers; % of operational budgets covered by generated receipts; No. of training programmes (disaggregated by subject); No. of trained persons	Reduction in public health expenditure by 30% in the urban areas; Increase in life expectancy by at least 15%	Ch pu ho Ch ex

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	W inc
				Sensitization of farmers, agricultural processors and consumers on health quality standards (pesticide residue, vaccines, hormones; nutritional additives, etc...); Periodic refresher programmes for farmers, authorized processors and certification agents on the trends of standards		departments; Information aids (Posters, Leaflets, TV Adverts and Radio) are produced and diverse dissemination channels are used; 100% of authorized processors are trained and given periodic refresher programmes on quality standards	(disaggregated by gender and type of organization; No. of consumers who know the standards.		

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	W
	Post-harvest handling, post-harvest processing and storage	State Farmers Industrialists Craftsmen Traders	Same	Design of suitable equipment Building of post-harvest machine	Commitment of the authorities Participation of the private sector (industrial) Creativity of craftsmen	Fall in post-harvest losses Improvement in products	Increase in the yield of harvests and processed products	Increase in the value of Senegalese products	Ex
Agricultural biodiversity and Natural Resource Management	Preservation of and improvement in agricultural biodiversity	(i) State MEDD (Parks Department) MAER (ISRA) MEPA MPEM MIN (ITA) (ii) Inter Org IUCN WWF (iii) Universities (Fac. of Science,	-The State -Farmers organizations -NGOs -Local authorities	-Create synergies for activities carried to improve and preserve biodiversity.	- Non-fulfilment of commitments of stakeholders.	-Stakeholders are committed. -research outcomes ensuring a better preservation and improvement of agricultural biodiversity are known.	-Number of commitment and agreement letters signed -Number, Database available.	-Biodiversity has improved. - Lands have been restored.	-N spe -N -R the

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	W
		IFAN, Fac. of Med. and Pharmacy (iv) CGIAR AfricaRice (V) Farmers' Organizations and civil society							
	Land and water resources, irrigation and management of integrated natural resources	- Regional Structures OMVS ; OMVG ; - Ministries: MEPA, MAER, MEED, MESR, etc. - NGOs - Farmers' organizations	-The State -Farmers' organizations -NGOs -Local authorities.	Creating synergies for activities carried out to improve integrated natural resource management.	Non-fulfilment of commitments by stakeholders.	-Modes of management of natural resources are better articulated.	Number of modes of management of natural resources is articulated.	Integrated natural resources are better managed.	-N res -N res

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	W
Trends and challenges for agriculture in Africa	Climate change, adaptation and mitigation	Ministries (MEDD, MAER, MEPA, MPEM) COMNACC ANACIM, CSE FOs NGOs	FOs Research Institutions ISRA, ITA, INP, Univ) Agricultural Council (ANCAR, other stakeholders, SNCASP) EFAR	Strengthen capacity Embark on advocacy Sensitize and inform stakeholders Strengthen existing consultation frameworks	Availability and accessibility of financial resources Institutional stability	Consultation frameworks on on CC are functional Available T&Is are being used	Number of structures involved in the frameworks Number of meetings held Number of deliberations implemented Number of T&Is used	Communities are resilient to CC.	Nu Ra T&
	Policy and institutional research, including market access and trade	Research Ministry of Trade Private sector National Assembly	Research Institutes Universities SNRASP ARM, ASEPEX, UNACOIS Employers	Articulate the objectives of the S3A to the PSE sector policy documents	Political will demonstrated by the authorities (PSE)	Market information systems are used by VC stakeholders. The introduction of agro-forestry-pastoral products onto the market has improved. The volumes of traded	Number of functional SIMs Number of stakeholders using SIMs Volume of traded agricultural products	Incomes of stakeholders have improved	Ino

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	W
						agricultural products have increased.			
	Responses to changes in the means of subsistence of rural communities	FOs Local authorities Research Agricultural Council Territorial Administration Technical Departments	FOs City Councils ARD Territorial Administration	Sensitize grassroots stakeholders Train stakeholders on adaptation strategies	Existence of an agricultural consultancy department Availability of financial resources	Adaptation strategies have been mastered and applied.	Number of trained stakeholders Number of applied strategies Number of stakeholders implementing at least one strategy	Communities are resilient.	Nu ad
	Gender	Ministries (Women, Youth, Agriculture, Social Work, etc.)	FOs Vulnerable Groups (Women, Youth)	Sensitize stakeholders on Gender Train stakeholders on Gender Apply the SNEEG	Respect of the application of gender laws and strategies	Gender laws and strategies are being applied.	Number of laws and strategies applied Number of persons	Factoring of Gender into projects and programmes is effective.	Nu yo ma

Subjects	Activities/specific objectives	Who are the key stakeholders?	Which target groups will ensure the attainment of the outcomes?	Which activity do we need for to attain the objectives?	Which key assumptions should be taken into account?	What are the short-term outcomes?	What are the success indicators?	What are the long-term outcomes?	W inc
					Availability of financial resources		sensitized on Gender Number of persons trained on Gender		Nu Wo pro

V.4: MALAWI NATIONAL CONSULTATION

ROLL-OUT OF THE SCIENCE AGENDA IN AGRICULTURE IN AFRICA



Participants at East Africa Regional Consultation, 10th -12th April 2017,
Cross Roads Hotel, Lilongwe, Malawi

4.1 OVERVIEW

The Forum for Agriculture Research in Africa (FARA) in collaboration with the Centre for Coordination of Agricultural Research and Development for Southern Africa (CCARDESA) and the Ministry of Agriculture Irrigation and Water Development (MoAIWD) organized the Malawi National Consultation to roll out the Science Agenda for Agriculture in Africa (S3A) in the country. The Consultation is the fourth in the series for Tier 1 countries in the implementation of S3A. The meeting was held from 18th to 21st July 2017 at Lilongwe Hotel in the Lilongwe. Participants were drawn from a wide spectrum of stakeholders which included Government Departments, Academia, Non-Governmental Organizations, CGIAR and the Private Sector.

The objectives of the Malawi National Consultation were to:

- Apprise participants of the status and strategy of the S3A
- Craft a Theory of Change and Results Framework, emphasizing science priorities, needs, baselines and expected change resulting from mainstreaming of S3A in Malawi.
- Deepen Malawi's engagement with S3A implementation.
- Provide the information base for the Malawian proposal to IFAD for implementation of S3A.

By the end of the workshop the following five expected outputs were successfully achieved as planned:

- Common challenges and opportunities in S3A implementation elaborated
- Roles and responsibilities for Malawi as one of the Tier One countries understood and confirmed
- The value addition of the S3A to Malawi's agriculture understood
- Strategies for mainstreaming S3A in Malawi agricultural development agenda elaborated
- Theory of Change, Results Framework and knowledge management mechanisms elaborated

4.2 PROCEEDINGS OF MALAWI NATIONAL CONSULTATIONS

Opening Session

The Opening Session of the National Consultation featured remarks by the Director of Agricultural Research Services, Representatives of CCARDESA and FARA. In the opening remarks, participants were encouraged to be active in all the sessions. And emphasis was placed on the need for Malawians to own the process for successful implementation of the Science Agenda in the country. The Science Agenda requires collaborative efforts and its success depends on the unique approach, which will make a difference. The Director of Agricultural Research Services assured the meeting that Malawi is committed to rolling out the Science Agenda as a tool for developing agriculture in the country.

In its remarks, CCARDESA reiterated the importance of domesticating S3A in Malawi considering the critical role agriculture plays in the country as well as other countries in the SADC region. It was further indicated that CCARDESA is very keen to work closely with FARA in achieving the objectives of S3A. CCARDESA encouraged Malawi to institutionalize the S3A by integrating the activities of the agenda in national policies.

FARA, in its opening remarks, acknowledged the steps Malawi has taken in the rolling out of the S3A right from the initial stages of its development. Because of its keen interest, Malawi has been selected among the first set of countries to roll out S3A. However, FARA reiterated the need for collective implementation of activities for the S3A in Malawi. As a game changer, S3A requires multi-sectoral involvement in its implementation.

Presentations

S3A Concepts and Processes; Country Action Plans for S3A mainstreaming

Day 1 provided a platform for participants to be exposed to the Science Agenda and other related information which was instrumental in the subsequent days. Key presentations were made by several stakeholders in the following order:

Presentation	Presenter	Institution
Genesis and Rationale of S3A	Dr. Irene Annor Frempong	FARA
The role of DARS in achieving Agricultural Development Targets & Implementation of S3A	Kondwani Makoko	DARS
Malawi Seed Industry	Supply Chisi	Seed Traders Association of Malawi (STAM)
Towards commercializing agriculture	Martin Isyagi	Commercial Agriculture Support Services Trust (CASS)
The Role of Banks in Supporting Science in Agriculture	Timothy Strong	Opportunity Bank, Malawi

Opportunities for Structured Trade Financing: Case for AHCX	Allan Chilima	Auction Holdings Commodity Exchange (AHCX)
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Dr. Irene Annor Frempong introduced and presented the key thematic areas and steps required for the domestication of the agenda. The agenda has the following thematic areas: Sustainable productivity in major farming systems; Food system and value chain; Agricultural biodiversity and natural resources management; and Mega trends and challenges agricultural productivity in Africa. In addition to the four themes, the Science Agenda highlights four crossing cutting areas, which will enable successful delivery of its outputs. The cross cutting issues are Sustainable intensification; Biosciences, information and communication technologies; and Foresight capabilities.

The Agenda proposes key interventions earmarked for its implementation. Malawi should consider aligning its operations within framework of the interventions, as follows:

Strengthening institutional systems of science for agriculture

- Sustaining basic capacity at national level
- Enhancing regional and global collaboration
- Knowledge Management

Sustainable financing of science

Creating a favourable policy environment

- Policy-science interface
- Commitment to youth and women

For the agenda to be effectively rolled out, countries need to institutionalise it through establishment of structures within the existing frameworks. Also, the Science Agenda requires creation of a favourable policy environment that will lead to sustainable financing mechanisms.

Participants reiterated the need to institutionalise the agenda by identifying focal point for its implementation. Members also raised the need to actively involve the private sector in the delivery of the agenda in Malawi.

The presentation by the Department of Agricultural Research Services (DARS) placed emphasis on the priority areas which could be considered in the implementation of the S3A. The priority areas include:

- 14) Strengthening bio-fortification to achieve food and nutritional security.
- 15) Improvement on collaboration and network with stakeholders.
- 16) Enhancement of the levels of adoption of existing technologies
- 17) Improvement of dissemination of existing technologies.
- 18) Development of appropriate technologies to double crop and livestock yields

Seed Traders Association of Malawi provided insights into the opportunities and challenges the seed sector is facing. The Seed sector is key in the development of agriculture in Malawi and provides business opportunities for both farmers and private companies. However, it was indicated that the sector is facing some substantial challenges more especially on quality assurance. The science agenda can capitalize on the opportunities by contributing to improved availability of high quality seeds on the market. Capacity building in the sector is inevitable for effective seed certification.

Presentations from Commercial Agriculture Support Services Trust (CASS), Opportunity Bank, Malawi and Auction Holdings Commodity Exchange (AHCX) brought in a new dimension on the potential role of the private sector in the delivery of S3A. All the presentations placed emphasis on how the private sector can improve agricultural productivity through access to finance and structured markets. Involvement of the private sector will be a game changer in S3A as farmers will have access to finance for their farming as well as readily available markets for their products.

Day 2: Realizing S3A vision at country level and alignment of regional and national priorities

The second day started with a recap of what transpired the previous day. After the recap, introductory presentations were in preparation of break-out groups. The presentations centred on the following thematic areas which formed the basis of group formation:

- Planning and coordination of agricultural research and development
- Capacity development, youth and agribusiness
- Innovation platforms knowledge management
- Knowledge management
- Policy environment for science.

After the presentations three groups were formulated in the morning while two were constituted in the afternoon. Each group discussed key issues in line with the Science Agenda under each thematic area. The presentations were done in plenary the following day.

A policy dialogue was organized to tease out key issues on nutrition. Three panelists were drawn from Lilongwe University of Agriculture and Natural Resources (LUANAR), International Potato Centre and Department of Agricultural Research Services. As a nation, Malawi is implementing several initiatives to curb the problem of malnutrition. For instance, DARS is conducting breeding work on sweet potato, maize and beans to come up with varieties that are rich in particular nutrients. Quality Protein Maize varieties have been developed and are available on the market. Currently, Provitamin A rich (Orange) maize is under evaluation for release in the country. Similarly, DARS has released two bio-fortified bean varieties rich in iron and zinc targeting children and pregnant mothers. However, both maize and bean varieties have not reached the target population due to either limited promotion activities as well as socio-cultural factors. For example, the orange maize is being poorly accepted by farmers because they are used to consuming white flour. Concerted efforts need to be made to change the mind set of farmers on the use of orange maize.

CIP in collaboration with DARS is working on orange fleshed sweet potato as part of combatting malnutrition in the country. Five varieties have so far been released for production in Malawi. However, availability of clean planting of the released varieties has remained a substantial challenge. Efforts to overcome the challenge such as developing projects targeting seed production are underway.

The promotion of the nutritionally rich varieties requires appropriate policies, which particularly target such initiatives. In Malawi, the Nutritional Policy is well structured for the promotion of nutritionally rich varieties. The policy encompasses the promotion of nutritionally rich varieties through dietary diversity. The policy also emphasizes training of households on the use of nutritionally rich varieties as well as promoting food fairs of the same.

LUANAR is developing innovations for preservation of root and tuber crops, including the orange fleshed sweet potato for continuous supply of rich foods on the market throughout the year. In Malawi, the supply of most foods is dependent on the season. More food crops are available during and towards the end of the rainy season and the supply drastically changes towards the end of the season, therefore any innovation, which will contribute to continuous supply of important food items should be seriously considered as part of the S3A.

The success of promoting nutritionally rich varieties strongly hinges on the engagement of several actors including the private sector. Therefore, proper coordination needs to be put in place for effective delivery of nutrition component of the S3A. Private sector considers high yield as a very key component in the effective promotion of varieties because high yield will maximise profit. Public awareness forms part of the initiatives Nutrition Policy is advocating. However, most messages on the nutritionally rich varieties target rural people leaving out urban and peri-urban communities. The S3A should strive to provide such important messages to all affected groups. Also, the S3A should emphasize on food safety with more focus on aflatoxins.

Day 3: Introduction to the Results Framework, Theory of Change and Knowledge Management

Day 3 presentations started with reports from previous day parallel sessions. The aims of the parallel sessions were to define the processes and stages for building ownership, integration into ongoing processes and support of the Science Agenda in Malawi. Specifically, the objectives defined the institutions to be engaged for the country's buy-in, the studies to be undertaken and the processes to which planning and coordination of the Science Agenda will be aligned to achieve targets set by Malawi. The following were the presentations:

Group 1 Planning and Coordination

The group highlighted the opportunities existing in the country to implement the Science Agenda because of the existence of ASWAp as a tool, which links to CAADP, SDGs and hence S3A. Therefore, it was indicated that ASWAp is a good entry point for S3A multidisciplinary team and coordination. It was also noted that within the ASWAp framework there exists a multidisciplinary team. Apart from the government, the various key partners include the farmers union (representing small, medium and large scale farmers), Malawi Confederation of Chambers of Commerce and Industry (representing the private sector), CISANET (representing the civil society- all NGOs and INGOs), Donor Committee on Agriculture and Food Security (representing the donor community). But a gap was noted as some actors were not coming out within the ASWAp framework, especially the Universities and the CGIAR institutes.

In order to drive the research agenda, there is a need to ensure that the research priorities are more foresighting, and forecasting of the demand and supply of seeds as well as farm produce; application of the business model for upscaling technologies; involvement of research, extension and private sector in research and development; Public-private sector partnerships in research; investment in irrigation and water harvesting; increasing funding for AR4D; activities on value addition; and strengthening the planning, monitoring and evaluation process.

Group 2: Innovation Platforms

The group on innovation platforms stated that the actions that are required to secure political will includes: sensitization of the policy stakeholders (e.g. Parliamentary Committee on Agriculture), packaging of the success stories through policy briefs and field visits, set up a lobby group to interact with the policy stakeholders, engagement of local leaders, engagement of the media to disseminate information, holding demonstrations, participation in national shows and events, as well as follow ups. In addition, developing financing scheme for small and medium enterprises (SMEs), would require affordable and managing financing through low cost borrowing, friendly repayment requirements, and insurance.

The notable constraints that would deter achievement of the innovation platforms include: Lack of political in institutionalization of innovation systems, especially where the science agenda misaligns with the national priorities which might require more consultations to review and harmonise the national policies. Furthermore, lack of awareness, resistance within the civil society and lack of clear financial mechanisms may affect achievement of the stated objectives. It was also reported that the existing government structures at area and district level, would influence sustainability of the innovation platforms.

The actions that are required to ensure sustainability of the innovation platforms include development of financing scheme of SME, which would ensure affordable financing through low cost of borrowing/low interest rates, easily accessible loans, friendly repayment terms, and group guarantee/Insurance. Financing management could be done by the private sector with government policy-based interventions as may be necessary. Furthermore, the source of funding could be the government grants, donor grants, and CSR programmes.

Group 3: Knowledge Management

The third group on knowledge management reported that the country access information from different sources, including the Guide to Agriculture Production (GAP), Malawi Investment Trade Centre,

National Statistics Office, Auction Holding Limited, and Agriculture Commodity Exchange (ACE), among others. The Guide to Agricultural Production has information about crops commonly grown in Malawi, their climatic requirements, productivity and husbandry practices. The Malawi Investment Trade Centre has information on high cash value crops and indicative prices and value chain. The National Statistical Offices share almost every statistical information about Malawi. Agricultural Production Estimates Survey (APES) has information about agricultural production estimates for a particular season. The APES information informs food security, farm gate prices of commodities and inflation estimation for the country. The Auction Holdings Limited has information on high cash value crops, which they broker between farmers and buyers. Agricultural Commodity Exchange has information on high cash value crops on prices, suppliers and potential buyers.

The notable challenge is that most of the available data is not digitized. Furthermore, there are challenges in accessing online databases due to server problems (databanks mostly down). As solutions, it was proposed that the Science Agenda could harmonise and link the available data sources, and also fund an ICT centre on knowledge management. Notable key stakeholders to drive the Science Agenda on knowledge management could include the government, private sector, farmer organisations, individual commercial farmers, academic institutions, as well as development partners. With engagement of various key stakeholders, the immediate plans on knowledge management could include stakeholder mapping, which may require RBM and MCCI to assist or hire a consultant. After the stakeholder mapping, a workshop could then be organized on knowledge management. A strong proposal was made to move the Information Centre out of the Ministry of Agriculture due to capacity challenges. The following institutions were suggested to host the information system: Tobacco Control Commission (TCC), Universities or any Quasi Government Institution with reputable track record on information system.

Group 4: Capacity Development, Youth and Agribusiness

The forth group deliberated on capacity development, youth and agribusiness and came up with the following issues:

- Parallel policies, which duplicate effort on agricultural research and development.
- Delays in preparation of strategic documents and policies.
- Poor coordination of policies, institutions and activities.
- Inadequate implementation capacity for real core functions; policies which are rhetoric and lack clear implementation frameworks.
- Poor enforcement of regulatory frameworks and guidelines.
- No clear resource allocation targeting capacity development; weak M & E mechanism.
- Lack of adequate key information amongst key stakeholders; inadequate awareness of stakeholders on sector policies and priorities.
- Inadequate allocation of resources for addressing identified capacity gaps at all levels; inadequate political goodwill for effective capacity development.
- Lack of accountability among service providers.
- Weak performance management mechanism.
- Bureaucratic processes creating systemic inefficiencies.
- Elements of political interferences.
- Limited resources for sensitization.
- Dysfunctional institutions and institutes for capacity development across the divide.
- Inadequate involvement of the private sector and other non-state actors to drive the agenda; Disharmony of curriculum and industry human resource requirement-supply driven training that is out of synchrony with the industry.
- Poor entrepreneurial orientation among the youth; inadequate linkages for commercialization technology and innovations.
- Lack of access to factors of production among the youth and women to meaningfully participate in agribusiness.
- Inadequate policies targeting youth and women to enhance their participation.
- Lack of mentorship and coaching services to support upcoming entrepreneurs.

The group proposed notable strategic actions to ensure positive change in capacity development, youth development and agribusiness which include:

- Utilisation of Joint Sector Reviews and ensuring that all key stakeholders are presenting their issues, finances, targets and report progress.
- Conduct of sensitisation and awareness reviews.
- Harmonization of curriculum with set up vocational training for farmers - adopt models or farmer training that can be flexible enough to accommodate farmers schedules and ability to cost share.
- Ensuring national budget allocations for capacity building are enhanced to adequately address capacity needs for implementation of programmes.
- Ensuring access to information and data to stakeholders as part of capacity development.
- Develop a strategy for private sector involvement in capacity development as well as financing of applied research activities.
- Ensuring institutional transition of policies through succession planning.
- Ensuring regulation, quality assurance and standardization is well provided.
- Ensure adequate consultations and participation of all relevant stakeholders.
- Setting up of vocational training for farmers - adopt models or farmer training that can be flexible enough to accommodate farmers schedules and ability to cost share.
- Ensuring institutional transition of policies and strategies among institutional staff.
- Including service providers in capacity building and training programmes.
- Ensuring Research-Extension-Stakeholder- Farmer Linkage.
- Clarifying the science for innovation and science for academic purposes but ensuring their linkages.
- Providing business models that will facilitate commercialization of research outputs.
- Improving coordination of capacity development and sensitization for projects.
- Clarifying the role of private sector and their involvement in financing projects.
- Ensuring national budget allocations are enhanced to adequately address capacity needs for implementation of programmes.
- Ensuring access to information and data to stakeholders as part of capacity development.
- Developing a strategy for private sector involvement in capacity development as well as financing of applied research activities

Agricultural Innovation Systems Policy Practice Index (AIS-PPI)

A presentation was made on development of Agricultural Innovation Systems Policy Practice Index (AIS-PPI) during which it was proposed that the team members in Malawi should include Department of Agricultural Planning Services, Existing Innovation Platforms (IPs) on policy and advocacy e.g. Root and Tuber Crop Development Trust, Legume Development Trust, CISANET, DARS, CAETS, Farmer organizations e.g. FUM, NASFAM, Ministry of Environment, Ministry of Trade, and Universities. Furthermore, it was suggested that CASS should be included as one of the stakeholders, as well as National Agrodealers Association of Malawi. The entry point for policy team formation would be through the PS –MoAIWD who would in turn link up with the various ministries and agencies for representative on the Policy team, after which the Policy Team members will be communicated to CCARDESA and FARA for the training to begin.

In addition, the group evaluated the four thematic themes and 26 policy dimensions developed based on CAADP framework. Synthesis of the valuation came up with five steps to develop Malawi's AIS-PPI as follows:

- STEP 1: Assessment by Local Team
- STEP 2: Stakeholder Review
- STEP 3: Sector Review
- STEP 4: Validation
- STEP 5: Capacity Strengthening

After group presentations and feedback, the consultant from ALINe made several presentations on Theory of Change. The consultant presented the introduction of “Theory of Change” before the group break-out sessions. He stated that the megatrends affecting agriculture in Malawi include access to affordable finance, climate change - variability, adaptation and mitigation, gender, responses to policy and institutional shifts, sustainable intensification, shifting disease vectors and pests, priorities, population (growth, changing dynamics, and demographics), shifting labour markets (e.g. emergence of more commercial farmers), urbanization, science - technology, and innovation developments (e.g. BioTech), regional trends, shifts in foreign investment. Members pointed out that the other key factors affecting agriculture in Malawi include environmental degradation, as evidenced by deforestation, soil erosion, siltation of water bodies and pollution. Financial literacy, ethical issues and ethical business-record keeping were also highlighted as major drawbacks to agricultural development. Quality assurance in agricultural sector threatens agricultural development e.g., fertilizer, seed etc. Poor infrastructure (roads, electricity), policy incoherence also poses challenges to agriculture in Malawi.

After the feedback from members’, there was group work on the priority challenges. Those are summarised in Table 1. Other challenges include lack of proper budgeting, agroprocessing and value addition challenges, as well as inadequate involvement of the stakeholders at all levels across the value chain.

Table V.4.1. Major Challenges affecting research and development, roll-out/delivery of research and adoption of technologies

Upstream/R&D	Roll-out/delivery	Adoption/Usage
<ul style="list-style-type: none"> ● Inadequate research man-power and equipment to execute research for different thematic areas ● Inadequate coordination and collaboration between stakeholders in research ● Lack of appropriate irrigation facilities for use in dry season ● Inadequate post-harvest tech/agro-processing ● Lack of high quality planting material for different crops and livestock breeds ● Inadequate scientists and technical staff, equipment and supplies (labs, levels etc) ● Lack of proper coordination and collaborations ● Lack of proper budgeting ● Inadequate participation from stakeholders in research design ● Low soil fertility ● Curriculum and industry needs 	<ul style="list-style-type: none"> ● Lack of harmonisation of agricultural messages ● Regulatory Authority at Council level ● Poor coordination between departments within the MOAIWD – e.g. DARS and DAES ● Limited capacity of some farmer organisations ● Out-dated curricula ● High-vacancy rates ● Limited access to financial services ● Lack of standards (agro dealers not vetted, Malawi Board of Standards not up to scratch) ● Political influence 	<ul style="list-style-type: none"> ● Effective demand for goods (goods drive market) ● Agricultural commercialisation abandoned (finance, productivity, land holding) ● Sustainability of interventions (yields gap, access to tech – distribution uptake, culinary – colour, taste, palatability; technology meeting full needs of farmers vs markets) ● Market driven requirements (local vs hybrid maize, dairy goats, soy milk, tech balance vs food security issues) ● Multi-sectoral challenges (no opportunities for income – people abuse agriculture; labour demand for the tech; Maslow’s Hierarchy of Needs) ● Mutual uptake of technology (marketing of tech; harnessing of

		tech; processing challenges)
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To respond to the identified challenges, groups met and deliberated on the methods to tackle the issues based on the following guiding questions

1. What does success look like? - Clear statement(s) about the desired objective that you want to achieve.
2. Who needs to be involved in making this happen, and what do they need to be doing? - Think broadly, but identify who is critical to achieving this success (and be as specific as possible - e.g. what specific team/ department in the Ministry of Agriculture)
3. What does this look like now? - What's the current situation, both the good and the bad
4. What are the constraints (internal and external)? - What could stop success from happening, or make it more difficult to achieve?
5. What role does the Science Agenda play in achieving this success? – Be specific: what practically can the Science Agenda do to achieve this success. This may be directly or wider - for example through changing ways of working, shifting priorities, and/or catalysing existing activities.

The proposals by the groups are presented in the tables below:

UPSTREAM: Challenge – Inadequate research manpower and equipment to execute research for different thematic areas.

What does success look like? <ul style="list-style-type: none"> • Having the minimum desired number of qualified personnel in specific research areas. • Doubling the number of scientists in different research fields by recruiting and training new staff-mainly at MSc and PhD levels. • Have adequate facilities and equipment for research 	
Who needs to be involved to make this happen and what do they need to be doing? <ul style="list-style-type: none"> • Academic institutions(LUANAR) • DAES • Department of animal health and livestock development • Human resource directors • CGAIR • Ministry of finance • DCAFS(Donor Committee On Agriculture And Food Security) 	
What does this look like now? <ul style="list-style-type: none"> • Only 40%-70% of required vacant positions of research scientists are filled 	What are the constraints (internal and external)? <ul style="list-style-type: none"> • Shortage of man power to be trained within the system • Lack of authority to recruit
What role does the Science Agenda play in achieving this success? <ul style="list-style-type: none"> • Funding to help in recruitment • Having a Capacity development plan • Collaboration in research between countries implementing the science agenda 	

UPSTREAM: Challenge – Inadequate coordination and collaboration between stakeholders in research

What does success look like? <ul style="list-style-type: none"> • One planning meeting for all stakeholders to enhance coordination

<ul style="list-style-type: none"> • Having a good M&E system • Having common indicators of measuring progress and success 	
Who needs to be involved to make this happen and what do they need to be doing? <ul style="list-style-type: none"> • All research organizations (LUANAR,DARS, DAES, CGIAR, National Commission for Science and Technology, DAHLD etc.) 	
What does this look like now? There pockets of collaboration that need to be brought together	What are the constraints (internal and external)? <ul style="list-style-type: none"> • Leadership problems-who leads the collaboration of all the stakeholders • Limited funding
What role does the Science Agenda play in achieving this success? <ul style="list-style-type: none"> • Supporting ASWAP in institutionalising the coordination of stakeholder within the science agenda framework. 	

UPSTREAM: Challenge – Inadequate post-harvest technologies and agro-processing

What does success look like? <ul style="list-style-type: none"> • For all key commodities they should be reduction of post harvest losses, value addition and agro-processing • Consistency supply of commodities on the market not seasonal • Regularity of supply after harvest through storage 	
Who needs to be involved to make this happen and what do they need to be doing? <ul style="list-style-type: none"> • Private sector • Research institutions • Donor community 	
What does this look like now? <ul style="list-style-type: none"> • Limited value addition takes place and for limited • Limited warehouse facilities • High post-harvest losses • Inadequate agro-processing techniques 	What are the constraints (internal and external)? <ul style="list-style-type: none"> • Inadequate financing and lack of structured markets crops • Limited technology for agro-processing • High cost of capital
What role does the Science Agenda play in achieving this success? <ul style="list-style-type: none"> • Up scaled business incubation model in Malawi • Support innovation platforms and market linkages • Technologies for value addition should be provided 	

ROLL-OUT: Challenge – Lack of harmonization of agricultural messages (Regulatory authority at council level, coordination between departments within MoAIWD)

What does success look like? <ul style="list-style-type: none"> • A comprehensively updated and readily available guide to agricultural production. • Complete electronic copies of guide to agricultural production focusing on: <ol style="list-style-type: none"> 1. Crop production 2. Livestock production 	
Who needs to be involved to make this happen and what do they need to be doing? <ul style="list-style-type: none"> • DAES-To provide leadership in extension delivery • Farmer organizations (FUM, NASFAM)-To compliment DAES • DARS-Generate technologies 	
What does this look like now? <ul style="list-style-type: none"> • Limited knowledge among extension officers • Limited research dissemination forums 	What are the constraints (internal and external)? <ul style="list-style-type: none"> • Inadequate financing

<ul style="list-style-type: none"> • Low participation in research dissemination forums 	<ul style="list-style-type: none"> • Donor priorities • Government priorities • Inadequate capacities at District Councils due to leadership challenges and limited financing
What role does the Science Agenda play in achieving this success? <ul style="list-style-type: none"> • Proper coordination through development of multi-stakeholder platforms • Decentralizing and strengthening of M&E • Facilitating updating of curriculum • Support MAFAAS to expand accreditation and harmonization of curricula. 	

ROLL-OUT: Challenge – Limited capacity of farmer organisations

What does success look like? <ul style="list-style-type: none"> • Farmer organizations being able to recruit and retain extension staff, have a code of ethics, governance processes and structures. 	
Who needs to be involved to make this happen and what do they need to be doing? <ul style="list-style-type: none"> • National Associations-Holding AGMs every year • Ministry of Industry, Trade and Tourism-Regulate operations of cooperatives 	
What does this look like now? <ul style="list-style-type: none"> • Farmer organizations have governance deficiencies • Inability of farmer organizations to generate funds to 	What are the constraints (internal and external)? <ul style="list-style-type: none"> • Inadequate funds • Founder syndrome meet their operational costs • Poor mentorship schemes within organizations
What role does the Science Agenda play in achieving this success? <ul style="list-style-type: none"> • Engage retired experts as Technical Advisors • Support farmer organizations to develop a business orientation i.e. do farming as a business • Support organizations to have proper feedback mechanisms for purposes of refining research agenda and populating knowledge management systems. 	

ROLL-OUT: Challenge – Limited access to affordable financial services

What does success look like? <ul style="list-style-type: none"> • Farmers have access to affordable and flexible loan packages for agricultural enterprises. 	
Who needs to be involved to make this happen and what do they need to be doing? <ul style="list-style-type: none"> • CAS-To provide a negotiating platform • Financial institutions-To customize loan packages • Commodity exchanges-To establish structured markets 	
What does this look like now? <ul style="list-style-type: none"> • Exploitative and predatory loan schemes • Stereotyping of farmers as perpetual loan defaulters 	What are the constraints (internal and external)? <ul style="list-style-type: none"> • Lack of credit guarantees • Unaffordable insurance • Fragmented effort by donor community to finance agribusinesses • Financial illiteracy
What role does the Science Agenda play in achieving this success? <ul style="list-style-type: none"> • Facilitate evidence-based research in agricultural financial services. • Introduce financing models for provision of agricultural credit. • Support entrepreneurship among farmers. 	

ADOPTION: Challenge – Effective market driven demands requirements

What does success look like? <ul style="list-style-type: none"> • Reduce the gap of ignorance • Enhanced information portal • Structured trade and commodity finance e.g. forward contracts, futures markets • Effective demand for goods and services • Commercially-oriented smallholder farmers utilizing research outputs to support their farming enterprises 	
Who needs to be involved to make this happen and what do they need to be doing? <ul style="list-style-type: none"> • Research institutions e.g. DARS, Universities, CGIARS – generates new knowledge • Farmer organisations – capacity building and linkage to farmers • MCCI and MITC– trade and investment promotion and support Malawi government (Agriculture, Trade, Finance) – Business friendly regulatory and policy framework 	
What does this look like now? <ul style="list-style-type: none"> • Inadequate research finance/ underfunded research • Inadequate information infrastructure • Unstructured and unreliable markets • Uncoordinated interventions 	What are the constraints (internal and external)? <ul style="list-style-type: none"> • Antagonistic market reward mechanism • No cost recovery mechanism to sustain research • Lack of consolidated information portal • Lack of financial literacy
What role does the Science Agenda play in achieving this success? <ul style="list-style-type: none"> • Creating sustainable technological interventions • Create consolidated information portal • Decision support tool 	

ADOPTION: Challenge – Low adoption and unsustainable use of technologies

What does success look like? <ul style="list-style-type: none"> • Mutual uptake of technologies • Appreciation and wide adoption of technologies that respond to good balance of market and farmer needs • Increased productivity and profitability at all levels 	
Who needs to be involved to make this happen and what do they need to be doing? <ul style="list-style-type: none"> • Research institutions e.g. DARS, Universities, CGIARS – generates new knowledge • Farmer organisations – capacity building and linkage to farmers • MCCI and MITC, Commodity Exchange– trade and investment promotion and support • Malawi government (Agriculture, Trade, Finance, NCST) – Business friendly regulatory and policy framework 	
What does this look like now? <ul style="list-style-type: none"> • Incoherent technologies • Low adoption rates 	What are the constraints (internal and external)? <ul style="list-style-type: none"> • Inadequate, sustainable finance for the technologies • Affordability of technologies

ADOPTION: Challenge – Unsustainability of interventions

What does success look like? <ul style="list-style-type: none"> • Sustainable and self-perpetuating interventions • Adoption at grassroots level 	
Who needs to be involved to make this happen and what do they need to be doing? <ul style="list-style-type: none"> • Research institutions e.g. DARS, Universities, CGIARS – generates new knowledge • Farmer organisations – capacity building and linkage to farmers • MCCI and MITC, Commodity Exchange– trade and investment promotion and support • Malawi government (Agriculture, Trade, Finance, NCST) – Business friendly regulatory and policy framework 	

What does this look like now? <ul style="list-style-type: none"> • Interventions are driven by projects and subsidies • Limited adoption • Political interference • Inadequate funding 	What are the constraints (internal and external)? <ul style="list-style-type: none"> • Political interference • Inadequate funding
What role does the Science Agenda play in achieving this success? <ul style="list-style-type: none"> • Create sustainable and self-perpetuating interventions through generation of new knowledge/ innovations 	

Day 4: Consolidation of Action Plans, Theory of Change, Results Framework and Knowledge Management

The fourth day started with presentation on consolidated group work on Theory of Change done on the previous day. The comments were submitted to the consultant for inclusion in the draft Theory of Change write-up. The final session aimed at developing monitoring system indicators for the areas identified in the Theory of Change. The same groups from the previous day were re-constituted to develop indicators for each of the areas discussed. Results from the groups were submitted to the consultant for consolidation.

Closing Remarks

The workshop brought out key issues and associated actions for consideration in the implementation of S3A. More importantly, useful information was gathered for a synthesis report, which will be used in the formulation of an investment proposal. The roll-out of S3A in Malawi requires key actions to be undertaken. The keys actions identified in the workshop are as follows:

A) Planning and Coordination

- Assign focal persons in each sector for implementation of the Agenda
- Malawi to draft a Commitment Letter for submission to FARA. Technical Working Groups to agree and sign (with all key stakeholders), linking to national direction.
- Organise a meeting with individuals who did not participate in the meeting to broaden audience
- Need to match list of value add areas with those in the ASWAp M&E group (those with research focus etc) to ensure alignment with existing indicators/targets.

B) Innovation Systems and Partnerships

- Effectively engage policymakers through documentation and instruments that endear them to S3A.
- Promote issues that foster changing mind-set by stakeholders.
- Stream S3A needs to build on existing structure.
- Workable institutionalization process to create strategic Innovation Platforms at national level by engaging expert teams for different commodities.
- Harmonize and link existing data systems available in Malawi.
- Mainstream ASWAp KMS components into FARADDataInformS by engaging institutions such as Commercial Agricultural Service, Tobacco Control Commission and Universities.
- Conduct a detailed stakeholder mapping and workshop on data management system.
- Create a National Team for Policy Assessment and Development of Innovation Platform Systems for Malawi.
- Establish a strong M&E system at district and ministry level.

C). Capacity and Youth Development and Agribusiness

- Strengthen Joint Sector Reviews, sensitization and awareness
- Harmonize curriculum on entrepreneurship and vocational training for farmers

- Ensure institutional transition of policies and strategies among institutional staff
- Clarify and link science for innovation and science for academic purpose
- Develop business models that facilitate commercialization of research outputs
- Improve coordination of capacity development and sensitization for projects
- Define clear roles and involvement of private sector financing of projects
- Inclusion of capacity needs in National budget allocations
- Knowledge management should be part of capacity development

V.5: GHANA NATIONAL CONSULTATION

ROLL-OUT OF THE SCIENCE AGENDA FOR AGRICULTURE IN AFRICA



GHANA NATIONAL CONSULTATION ON THE SCIENCE AGENDA

Front: Sitting from left to right: Dr. George Essegbey, (Dir. CSIR-STEPRI), Prof. Victor Agyeman (Director-General), Dr. Irene Annor-Frempong (FARA), Prof. K. Frimpong Boateng (Min. MESTI), Mr. Oliver Boachie, Special Assistant to the MESTI Minister, Madam Salimata Abdul-Salam, Chief Director (MESTI) and Hon. Dr. Yakubu Alhassan (CSIR-Head office)

5.1 OVERVIEW

The Ghana National Consultation on the roll out of S3A was held from 11th – 14th July 2017 at the CSIR Science and Technology Policy Research Institute in Accra, Ghana. It was the fifth in the series of five Tier 1 countries selected to pilot implementation of the Science Agenda in Agriculture in Africa. The workshop was jointly organized by the Council for Scientific and Industrial Research (CSIR), Ghana and the Forum for African Agriculture (FARA) with financial support by the International Fund for Agricultural Development (IFAD), the European Commission and the Government of Australia.

Participants at the Workshop helped to develop a collective vision and operational plan for the implementation of the Science Agenda in Ghana. There was reasonable representation from institutions and agencies critical to the delivery of the S3A and Ghana's national research priorities.

The targeted institutions included relevant ministries (Finance, Agriculture, Environment, Science, Technology and Innovations), departments, M&E specialists, private sector actors, farmer organizations, research centres, and academia, among others.

The Objectives of the Ghana National Consultation were to:

- 1) Develop the Theory of Change for the Science Agenda for the country and agree on the outcomes that are being pursued. This included reviewing the roles of relevant actors and how key national strategies could be aligned to support implementation of the Science Agenda.
- 2) Break these down into measurable intermediate outcomes that feed into the different thematic areas of the Science Agenda.
- 3) Translate the TOC framework into an operational plan with appropriate methods and tools, data capture schedules and clear roles and responsibilities for all the partners.
- 4) Agree and capture the key learning and evaluation questions related to implementation of the Science Agenda in the country.
- 5) Identify the sources of data and statistics that would be helpful to create a baseline for the measurement framework and identify any initiatives underway that seek to collect relevant data.

The expected outputs of the National Consultation were:

- 1) In-depth analysis, profiling and baseline development for Ghana
- 2) Identified approaches and processes for mainstreaming S3A in Ghana key national agricultural development strategy and capacity requirements.
- 3) Country level S3A implementation strategies developed
- 4) Country Theory of Change and measurement framework developed and the knowledge management and data sharing needs and processes defined

Additionally, the consultation facilitated the development of:

- 1) A country-led proposal to IFAD for implementation of the S3A in Ghana
- 2) Mechanisms for engaging non-state actors, especially farmers, producers as well as rural small and medium entrepreneurs in mainstreaming S3A in the country.
- 3) Means for identifying appropriate channels for communication (mass media, electronic media, workshop and conferences).
- 4) Means for identifying appropriate knowledge management approaches and mechanisms in advancing S3A.
- 5) Application of Policy Practice Index in informing S3A policy practice at the country level
- 6) Promotion of strategic and operational implementation platforms for advancing S3A
- 7) Popular messages in communication and policy briefs

5.2 PROCEEDINGS OF THE NATIONAL CONSULTATION

2.1 Opening Session

The first plenary session was devoted to the opening ceremony of the National Consultation. It featured welcoming address by the host institution, statement by the chairman of the session and a keynote address that officially kick off the four-day Consultation.

Welcoming participants, the Director-General of the Council for Scientific and Industrial Research (CSIR), Ghana, Prof. Victor Kwame Agyeman underscored the important role science had played in solving the developmental challenges of the continent. He noted that agriculture had been the foundation of Africa's economic development and noted with concern the inability of the continent to derive the full potential of the sector. He noted with regret that the potential of the sector had still not been exploited for the benefit of the populace.

Making reference to the Ghanaian situation, he observed the reduction of the contribution of agriculture to the Gross Domestic Product from 31.8% in 2009 to 19% in 2015 and called for concerted efforts at working effectively towards transforming agriculture in Ghana through a more effective application of science. The Director-General expressed excitement about the fact that Africa had found its prudent to shift from the business as usual to connecting science to transform agriculture for the benefit of its people. He was convinced that the National Consultation would provide the impetus and modalities for the transformation that would lead to agricultural growth and increased economic benefits for Africa. He pledged the support of the CSIR in technology and innovation generation and dissemination with beneficial outcome to end-users for agricultural growth in Ghana.

In his acceptance remarks, the Chairman for the Opening Ceremony, Hon. Prof. Kwabena Frimpong Boateng, Minister of Environment, Science, Technology and Innovation, outlined some challenges facing the country, which could be addressed with the more effective application of science. He mentioned, for instance, the drying up of rivers and coastal erosion as a result of climate change effect, the negative effects of illegal mining, which had led to pollution of water bodies, destruction of farms, and land degradation.

The Minister expressed optimism that the workshop would help identify linkages to address the challenges of the country. He noted with excitement the caliber of the participants including representatives from academia, agricultural research and training institutions, farmers' groups, the private sector and civil society at the workshop and expressed the hope that they would bring to bear their expertise, knowledge and experiences in fashioning out strategies designed to ensure the more effective use of science to address the developmental challenges in Africa.

Prof. Frimpong Boateng announced that the Government of Ghana had made science and technology the centre piece in the country's development by working towards the policy that would lead to more investment in science. He added that the Ministry was working towards the constitution of a Council made of eminent scientists to advise the Government on matters of science. This, he said, would ensure the right place of science in Ghana's development. Additionally, he announced measures currently being employed by government towards the creation of the Science and Technology Fund that would ensure the actualization of the plan to have 1% of the country's GDP invested in science and technology research. He commended the organizers and sponsors of the workshop and said his Ministry would be very much interested in the outcome of the workshop.

In a statement made on behalf of the Executive Director of FARA, Dr. Irene Annor-Frempong, FARA's Director of Research and Innovation, took participants through the history of the S3A initiative explaining

that it was designed to be Africa's response to declining productivity and poverty on the continent. She said after 10 years of implementing CAADP, it was evident that African countries could achieve the kind of agricultural transformation desired only if the continent deepened its application of science.

Dr. Annor-Frempong explained that it was against this background that the science agenda for agriculture in Africa was developed and later endorsed by the Heads of State Summit in June 2014 in the context of the Malabo Declaration on Accelerating African Agricultural Growth and Transformation (3AGT). She stressed the need for the domestication of the initiative in Africa and added that S3A was developed as a tool to help African countries achieve their development goals with respect to agricultural productivity.

She said Ghana had stood high and seen as a country with the potential to domesticate the policy initiative, and added that it was against this background that Ghana was selected as one of the tier one countries for the implementation.

Dr. Annor-Frempong stressed that the program had the ultimate objective of employing the more effective application of science from all its facets and working towards leveraging science to drive agricultural development. She further urged Ghana to take charge of her destiny through the application of science to drive the country's agriculture. On the outcome of the workshop, she said the workshop was being used to open up the conversation of using the science agenda to drive Africa's agriculture. Dr. Annor-Frempong reported that the agenda had been launched at the regional level and also being launched at the national level. Concluding her statement, she was thankful to the International Fund for Agricultural Development, the European Union and the Government of Australia for providing financial support for the consultation workshop.

In a keynote address read on behalf of the Hon Minister of Food and Agriculture (MoFA), Dr. Owusu Afriyie Akoto, a Deputy Minister of MoFA, Hon. George Oduro, said the development of the Science Agenda under the auspice of FARA was an important step on the road to the transformation of Africa's agriculture. He said as a long-term strategic framework with a wide range of science and technology opportunities, the initiative had the potential to bring about agricultural transformation in Africa.

He said the vision to ensure that Africa by 2030 was food secure, a global scientific player, and the world's breadbasket, was quite ambitious, but noted that this vision could be realized with the right continental commitment.

Dr. Akoto Afriyie noted that the realization of the vision of the science agenda depended on effective domestication of the framework agenda into national strategies, as well as institution of the right investment and action plans, given the uniqueness of the contexts, challenges, opportunities and priorities of the different African countries including Ghana. He was hopeful the workshop would lead to increased awareness about the S3A and the rationale and process of its domestication into Ghana's science for agriculture agenda. He was happy the consultation would lead to the identification of the science for agriculture priorities, institutional arrangements and S3A platforms or fora for Ghana, and pave the way for Ghana's S3A Action Plan to be developed and further lead to the development of Country Theory of Change, Data management infrastructure, Knowledge Management and Sharing.

Dr. Akoto Afriyie encouraged all participant fully to contribute in all aspects of the discussions so as to produce a document that when adopted would meet the expectations of the Science agenda. On this note the Minister declared the Workshop officially open.

In bringing the opening session to a close, the Chairman, Hon. Prof. Frimpong Boateng, thanked participants for making time to share their expertise and contribute towards the science agenda. He said the

workshop was an important step towards the domestication of the initiative in Ghana. He wished participants fruitful deliberations.

2.2 PLENARY SESSION TWO

The second plenary session, which was on the theme: “An Overview of the S3A-Status and Strategy,” provided an overview of S3A, its development process, plans for the roll out in selected countries as well as the strategies for actualizing S3A. The main learning objective of this session was to provide opportunity for the participating countries to identify areas they needed to start preparing for, and which ones to avoid in order to drive their own S3A. The session was chaired by Dr. George Owusu Essegbey, the Director of CSIR-STEPRI. The main objectives of the session were to:

- Refresh countries’ knowledge of S3A.
- Examine S3A implementation framework.
- Define implementation capacity requirements.
- Propose sustainable financing for S3A.
- Develop a framework for accountability for results.
- Propose a framework for knowledge and information sharing and lessons learning for S3A implementation.

In this Session, Dr. Irene Annor-Frempong took participants through the overview of the S3A in terms of the current status and the implementation strategy. In a three-part presentation, she took participants first, through the S3A framework; second, the roll-out plan and in the third part outlined the linkages between S3A, mega initiatives and emerging implementation process.

In a post-presentation question-and-answer and commentary session, it emerged that:

- The agenda is about leveraging domestic investment to meet the goals set in the initiative; it is about making systems work in Africa.
- The agenda is not only about science, but it is also about the supportive policies, governance structures, incentives and motivation for our scientists and lastly services that in an integrative manner, keep the parts together.
- The agenda is also about studying the success stories of countries and adapting to the African situation.
- The agenda is not about the hard science we know in the universities. It is about science, technology, extension, social learning that includes issues of indigenous knowledge.
- The agenda is about harmonizing our research efforts and making sure that the differences are making the desired impact on Africa’s agriculture.

2.1 PLENARY SESSION THREE

Plenary Session Three titled “Ghana Country Profile and National Level Success Factors” was chaired by Dr. George Owusu Essegbey. The Session offered an opportunity for Ghana to provide vital information and statistics on the status of agriculture in Ghana from different stakeholders’ perspectives and how S3A could be integrated into their different activities.

The Session witnessed five technical presentations. In the first presentation, the Director-General of the CSIR, Prof. Victor Agyeman, took participants through the role of the NARS in Ghana’s agricultural sector and in the implementation of the science agenda. In his submission, he said the CSIR would position itself and play its role as the lead agency for the coordination of all agricultural research activities in Ghana.

In the second presentation, Dr. King David Amoah outlined the role of farmers' organizations in Ghana's agricultural sector and pledged the support of the umbrella farmers' organization in Ghana to drive the science agenda.

Mr. Greg Akrofi, a representative of Chemico Ghana Ltd, a private agro-input firm, in the third presentation, took participants through the role of the private sector in driving the science agenda. He said the private sector would continue to play its expected role in support of Ghana's agricultural sector and in particular, the science agenda for agricultural development.

The fourth presentation on the role of the CGIAR in the agricultural sector was delivered by Dr. Asamaoh Larbi, the country representative of the International Institute of Tropical Agriculture (IITA). He said the IITA would continue its capacity building programs by training the needed human resource to drive the agenda, and embark on fund-raising for joint research and development activities in the various aspects of agriculture with the NARS.

In a post-presentation question-and-answer session, the following points were emphasized:

- There is the need for institutions within the NARS, especially the universities and research institutions to collaborate more effectively to forge the needed synergy and address the issue of duplication of research efforts
- The NARS must embrace the active participation of other actors such as civil society and extension organizations.
- The motivation to drive scientists to give off their best will also include protecting their work; a justification to FastTrack the passage of the Plant Breeders Bill.
- Questions arising from issues of GMOs should rather serve as incentive for scientists to do more explanations and throw more light by way of education on the issue.
- There is the need to employ the more effective application of Innovation Platforms to drive the agenda
- There is the need for an umbrella Farmers' Organization that will gain acceptance and legitimacy from the state and be empowered more effectively to drive the agenda
- International research organization like the IITA that undertake capacity building initiatives by way of training of graduates to drive research in Africa must do periodic follow-ups to assess the performance and contribution of their products towards agricultural development on the continent.

DAY TWO

2.2 PLENARY SESSION 4A

Plenary Session 4A for the second day was on the title: Realizing the Ghana Vision of the S3A and similarly chaired by Dr. George Owusu Essegbey. This Session provided a platform for sharing key findings/information with the participants, especially with respect to consultations on the building blocks for the implementation of the S3A.

The building blocks for the implementation of the S3A that would inform the discussions were identified as the:

- Creation of favorable policy environment for science using the proposed Policy Practice Index.
- Capacity strengthening mechanisms for Ghana.
- Effective financing arrangements available for Ghana to explore.
- Effectiveness of innovation platforms in advancing the S3A.
- Collaboration mechanism for enhancing S3A.

The Session sought to achieve six objectives. There were to:

- Refresh countries' knowledge of S3A.
- Examine S3A implementation framework.
- Define implementation capacity requirements.
- Propose sustainable financing for S3A.
- Develop a framework for accountability for results.
- Propose a framework for knowledge and information sharing and lessons learning for S3A implementation.

In this Session, three technical presentations were delivered. In the first presentation, Dr. Fatunbi Oluwole of FARA took participants through the topic: “Country Level Implementation Platforms for S3A and the Effective Modalities for Collaboration at all Levels.” The presentation touched on the agricultural yield gap between Africa and Europe and underscored the fact that this gap could be closed through the vehicle of the science agenda. He discussed the various approaches and country level implementation platforms with special emphasis in the Innovation Platform that could be employed to ensure the effective implementation of the agenda.

In the second presentation, Dr. Irene Annor-Frempong took participant through a paper titled: Country Engagement Process and Alignment with CAADP. The presentation highlighted the engagement process and traced the pathway towards achieving the objectives of the agenda.

The third presentation was delivered by Mr. Ayeuboro Adama of the Policy, Planning and Budgeting Directorate of Ghana's Ministry of Food and Agriculture (MoFA), on behalf of his Director, Mr. Daniel Ohemeng-Boateng, who is also CAADP Focal Person in Ghana. The presentation was on the topic: Role of MoFA in Advancing the Ghana's Agricultural Sector and in Meeting the CAADP targets. The submission touched on the structure, scope, and actors in Agricultural Sector, the role MoFA plays in the Sector in particular reference to the implementation of CAADP targets. He reported that MoFA would factor the S3A initiative into METASIP 3, which was currently being developed for implementation from 2018-2021.

2.4 PARALLEL SESSION A

2.4.1 Group A

Under Parallel Session A, two groups were formed. Group A looked at Planning and Coordination, and was facilitated by Dr. Irene Annor-Frempong. The Group tried to clearly map out the detailed processes and stages for building ownership, integration to ongoing processes and support of the Science Agenda in Ghana. Specifically, it defined the institutions to be engaged for the country's buy-in and support, the studies to be undertaken, the current processes to which the planning and coordination of the Science Agenda could be aligned to respond to Government's set targets for agricultural transformation.

The key outputs expected of the Group were: development of a Planning and Coordination Strategy for the Science Agenda in Ghana; and proposal of a Financing Plan for the Science Agenda in Ghana.

2.4.2 Group B

The second Group, Group B, looked at Innovation Platform and its application in driving the Agenda. The Group's work was facilitated by Dr. Fatunbi Oluwole. The objectives before the Group were to:

- Collate information on the state of the existing operational IP in Ghana – existence of Ops, commodities of interest and state of development.
- Discuss national policy for agricultural innovation: existence of policy; state of implementation; control; strategic commodities; Strategic IP/think tank.
- Develop stepwise action to integrate IP formation into the national strategy; Further consultations; Needed advocacy; Lobby; Finance; Field action.

2.5. PLENARY SESSION 4B

Plenary Session 4B was on the theme: Realizing the Ghana Vision of the S3A and was again chaired by Dr. George Owusu Essegbey. The Session had two parts, namely Presentation of three background papers on Realizing the Vision of the S3A at the country level and Parallel Session B. Three papers were delivered on the theme: Background Papers on Realizing the Vision of the S3A at country level.

The first paper titled: Creating Favorable Policy Environment for Science Using Public Policy Index (PPI) was presented by Dr. Paul Boadu of FARA. He discussed the role of STI and outlined the S3A strategies including integrating, connecting, and strengthening science through the existing Agricultural Innovation Systems (research, extension, education, public and private stakeholders etc.). Furthermore, he explained the guiding principles of the PPI and its expected impact. He ended with a discussion on the way forward.

The second paper titled: Strengthening Human and Institutional Systems of Science for Agriculture in Ghana was presented by Dr. Amos Gyau, Lead Specialist for Capacity Development, FARA. His presentation examined the role of capacity development in the S3A and the key capacity areas. He mentioned challenges such as mismatch of demand and supply of technical capacity, poor infrastructure, and lack of foresight and shared the experience in respect of capacity development from the perspectives of FARA. The presentation ended with a discussion about the way forward and reflections into the future.

The third paper titled: Emerging Knowledge Management Plan for the S3A was delivered by Dr. Augustine Kouevi of FARA. He took participants through knowledge management solutions in S3A, making reference to Data and Information Systems (FARADatainformS). He further elaborated on the FARADatainformS architecture and discussed the remaining phases of the development of FARADatainformS.

In a post-presentation question-and answer/commentary session, issues of Innovation Platform featured prominently with most questions and contributions being IP-related. The following points were emphasized:

- Innovation Platform (IP) creates good opportunity for engagement and ensures the equality of all of stakeholders in driving the research agenda. The guiding principle is that every stakeholder has a say and may not necessarily have his/her way. Adequate room must therefore be made to accommodate diverse opinions.
- The perception that research findings are imposed on farmers may be far-fetched as researchers have always engaged cordially with farmers.
- In spite of the fact that money is needed to drive the IP, it is not money that sustains it. IPs are system-driven and they can be sustained more effectively through quality facilitation skills
- On the distinction between strategic and operational IP, it was explained that the composition was similar; however, strategic IP is at a higher level.
- On mainstreaming gender in IPs, there is the need to employ different strategies as issues of competitiveness and religion may play a critical role in sustaining IP

- With regard to capacity development, there is the need to invest in the training of people in agripreneurship, which has a global outlook and is a priority for African Governments and Development Partners.
- There is also the need to build foresight capacity if the challenges of capacity development are to be addressed.

2.6 Parallel Session B

Parallel Session B was made up of three groups.

2.6.1 Parallel Session for Group A

Group A deliberated on the topic, “Capacity Development and Agribusiness”, and was facilitated by Dr. Amos Gyau. The objectives were to:

- Discuss the preliminary findings from review of NAFSIPS
- Assess the state of Foresighting in Human and Institutional capacity Need for Ghana and S3A implementation
- Identify the Action Points for Capacity Development Action Plan for Agriculture and S3A
- Explore Opportunities for Engaging Youth and Women in Agribusiness
- Propose Financing Options for Agribusiness Development

2.6.2 Parallel Session for Group B

Group B break-out session discussion was guided by the topic “Creating Favorable Policy Environment for Science Using Public Practice Index” and was facilitated by Dr. Paul Boadu.

The objectives of the Parallel Session which guided Group B in carry out its task were to:

- Develop/validate/discuss policy themes and dimensions
- Define policy themes, discussions and measurement level
- Identify data sources and collate them at country level

2.6.3 Parallel Session for Group C

Group C worked on the topic “Knowledge Management” and was facilitated by Dr. Augustine Kouevi/Dr. Abdulrazak Ibrahim. This Session introduced knowledge management mechanisms aimed at ensuring S3A implementation on the continent and in Ghana in particular. It proposed a framework for knowledge sharing and lessons learning for S3A Implementation based on inputs received through the regional consultations and user experience survey conducted.

Specifically, the Session had the objectives to:

- Provide ample opportunity for stakeholders in Ghana to discuss and provide in-depth feedback.
- Build ownership, assemble country team and agree on an appropriate FARADaInFormS strategy with clear timelines to drive and support the Science Agenda in Ghana.

The key outputs expected from the Group session were:

- KM emerging plan for S3A presented and country feedback received.
- Ghana Country buy-in and relationship created with FARADaInFormS country focal point, including existing focal persons for E-RAILS, E-Capacities, etc. where possible.
- Country taskforce for FARADaInFormS identified and constituted.
- Draft country action plans developed, including capacity building strategies for relevant Data and Information Systems (Primary focus will be around E-RAILS, E-Caps, IPaBP)

2.7 Group Presentations

The key highlights of the Group Presentation were as follows:

- Capacity development in agribusiness should look at capacity development in technology generation with respect to the crops and livestock sectors.
- Capacity development in marketing is a critical area that should not be overlooked in promoting competitiveness of agribusiness.
- Capacity development must be tailored along the commodity value chain to ensure the effective application of the needed knowledge and skills, especially those required to address post-harvest losses through processing. This will effectively drive activities in the value chains.
- For the Science Agenda to succeed, there is the need to give serious consideration to capacity building in terms of infrastructure and legal issues.
- Inadequate skills for developing good quality Action Plans is a deficient area, which ought to be addressed through the required capacity development activities.
- Agribusiness must be mainstreamed in the Innovation Platforms such that agriculture is seen as a business and not just a way of life.
- There is a need for the key data collection agencies to deepen their collaboration to ensure the gathering of good quality data from primary sources.
- Identification of available data sources in the country such as data from universities, annual and technical reports, data from the Ghana Statistical Service, the CSIR, GAEC, as well as e-Agriculture, FAO-Stat, is crucial for the success of the Science Agenda.

2.8 Round Table Policy Dialogue on Food and Nutrition Security: The Case of Biofortification

Before the Round Table Policy Dialogue, Dr. Abdulrazak Ibrahim of FARA delivered a paper on the topic, Policy Dialogue on Food and Nutrition Security: the Case of Biofortification. The presentation discussed the impact of agricultural research and highlighted issues of S3A and nutrition-sensitive Innovation Platforms. The presenter took participants through biofortified staple crops and identified where these crops were being cultivated.

The round table discussion had as panellists the following experts:

- Hon. Dr. Ahmed Yakubu Alhassan of the CSIR Head Office
- Prof. Emmanuel Otoo of the CSIR- Crops Research Institute
- Mr. Ayueboro Adama of the Policy Planning and Budgeting Directorate (PPBD) of Ghana's Ministry of Food and Agriculture (MoFA).
- Mr. Gideon Ashitei of the Women in Agricultural Development Directorate of MOFA.

The following points emerged out of the post-round table dialogue discussions:

- Issues of food quality should feature prominently in breeding activities of research scientists. There is therefore the need for a lot more investment in this research area.
- There is the need for the right policy framework to ensure that Ghana becomes food secure and is able to achieve its long-term development goals in terms of meeting the food nutrient requirements of the citizens.
- Given the importance of food and nutrition, the Government of Ghana should work towards mobilizing the needed resources to ensure the effective application of science in improving the nutritional status of Ghanaians.
- The concerns of women will need to feature prominently in the implementation of programs that seek to promote good food and nutrition status in the country.
- Food research scientists must explore more innovative ways of incorporating micro-nutrients in staple foods to address the nutrient deficiencies of some of these staple foods.
- CORAF/WECARD should continue to focus its research attention on food and nutrition security and work together with its stakeholders to make the West African sub-region food and nutrition secure.

- African scientists should work together with their counterparts in the developed world to improve on the nutritional qualities of food crops and animals.

DAY THREE

PLENARY SESSION 5

Plenary Session 5 for the third day was on the theme, “Ghana Theory of Change and Results Framework for S3A implementation - Concepts and Practices” and was chaired by Dr. Ahmed Yakubu Alhassan, a former Deputy Minister of Food and Agriculture and former Member of Parliament. For the Session, a paper titled: Theory of Change and Results Framework for S3A was delivered by Mr Enock Warinda, Lead Specialist (M&E), FARA. He took participants through the Theory of Change and its application for the S3A. Other issues that featured in the presentation included:

- Relevance of the S3A themes in the Ghanaian context
- Where and how S3A can add value relative to national program and policies currently shaping Ghana’s agriculture sector
- Theory of Change and the Management Framework
- Steps to Create Theory of Change for S3A
- Some Key Elements in Theory of Change
- CAADP and S3A Results Framework: Linkages and Relevance in the Consultation Process

Dr. Warinda later facilitated a discussion on current data collection processes, methods and indicators to understand what was working, what was not working, and what else was needed to get it to work.

3.1 Groups for Plenary 5

The break-out groups for this session were based on the various S3A themes, as follows:

- Group 1 looked at Sustainable Productivity in Major Farming Systems
- Group 2 examined Food Systems and Value Chains
- Group 3 analysed Agricultural Biodiversity and Natural Resource Management
- Group 4 reviewed Megatrends and Challenges in Africa’s Agriculture

3.2 Group 1: Sustainable Productivity in Major Farming Systems

Specific activities/goals for Group 1 were:

- Transformation of Production Systems
- Crop Improvement and Protection
- Improving Livestock Production and Productivity
- Aquatic Systems and Fisheries
- Agroforestry and Forestry
- Agricultural Mechanization

3.3 Group 2: Food Systems and Value Chains

Specific activities/goals for Group 2 were:

- Food and Nutritional Security
- Food Processing
- Food Safety and Storage
- Post-harvest Handling, Processing and Storage

3.4 Group 3: Agricultural Biodiversity and Natural Resource Management

Specific activities/goals for Group 3 were:

- Conservation and Enhancement of Agricultural Biodiversity
- Land and Water Resources, Irrigation and Integrated Natural Resource Management

3.5 Group 4: Megatrends and Challenges in Africa's Agriculture

Specific activities/goals for Group 4 were:

- Climate Change, Variability, Adaptation and Mitigation
- Policy and Institutional Research Including Market Access and Trade
- Responses to Changes in Livelihoods of Rural Communities
- Gender

Under each of the specific activities/goals, each group was tasked to answer the following questions:

- What is the situation that Ghana faces in implementing the S3A?
- What are the underlying causes of current constraints?
- What needs to change via S3A?
- How will these changes be made via S3A?
- What are the internal and external constraints likely to affect this?

3.6 Mapping of Key Actors in S3A Implementation

Each of the groups under a specific activity/goal was to respond to the following questions:

- Who are our key actors?
- Who are our target groups?
- What actual activity do we need to undertake to achieve the goals?
- What are the key assumptions we should focus on?
- What are our short-term expectations?
- What are our key indicators of success?
- What are our long-term expectations?
- What are our key Indicators of success?

3.7 Summary of Presentation by the Groups.

3.7.1 Key S3A Activities

- Create/strengthen partnerships
- Facilitate infrastructure support
- Connect people and organizations
- Enhance individual and organizational capacity
- Create conducive policy conditions
- Identify existing opportunities
- Create knowledge repositories and use them
- Engage in specific agronomy and pathology
- Promote learning and build partnerships
- Leverage resources and reduce barriers
- Foster public and political will
- Strengthen formal education system

3.7.2 Key Actors

- Commissions (Minerals, Lands, Forestry, Water)
- National Biosafety Authority (NBSA)

- Ghana Atomic Energy Commission (GAEC)
- Council for Scientific & Industrial Research (CSIR)
- Nuclear Energy Regulatory Authority (NRA)
- Ministry of Food & Agriculture (MoFA)
- Ministry of Fisheries & Aquaculture Development (MoFAD)
- Ministry of Local Government & Rural Development (MLGRD)
- Ministry of Education (MoEd)
- Ministry of Health (MoH)
- Ministry of Environment, Science, Technology & Innovation (MESTI)
- Ministry of Lands & Natural Resources (MLNR)
- Universities and Agricultural Colleges
- Metropolitan, Municipal and District Assemblies (MMDAs)
- Ministry of Chieftaincy and Religious Affairs (MoCRA)

3.7.3 Constraints (Internal and External)

- Incentives to collect and share information
- Deciding on ‘best’ evidence
- Buy-in by governments for resource allocation
- Lack of political will
- Lack of coordination between various actors
- Duplication of efforts
- Limited local funding for R&D
- Limited structures for enforcement of national & international treaties
- Invasion of Invasive Alien Species

3.7.4 Role of S3A in Achieving Success

- Bring together approaches, methodologies, individuals and organizations for data collection, interpretation and analysis
- More systematic approach to documenting what works and what does not in agricultural science, technology and innovation
- Provide Knowledge Management system and Innovation Platform to collate evidence
- Provide/identify funding opportunities for evidence collation and usage
- Facilitate organizational, individual and systemic transformation.

3.7.5 Key Assumptions

- There is policy action plan in place
- Relevant policies are enforced
- Adequate adaptation to climate change
- Willingness of actors and target groups to work together
- Reliable funding from Development Partners and Agencies
- Broad alliances available
- Data and learning ensured
- Agricultural research in national budgets
- Policies based on scientific evidence
- Adequate service, social and economic connections

DAY FOUR

4.0 PLENARY SESSION 6

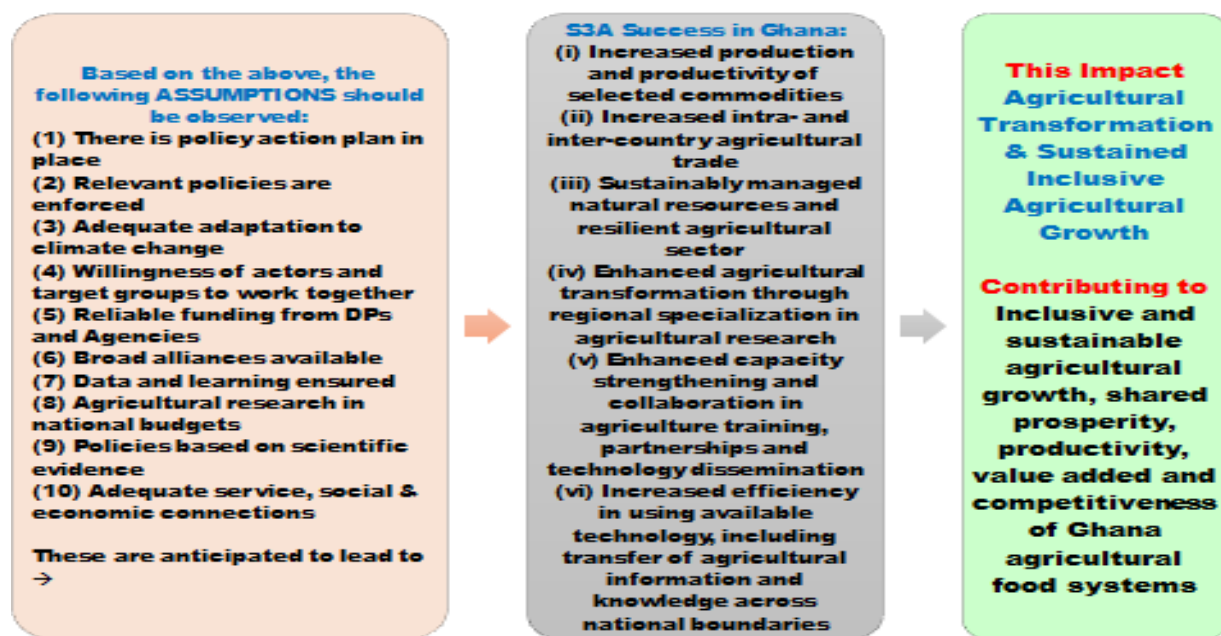
4.1 Consolidation of Action Plans, Theory of Change, Results Framework and Knowledge Management

4.1.1 Action Plans for Mainstreaming S3A

The Session was chaired by Mr. Henry Crenstil Jnr., the Eastern Regional Director of the Department of Food and Agriculture. A presentation of the Draft Ghana S3A Theory of Change and Results Framework was delivered by Mr. Enock Warinda of FARA, while the Draft Country Policy Themes and Dimensions were delivered by Dr. Paul Boadu also of FARA.

Draft Theory of Change for GHANA





4.1.2 Remarks from Stakeholders (Research Institutions, Universities, Ministries of Finance and Agriculture, Regulatory Agencies)

The Session provided brief remarks by some key stakeholder institutions. Key highlights of these remarks were captured below:

- The representative of research institutions in Ghana expressed excitement about the opportunity to discuss how best science could be used to drive agriculture in Africa. He called on institutions and stakeholders mandated to implement the Science Agenda to do what was expected of them to drive the initiative.
- The representative of environmental regulatory agencies in Ghana noted that because agricultural development had a lot to do with the environment, institutions and stakeholders must implement the various aspects of the agenda in the most environmentally friendly manner. She pledged the support of her Organization, the Environmental Protection Agency to play whatever role expected of it to ensure the success of the Science Agenda.
- The representative of universities in Ghana called for more enhanced collaboration between the universities and agricultural research institutions so that they could all play their respective roles effectively to drive the Science Agenda.
- The representative from Ghana's Ministry of Finance called for the incorporation of the Science Agenda in the Ghana Shared Growth and Development Agenda 3 (GSGDA 3) policy document for the agenda to enjoy the needed legitimacy and budgetary support from the Government of Ghana.
- For his part, the representative of Ghana's Ministry of Food and Agriculture said the only way to ensure the success of the agenda was to mainstream it in all programs of the Ministry. He added that issues of inter-country trade should be given the needed consideration to open up the African market to agricultural produce.

4.1.3 Next Steps by CSIR/CORAF/FARA

The key actors in the organization of the Consultation Workshop, namely the CSIR, FARA and CORAF/WECARD were given the opportunity to make their concluding remarks as part of the way forward following the National Consultation.

4.1.3.1 CSIR

In his concluding remarks, the Director-General of the Council for Scientific and Industrial Research (CSIR), Prof Victor Kwame Agyeman, pledged the support of the CSIR to engage with the critical stakeholders whose inputs would inform the success of the Agenda. He said the CSIR would build the right linkages with the relevant agencies to ensure that together in a concerted effort, the Science Agenda was carried to its logical conclusion. He said in three days' time the Team put together would produce the Country Document for the Science Agenda after which the consultation process would continue at the continental level.

He said in the meantime, the CSIR would work towards ensuring that the Agenda was incorporated into Ghana's Medium-Term Agriculture Sector Investment Program 2 (METASIP 2) and the Ghana Shared Growth and Development Agenda 2 (GSGDA 2) and the Science, Technology and Innovation Policy (STIP) documents, which were all under review. He noted the key role played by the CSIR-STEPRI in the review of the STIP document and expressed the hope that the Institute would bring to bear their expertise to shape the document towards the Science Agenda.

Prof. Agyeman said the CSIR would identify some important influential personalities to champion the Science Agenda.

4.1.3.2 CORAF/WECARD

The representative of CORAF/WECARD, Mr. Patrice, for his part said CORAF/WECARD would continue to work with FARA to ensure the actualization of the Agenda. He reported that a similar Consultation Workshop was being conducted in Senegal, one of the Tier One countries. He said four M & E specialists would be engaged to help finalize the Document and come up with the mapping of the Theory of Change.

4.1.3.3 FARA

Speaking on behalf of FARA, the Director of Research and Innovation, Dr. Irene Annor-Frempong, described the Science Agenda as a call to action and a rallying point to harmonize research efforts. She added that it represented tool for making a business case for the Science Agenda and a case for increased investment in agricultural research. This, Dr. Annor-Frempong, said meant making a shift from the business-as-usual attitude of doing agricultural research.

Vb: NATIONAL CONSULTATIONS

OBSERVATIONS, CONCLUSIONS, RECOMMENDATIONS AND WAY FORWARD

Based on deliberations at the National Consultations, what follows are some of the key observations, conclusions reached and recommendations made by the participants.

Vb.1 Observations and Conclusions

- 1) **Critical Importance and Timeliness of the Science Agenda:** The Science Agenda is a critically important intervention in Africa's agriculture. It will provide a strong impetus for the transformation of Africa's agriculture and enable the continent to achieve CAADP-Malabo goals and targets. Its focus should however not be solely on improving productivity. It should foster application of existing innovations and look into improving nutritional value of food.
- 2) **Strong Outreach to National Stakeholders:** A broad range of stakeholders should be cultivated to facilitate its implementation. In essence, the institutions composing NARS and AIS should be more inclusive. Engagement of the private sector should be significantly enhanced. NARS must also embrace the participation of other key actors particularly the private sector, NGOs, extension organizations.
- 3) **Stakeholder Framework:** A new stakeholder coordination framework may not be required for the implementation, partnership and coordination of S3A implementation. Existing frameworks like ASWAp (Malawi) should be strengthened to include stakeholders that are not present, especially Universities research centres and CGIAR institutes in the countries.
- 4) **Improved Institutional Cooperation and Collaboration:** Institutions within the NARS need to step up collaboration for effective implementation of the Agenda. At present, this is inadequate, especially between African Universities and Research Centres. The result is avoidable duplication of scientific research and waste of resources.
- 5) **Operational Model for Implementation of the Science Agenda:** The Science Agenda is not a project or a separate program. It is a guiding framework for more intensive application of science in Africa's agriculture. To this end, its implementation requires that it be mainstreamed into existing national agricultural development strategies and implementation plans. There will therefore not be a single operational model for the implementation of S3A at the country level. Each country will develop its implementation model that is suitable for its own context. However, countries should be mindful of the need to define clear entry points in terms of priorities for S3A to add distinct value to existing strategies and programs. Otherwise, it would be difficult to break away from the self-perpetuating business as usual circle. The Science Agenda is a new way of doing things.
- 6) **New Generation of Farmers and the Youth:** S3A should have a well-defined strategy for addressing the needs and enabling environment for the new generation of farmers and entrepreneurs. Some further work is needed in this area in terms of approaches and mechanisms.
- 7) **Success Factors in S3A Implementation:** The Science Agenda that has been rolled-out is a guide to countries. Its translation into an implementation plan will require a number of factors or inputs at the level of the countries. Central among these will be leadership role of the government, designation of focal points or responsible institutions for mainstreaming the Agenda and reporting on implementation; availability of financial resources; human and institutional capacity; enabling policy environment; and a robust knowledge management and information support system. A sub-strategy for each should be elaborated to guide countries' implementation arrangements.

Vb.2 Recommendations

- 1) **Framework for S3A Implementation:** The theory of change and results framework for each country should be finalized, endorsed by national stakeholders and made widely available to all stakeholder institutions
- 2) **National Focal Points:** FARA and the SROs should follow up with the Tier 1 countries to ensure that national focal points are designated to coordinate implementation and reporting on the performance of the Agenda.
- 3) **Financial Resources for S3A Implementation:** Countries should look inward within national budgets for agriculture; science, technology and innovations; education, among other related sectors as well as Public-Private Sector Partnerships to support implementation of the Agenda. These should be supplemented with investment proposals to development partners. Each country will therefore need to develop a concrete financing strategy for implementation of the Agenda.
- 4) **A Robust Knowledge Management and Information Support System:** FARADaInFormS is a veritable platform that could provide knowledge and information support to the S3A. It should be enhanced to regularly and systematically collate, process and share implementation strategies, programs and lessons. For instance, experience in the implementation of Innovation Platforms (including learning from the WAAPP platforms) should be shared.
- 5) **National Validation Workshop:** Each Tier 1 country should organize a National Validation Workshop sequel to the National Consultation held. This should be developed to the following issues:
 - a. Review and endorsement of the recommendations of the Report of the National Consultation.
 - b. Review and endorsement of the Country Theory of Change and Results Framework
 - c. Proposal and endorsement of National Focal Points for S3A Implementation
 - d. Outline of national strategy for financing implementation of the Agenda
 - e. Country level implementation arrangement:
 - i. Link with CAADP and other national agricultural and STI frameworks
 - ii. Country commitment letter
 - iii. National strategy documents into which S3A will be mainstreamed
 - iv. Implementation schedule, milestones and targets
 - f. Regular communication and dissemination of information on progress
 - g. Monitoring, evaluation and reporting on S3A Implementation
- 6) **Sustainable Financing of S3A Implementation:** Sustainable financing for S3A could be placed within the context of CAADP 10% of national budget allocation to the agricultural sector, 1% of GDP allocation to Science, Technology and Innovations under STISA 2024, and innovative sources of financing. Dependence on donors will not provide sustainable long-term solution to the effective implementation of the Science Agenda. Donor support however has a vital role to play.
- 7) **National S3A Capacity Building Strategy and Program:** At the heart of the successful implementation of the Science Agenda is the existence of adequate and responsive human and institutional capacity. Well capacitated national policy and program coordinating institutions and agencies; well-staff, equipped and resourced national agricultural research institutes

Vb.3 Emerging Key Priorities for S3A Interventions

(a) Technical Priorities

The consultations showed that country circumstances and state of agriculture, especially in terms of capacity for innovations, differ across the continent. Equally, they also revealed similarities or commonly shared challenges and opportunities in the implementation of the Science Agenda. Thus,

while there were variations in areas of strategic priorities for S3A interventions, generally the following were some of the key priorities identified by the countries during the consultations.

- 1) Management of post-harvest losses.
- 2) Strengthening capacity for aquaculture
- 3) Expansion of knowledge and effective use of Innovation Platforms, drawing on and disseminating lessons from platforms of existing programs (e.g., WAAPP)
- 4) Food quality and nutritional value of food
- 5) Strengthening bio-fortification to achieve food and nutritional security.
- 6) Enhancement of research into nutritionally rich varieties of crops as against singular focus on increased productivity.
- 7) Food safety with a focus on aflatoxins
- 8) Improvement on collaboration and networking among stakeholders.
- 9) Enhancement of the level of adoption of existing technologies
- 10) Improvement of dissemination of existing technologies.
- 11) Development of appropriate technologies to double crop and livestock yields by 2025
- 12) Production and supply of high-quality seeds accessible to farmers.
- 13) Research to promote availability of rich and nutritious food all through the year to address issue of seasonality of food crops.

(b) Institutional and Process-Related Priorities

In addition to the technical priorities, the consultations identified a number of priorities in the realm of institutions, systems, processes, and practices that S3A implementation arrangements should seek to address. Among these are:

- 1) Farmers' access to low-cost finance and structured markets. A long term sustainable financing arrangement for small scale farmers is required. Schemes should facilitate low-cost borrowing; farmer-friendly repayment terms; and affordable individual and group insurance.
- 2) S3A should consider appropriate business models for upscaling new technologies and extension services. It will not be sustainable for innovations and extension services to be delivered for free. A strategy of moving from free to affordable fees should be in for consideration.
- 3) knowledge management, S3A should seek to define clearly the type of knowledge and information it wants to generate, collate and disseminate and the stakeholders who need this input and for what. The products, services and expected outcomes of the knowledge management system should be cogently articulated. The KMS should build on existing data and information management platforms, where these exist. FARADDataInformS should have defined strategy for working with these. It should seek to harmonize the formats in which these are provided and ensure easy access, especially online. FARADDataInformS may have to be developed into a continental Knowledge and Information Centre for S3A and Africa's Agriculture.
- 4) The regional and national consultations have made considerable progress in tackling most of the issues in the rolling out of the Science Agenda. A second round of highly specialized region or continental consultations is required to focus on salient issues, particularly that of the priorities it should address and finance of implementation, among others.
- 5) Need for regular training and knowledge sharing among Innovation Platforms members and stakeholders.
- 6) Business models that facilitate commercialization of innovations and research outputs must be developed.

VI.4 Way Forward

The end of the Regional and National Consultations marks the beginning of a new phase in the implementation of the Science Agenda. This is particularly the case, when the strategy is a framework

that has to be adopted and mainstreamed by the government. As a way forward, this report puts forward the following:

- 1) **National Validation Meetings:** Organization of follow-up National Validation Meetings by Tier 1 countries to reach out to a larger number of stakeholders who did not participate in the National Consultations.
- 2) **Confirmation of National Focal Points:** Tier 1 countries be requested to confirm national focal points for implementation of the Agenda.
- 3) **Signing of S3A Memorandum of Commitment:** All Tier 1 countries and others subsequently should be encouraged to sign a Memorandum or Letter of Commitment for deposition with FARA. The SROs should be one of the signatories for the countries in their regions. FARA in consultation with the SROs should develop and agree on the format for the MoC or LoC drawing inspiration from the CAADP National Compact of stakeholders.
- 4) **Production of Country S3A Strategy Document:** Each Tier 1 country should be encouraged to produce a National S3A Document (Implementation Strategy) to articulate its priorities and map out its implementation pathway. The document should incorporate the endorsed Theory of Change and Results Framework for the country.
- 5) **S3A Regional Implementation Strategy:** ASARECA, CCARDESA, CORAF and NASRO should each consider developing a regional implementation strategy for the Agenda. This should draw on the countries' S3A strategy documents.
- 6) **Cultivation of Champions for S3A Implementation:** The focal points or institutions in each country should launch a drive to cultivate national champions or influential individuals in support of the Agenda.
- 7) **Alignment of S3A Value Addition:** The expected value addition of S3A should be aligned with those of existing ASWGs to harmonize performance indicators and measures.
- 8) **Use of Existing Institutional Structures and Policy Frameworks:** Countries should be encouraged to use existing institutional structures and policy frameworks to implement S3A at the national, regional and continental levels.
- 9) **FARADaInFormS as Knowledge Management Framework:** Existing data, knowledge and information system should be built into or linked with FARADaInFormS to ensure complementarity.
- 10) **Capacity Strengthening:** S3A has implications for how farmers and agri-business entrepreneurs are trained and re-skilled. It should therefore contribute to curriculum reform at tertiary education level, including in vocational training schools.

ANNEXES

LISTS OF PARTICIPANTS

ANNEX I: PARTICIPANTS AT REGIONAL CONSULTATIONS

SOUTHERN AFRICA REGIONAL CONSULTATION, MALAWI: LIST OF PARTICIPANTS

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ANNEX III

TOPIC FOR PANEL DISCUSSIONS AT REGIONAL CONSULTATION: ACTORS FOR DRIVING THE NATIONAL INNOVATION SYSTEMS FOR S3A IMPLEMENTATION – ROLES AND FUNCTION FOR COLLECTIVE ACTION

ISSUES

1. Is strengthening a National Innovation System (NIS) a core value added of the science agenda? What does an effective NIS in the context of agriculture entail?
2. Who are the main actors in a country's agricultural innovation system?
3. Is there a role for regional and international players? Who are the key regional and international actors?
4. How would you characterize the responsiveness of NIS to agric. challenges – taking response to the current army worm as an example?
5. What do national actors need to play effective role in NIS?
6. What is your proposal for actors to drive NIS in the context of S3A?
7. What are your concluding thoughts on making NIS more effective through S3A?

ANNEX IV

MEMBERS OF PANELS AT REGIONAL CONSULTATIONS

Malawi Regional Consultations	Rwanda Regional Consultations	Ghana Regional Consultations
<ol style="list-style-type: none">1. Dr. Yemi Akinbamijo, Executive Director, FARA2. Dr. Simon Mwale, Ag. Executive Director, CCARDESA3. Dr. Stephen, Africa Regional Representative, CIMMYT4. Mr. Max Olupot, Partnerships, Planning and Learning Officer, AFAAS	<ol style="list-style-type: none">1. Dr. Irene Annor-Frempong, Director, Research and Innovation, FARA2. Dr. Cyprian Ebong, Executive Director, ASARECA3. Dr. Mark Bagabe, Director-General, Rwanda Agriculture Board	<ol style="list-style-type: none">1. Dr. Irene Annor-Frempong, Director of Research and Innovations, FARA, Ghana2. Dr. Alioune Fall, Chairperson, CORAF/WECARD Board, Senegal3. Dr. Mina Quaye, CSIR, Ghana (representing Director-General), Ghana4. Dr. Mohamed Suleman, NASRO, Egypt5. Mr. King David Amoa, Representative Farmers' Association, Ghana6. Dr. Ayesha Itakeem, Managing Director, African Connections Ghana, Ltd and Vice President, Ghana Forum for Agricultural Advisory Services

ANNEX V

ISSUES FOR BREAK-OUT SESSIONS AT REGIONAL CONSULTATIONS

What are the Existing S3A Activities

- What kind of research is being done at present at the country level that contributes to the implementation of the science agenda in the following areas:
 - Sustainable productivity in major farming systems
 - Food systems and value chains
 - Agricultural biodiversity and natural resources management
 - Mega trends and challenges
- Who are the likely key actors that are currently involved and who are the actors that need to be involved to promote the science agenda nationally, regionally and across the continent and what types of behaviour changes are needed?
- What are the challenges you face in terms of implementing the science agenda?

Theory of Change and RF

Knowledge Management

- What do you expect FARADATAIInformS to generate for you to achieve your data and information needs?
- What data systems are you aware of? Which ones do you use most often and why?
- What metrics and data types will you feed through FARADATAIInformS
- What data infrastructure is required to feed data regularly to FARADATAIInformS

Sustainable Financing for S3A

- Present financing situation at the country for AR4D
- Ongoing responses to the financing challenge
- Sources from which AR4D is being financed
- Potential sources for financing S3A projects and programs at country level

Effective Modalities

- How could regional cooperation be improved so as to prioritize common agenda items that accelerate agricultural development?
- At national level, what partnerships are currently effective in developing innovations along value chains for small-holder farmers?
- How feasible is it that Africa will eliminate hunger and halve poverty by 2025 and how will STI be revamped at national level to assist that goal?

Creating a Favourable Policy Environment for Application of Science (using PPI)

- What are the existing science, technology and innovations policies and legislative frameworks that are intended to promote conducive agricultural investment in your country?
- Which institutions/departments are involved in the implementation of science policies in your country? List them and provide contacts of the coordinators where possible.
- How well are the institutions coordinated?
- What data are available to help support the assessment of the various components of the agricultural innovations system – please, provide sources

Strengthening Human and Institutional Capacities for the Implementation of the S3A

- What the key capacity needs of your country and region?
- What is that is need for these capacities to be built?
- What are the limiting factors?

Country Level Implementation Platforms for S3A

S3A Country Engagement Processes and Effective Modalities for Collaboration at all Levels (National, Regional and International)

- Identify the gaps in the process for effective engagement
- Provide descriptive notes on each of the steps
- Indicate the actors to drive the process in a stepwise fashion

- Indicate any other success factors for effective engagement

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