Food and Agriculture Organization of the United Nations

GUIDELINES FOR IMPROVED AGRICULTURAL RESEARCH FOR DEVELOPMENT IN EGYPT

2023

GUIDELINES FOR IMPROVED AGRICULTURAL RESEARCH FOR DEVELOPMENT IN EGYPT

Shaban Salem
Agricultural Research Center of Egypt (ARC)

Eman Abdallah
Agricultural Research Center of Egypt (ARC)

Atef Swelam
Food and Agriculture Organization of the United Nations

Selvaraju Ramasamy
Food and Agriculture Organization of the United Nations

Zijuan Liu
Food and Agriculture Organization of the United Nations

Food and Agriculture Organization of the United Nations
Rome, 2023

Required citation:
Salem, S., Abdallah, E., Swelam A., Ramasamy, S., Liu, Z. 2023. *Guidelines for Improved agricultural research for development in Egypt.* Rome, FAO. https://doi.org/10.4060/cc6053en

Cover photo: ©FAO/Khaled Desouki

CONTENTS

ACKNOWLEDGEMENTS

This document is a result driven from the comprehensive assessment of national agricultural research and extension systems with a special focus on agricultural research for development in Egypt which received great support from numerous stakeholders, including research organizations, farmers, extensionists, researchers and individual experts working in agricultural research for development (AR4D) system in the Arab Republic of Egypt. The authors are grateful to all the key informants, researchers, farmers, and extension officers for sharing their knowledge and insight to address the research questions examined during the assessment study. The authors are particularly grateful to Prof. Dr Mohamad Soliman, the President of Agricultural Research Center of Egypt for his great support and excellent insight during the implementation of the study. Special thanks to Dr Nasredin Hag Elamin, the FAO Representative in Egypt and his team for their great support in the organization of the study. The authors would like to thank Dr Scott Christiansen, Independent Consultant, Agricultural Research Systems for his review and editing of the documents.

©FAO/Aref Swelam

CHAPTER 1: INTRODUCTION

Agriculture is a major sector in Egypt's economy providing food for domestic consumption, in addition to contributing to foreign trade. Although industrialization has received greater attention in recent years, the country continues to depend largely on agricultural production. The agriculture sector represents 15 percent of Egypt's gross domestic product (GDP) and 25 percent of its workforce. Gender wise, agriculture employs around 45 percent of the female workforce. It is worth noting that most of the farming activities in Egypt are dominated by small-scale farmers who account for 25 million of those working in the agriculture sector, representing around 60 percent of the rural population. The main goals of sustainable agriculture and rural development is to increase food production in a sustainable manner and to reduce food loss and waste. These goals would be used to curb, or even bridge, the growing food gap and ensure stable supplies of nutritionally adequate food to achieve food and nutrition security and improve the standards of living in rural areas. Additionally, these goals could increase employment opportunities, generate income for poverty alleviation, and conserve and rehabilitate natural resources and the environment in marginal lands to maintain sustainable production system.

The Government of Egypt (GOE) ambition is to enhance the performance of the agriculture sector and create jobs for young graduates through expansion of cultivated lands by reclaiming new areas in the desert to meet the food demands of an increasing population. Despite the importance of the sector, the level of investments in agricultural research, which is critical to driving its growth and development, has been very low over the last 20 years.

National Agriculture Research System (NARS) in Egypt have a deeper understanding of the challenges both at the farm and system level, but they still need technical and financial support to increase their efficiency to sustainably enhance the impacts of agricultural research for development (AR4D) projects and achieve national food and nutrition security. Building the capacities of these institutions, expanding, and strengthening their abilities to respond to growing challenges is critically important for the achievement of national food and nutritional security for the country. Technical support, in the form of national guidelines and capacity enhancement can provide NARS with essential tools to streamline their efforts, increase their efficiency, and achieve better outcomes and impacts.

NARS in Egypt face multiple interlinked challenges due to the dynamic nature of the drivers of change and the complexity of the institutional structures and linkages within the country. Institutional linkages between actors in the NARS represent an important factor where cooperation allows for the integration of efforts, which saves time, effort and financial

resources and enriches the exchange of knowledge for better implementation of applied research to achieve sizable impact. Weak linkages between the NARS and stakeholders (either the government, farmers, extension agents, private and public investors, or national and international entities) usually leads to failure of decision-making to adopt the benefits from the scientific knowledge produced by researchers and innovators. Another major challenge for NARS is the insufficient financial support for agricultural research, extension, cooperative services. The Global Innovation Index issued by the Academy of Scientific Research and Technology in 2018 ranked Egypt fifty third in terms of research and development (R&D) expenditures. However, the average value of expenditures on R&D as a percentage of GDP in Egypt increased from 0.68 percent in 2017 to 0.72 percent in 2018. This is still well below the 1 percent targeted in the 2014 Egyptian Constitution and far below the world average of 1.17 percent in 2018.

Food and Agriculture Organization of the United Nations supports NARS to improve the research impact and strengthen the linkages amongst various actors. In this connection, OIN conducted a comprehensive assessment of national agricultural research and extension systems with a special focus on agricultural research for development in Egypt to establish a deeper insight into challenges and opportunities that are facing NARS in Egypt.

The assessment study provided a good understanding of the challenges and opportunities related to Egypt's agricultural research and organizational development to draw lessons and develop supporting guidelines. The data collection approaches of this study included i) literature review analysis, ii) focus group discussions for different stakeholders including researchers, academia, extension workers and farmers, and iii) key informant interviews for national and international experts and officials. The study aimed at enhancing efforts exerted by Egypt's NARS in the field of developmental research by formulating an integrated and coherent approach for research and dissemination of proven technologies and practices. Such approaches are expected to address key bottlenecks and provide the needed direction and means for sustainable improved implementation of AR4D. The direct outputs of this study included:

- clear understanding of the organization and management of NARS;
- guidelines that can be followed to effectively help AR4D implementation including assessing problem identification, research needs, demonstration, and out-scaling of proven agricultural technologies;
- assessment of the institutional linkages and collaboration within and between NARS actors and extension systems;
- a policy brief that offers specific recommendations to ensure effective adoption of proposed methodologies for enhanced impact of NARS's AR4D efforts.

The outputs of this study ultimately led to the development of comprehensive guidelines for improving AR4D through empowering the capacity of Egypt's NARS to better inform and influence policies and facilitate institutional changes required in the agriculture sector

CHAPTER 2:
LESSONS LEARNED

The agriculture sector in Egypt has been facing several challenges in achieving food security; these challenges include rapid population growth, soil and water issues, land fragmentation, low adoption of new technologies and practices, lack of marketing information, inadequate support services, weak institutional coordination, and lack of proper agricultural and rural development policies. Agricultural research could provide appropriate solutions to address such challenges and achieve sustainable development goals. However, the NARS in Egypt has been facing several challenges that resulted in impeding the strong contribution of agricultural research for development (AR4D) to overcome the problematic issues. Therefore, it is highly important to identify possible pathways to tackle these challenges, which in turn would strengthen the NARS to implement their mission and achieve their mandates. The current study was a step forward to support efforts exerted by Egypt's NARS in AR4D to draw lessons and develop a supporting guideline based on a case study.

1. Organizational set-up and linkage between the NARS organizations

National Agricultural Research System (NARS) comprises all entities that carry out agricultural research in various fields in the country. Most agricultural research in Egypt is conducted by public organizations, including research centres, research institutes and universities in addition to a few private research institutions and universities. Additionally, there is a considerable number of international research organizations that are conducting AR4D in close collaboration with NARS, such as the International Center for Agricultural Research in the Dry Areas (ICARDA), the International Water Management Institute (IWMI), the World Fish, the International Food Policy Research Institute (IFPRI), Italian Cooperation, European Union, World Bank and other entities.

The assessment study that looked at the structure of NARS in Egypt indicated that three main research for development centres exist in the country. The Agricultural Research Centre (ARC) and the Desert Research Centre (DRC) are leading the agricultural research in the country under the Ministry of Agricultural and Land reclamation (MoALR). The National Water Research Centre is the lead centre for water-related research in the country under the Ministry of Water Resources and Irrigation (MWRI). The National Research Centre (NRC) of the Academy of Scientific Research and Technology under the Ministry of Higher Education and Scientific Research is covering a full spectrum of research.

However, ARC is the officially designated lead centre for agricultural research in Egypt with distinguished capacity for conducting a wide range of agricultural research covering all fields of research related to the national agricultural development strategy. The assessment of linkages between the ARC and other national agricultural research institutions indicated the existence of interactions through the Regional Council for Research and Extension. This Regional Council was established to link national agricultural research organizations in Egypt. However, the linkages among them still need improvement by effectively promoting the coordination among different actors including decision-makers, scientists, researchers, extension officers, private sector and farmers. Thus, exploring the possibilities to reform and enforce the current coordination framework and policies in a way that ensures efficient and effective coordination between ARC and other research institutions in AR4D is essential.

It is also suggested to move towards decentralization to widely adopt participatory approaches in the development, implementation, and follow-up of strategic research plans. In addition, it is suggested to consider the establishment of partnerships and research alliances to conduct collaborative research activities and projects to enhance institutional linkages among NARS actors. These partnerships would ensure tapping available resources for better utilization. For instance, establishing a national database and roster to gather information on different research fields and participating research personnel to serve as a platform to stimulate develop collaborative research projects. This database also could include documentation of previously conducted research projects in all disciplines of agriculture. This would avoid duplication of effort and better align with Egypt's Sustainable Agricultural Development Strategy towards 2030 (SADS 2030).

2. Institutional capacity for research

Despite the large institutional capacities for research in Egypt, discussions with researchers revealed that they lack upgraded facilities as well as some key- skills on AR4D. Thus, bringing their knowledge and skills to up-to-date is critically needed. It is recommended to develop specialized capacity building programmes that aim at providing specific training to qualify the research staff and enhance their skills on the key-indicators of AR4D such as applicability, adoptability, affordability, gender sensitivity, monitoring and evaluation, feedback protocols, etc. In addition, designing tailor-made trainings on equipment, instruments, technologies and other facilities available in the NARS system.

The need to enhance researchers' capabilities to well design, plan and implement AR4D projects was also reflected in the discussion. That can be achieved through promoting the implementation of joint projects to encourage teamwork spirit; periodical on-job training to ensure updated knowledge, information, and skills. This means of updates will improve the standards of research staff to better conduct AR4D, benefit from available funding opportunities and effectively scale-out their research outputs and create the targeted sizable impact. Additionally, researchers highlighted other areas for improvement which were technical reporting and publishing in international peer reviewed journals, project proposal

writing and communication and collaboration with international research organizations. Therefore, all these areas will be considered in the training programmes to be delivered through the current study.

3. Linkage between research and extension

Extension officers are the vital link between researchers and farmers. It is therefore highly important to identify the main challenges affecting the performance of extension officers to keep that link efficiently active. The literature analysis and participatory discussion revealed that weak means of communication represented a real constraint to the delivery of extension services, shortage in agricultural extension personnel, lack of financial support, and the lack of trained, informed and up to date extension officers all are limiting the functioning of extension and advisory service and its link to research and farmers.

The existence of proper communication between extension officers and both researchers and farmers represent the basis for keeping effective and active links with research. However, there is a shortage in agricultural extension personnel because of ceasing the recruitment of new extension officers due to lack of financial resources and lack of on-the-job training. In addition, there is a need to strengthening the existing linkages between the agricultural extension system and all relevant institutions and stakeholders during the cycle of AR4D projects. In this connection, and from the participatory discussion with researchers and extensionists, the following suggestions were offered:

- provide sufficient technical, administrative, and financial support for agricultural extension bodies for proper and efficient performance of extension services delivery;
- enhance extension officers' contribution in decision-making on the research topics in their organizations where they can reflect on the community needs and problems that need interventions from research. In addition, they may report on previously implemented projects which helps to avoid redundancy or overlapping in order to better utilize the available already scarce resources;
- establish and strengthen linkages between extension officers, researchers and decision makers, which is highly important when setting the research priorities at national level;
- establish an efficient mechanism that links project managers to both the agricultural research system and the agricultural extension system;
- provide sufficient funds and equip extension officers with appropriate tools, knowledge, and skills to properly function and deliver the required services that farmers expect;
- establish strong linkages between Community Development Associations (CDAs) and the agricultural extension system as closely related partners in development, where they can support the role of extension services.

4. Implementation of agricultural research for development (AR4D)

Science and technology play a leading role in the advancement of countries and societies in the world. Therefore, research is the centre-point for achieving sustainable development goals in all sectors of the economy. As an agriculture-based economy, agricultural research and innovation play a significant role in improving sustainable food production and enhancing farming system productivity in Egypt. New applied agronomic practices, high yielding varieties, improved animal breeds, proper modern machinery, improved soil and water management practices, contribute to efforts exerted to support small-scale farmers to alleviate poverty, combat hunger, improve food system and increase income to farmers with poor access to resources. Consequently, investing in agricultural research is seen as one of the fastest and efficient methods to overcome the existing challenges. Thus, ensuring an enhanced food production system that protects the vulnerable through applied agricultural research is a top priority.

4.1. Challenges in implementing AR4D

The challenges in implementing AR4D in Egypt are a combination of several factors that limited the performance and output of its organizational, planning, and implementation mechanisms in the country. The participatory discussions revealed that the limitation of financial resources, low staff capacity on AR4D, weak institutional coordination and weak linkage between research and extension, were the main challenges facing NARS in performing AR4D projects. The performances of the various key players (namely, the decision makers, researchers, project managers, farmers, and extension officers) were limited by several related problems that negatively affected the implementation and/or impact of AR4D over the last 10 years. The participatory discussions further revealed that the extension officers did not have adequate mobility and logistics to work with farmers and the farmers could not fully benefit from AR4D because they lacked access to the new technologies and improved practices.

Farmers are considered the main beneficiaries and end users of AR4D projects outputs. Analyzing the main challenges that affect their adoption of the introduced interventions as service recipients is a crucial step towards accelerating the adoption rate to achieve the targeted impact of AR4D projects and thus the agricultural development goals. The analysis of challenges facing farmers showed the importance of enhancing famers' contribution in decision- making on research topics since they are the ones who are fully aware of real problems on the ground thus they can significantly contribute to identify their needs to be addressed through AR4D interventions. Accordingly, their enthusiastic participation usually leads to the success of the implemented projects and ensures their ownership of the project outputs. This can be done by involving influential lead farmers from the local community who can play a key role in linking farmers and project staff, which eases project implementation. It is also suggested to strengthen the role of Community Development Associations (CDAs) as active actors in communicating the research results to farmers.

4.2. Enhancing the institutional framework and research arrangements

Participatory discussions revealed that there are several coordination mechanisms for the institutional frameworks that coordinate the operations and functions of NARS in Egypt which are not functioning well on the ground, mainly due to the limitation of resources. This suggests that there is a need to enforce the existing coordination mechanisms supported by legal frameworks and establish a timely updated database containing records of implemented AR4D projects to avoid redundancy and overlap when designing or implementing further projects. It is also suggested to develop a binding follow-up mechanism for implementation of the strategic plans and monitor the performance of research staff at both universities and research centers. Moreover, it would be helpful to design a timeframe and measures to ensure commitment, as well as inducing substantial changes to cultural and political attitudes, operation of universities and research centers, and private sector who are involved in AR4D.

4.3. Research planning and implementation

From the participatory discussions held with the researchers, it was gathered that the farmers/end-users were not included regularly in the process of research gap identification. To promote the process of research planning and implementation, it is suggested to perform periodic updating of the research agenda to stay current with the changing national and international demands. Deep understanding of the prevalent conditions and community needs in the targeted potential project area are needed before developing and implementing a project to address farmers' concerns and needs. It is also suggested to include and strictly apply good monitoring, evaluation, learning and accountability mechanisms to ensure timely delivery of outputs and the efficiency of resource utilization.

The participatory discussions further highlighted the urgent need for the enhancement of several knowledge and skill-related changes on AR4D among the NARS researchers in Egypt. These included, but were not limited to project proposal writing, project management, risk management and monitoring and evaluation knowledge and skills. Opportunities should therefore be provided for the NARS researchers to upgrade their knowledge and skills in those areas, as this will not only facilitate their work and develop their skills, but also it should enable them to contribute more effectively to AR4D implementation in the country and ensures achieving a sizeable impact on the smallholder farmers and end-users.

Participatory discussions revealed that special training on project management skills is critically required. Additionally, providing incentives in managing AR4D projects is also needed to encourage and motivate researchers and project managers to function effectively in managing their projects. The discussion with researchers indicated that technical guidance, especially in multi-disciplinary projects, training on monitoring and evaluation systems, adopting participatory approaches in the design of the country's National Strategy are all necessary to ensure that the introduced AR4D activities are demand-driven, addressing

problems encountered on the ground at farmer level and ensuring the stakeholders' ownership of the introduced solutions.

The participatory discussion highlighted the need, under the leadership of ARC, to develop a unified set of criteria and indicators for and provide scientific training for researchers on how to develop project proposals by fulfilling these criteria. Moreover, the discussions with experts and researchers revealed that the research and extension staff personnel need improvement and it was suggested to increase the number of qualified researchers and extension staff, improve their salaries and redistribute them equitably across the country, since most of highly qualified researchers are centralized in the ARC headquarters in Cairo. In addition, it is recommended to attract and support talented young professionals and undergraduate students and provide them with capacity building programmes in the field of AR4D projects and sustainable development.

4.4. Technical, administrative and financial support to ARC

ARC is the lead institution on agricultural research in the country, therefore technical, administrative and financial support to ARC is considered critical for enhancing and promoting its performance. Discussion with researchers from ARC suggested the need to provide sufficient and stable fund flow for ARC to deliver its mandate and achieve its mission to advance the food security of the country. From the discussion with researchers and key informant interviews, it was also strongly recommended to mobilize and increase local funds allocated to sustainably implement AR4D activities and projects through self-reliance and reducing dependency on external funds. The contributions from the private sector and CDAs can play a key-role in this regard. The Government of Egypt can promote the contribution of private sector by adopting tax incentives and regulatory reform programmes to ensure enabling environment to stimulate private- sector contribution in supporting AR4D.

4.5. Contribution of stakeholders to decision-making and implementation of AR4D

The main function of the national agricultural research organizations in Egypt is to carry out adaptive research that addresses the community needs. The participation of all relevant stakeholders in AR4D activities, starting from the decision-making to the evaluation of project outcomes is important to ensure that their needs and concerns are thoroughly addressed to assure the value added and impact of introduced interventions. The results of the participatory discussions suggest that unlike the researchers, most of the extension officers and farmers were excluded from the decisions regarding the formulation and selection of research topics of projects implemented in their areas.

Lessons learned from analyzing the aspects related to the implementation mechanisms of AR4D indicated that, to facilitate the function of agricultural researchers, it was suggested to ensure that all relevant stakeholders are effectively involved in research gap identification and participate in the implementation of AR4D activities in the country. It is also suggested to enhance young researchers' role in the planning, implementation, and management of AR4D project to enhance their capacity in the field of science, technology and innovation. Gender mainstreaming in AR4D is also proposed to ensure equal opportunities for all farmers regardless of their age, sex, education, and culture.

5. Monitoring, evaluation and learning (MEL) of AR4D

MEL system is critical for the success of AR4D projects, ensuring proper implementation of the project workplan, keeping progress on track, and providing feedback from farmers and stakeholders that identifies and rectifies deviations encountered before, during and after project implementation. The desk review analysis and focus group discussions indicated that MEL was a key component for successful implementation of AR4D. It is important to build the capacity of researchers and extension officers in incorporating and adopting proper MEL mechanisms in their AR4D projects, in addition to sustainability and exit plans. Devoting specific attention to the feedback received from farmers is considered very helpful for the vital role it plays in diagnosing the problems that occurred during and after the implementation of AR4D projects.

6. Project sustainability and accountability for AR4D deliverables

A proper sustainability plan for AR4D projects is highly important to ensure that the beneficiaries continue to benefit from the services delivered by the project following its closure. The results of the participatory discussions indicated that most of the AR4D projects implemented in Egypt over the last 10 years did not appear to have sustainability plans or exit strategies, as the services or results delivered by the projects could not continue to be adopted after the projects ended. This could be a result of inappropriate project design from the beginning. Most of internationally funded-AR4D projects delivered to farmers are normally focusing on promoting the sustainability of the interventions they supported while this approach is absent in most of the cases for nationally funded projects. The participatory discussions also indicated that mechanisms to ensure accountability for AR4D results were not well enough thought out or clear to participants.

To ensure sustainability, technologies that can be easily reproduced independently by the farmers are the types of interventions that should be targeted mainly by AR4D projects. This is important because any such technology can easily be out/up scaled and advanced for commercialization by the local entrepreneurs and small- scale businesses. Additionally,

NARS in Egypt should ensure that, all AR4D projects considered for implementation in the country should provide viable sustainability plans and exit strategies, as this will both ensure a high impact and value for money. Additionally, proper accountability for deliverables, efficiency in resource use and value for money in AR4D implementation could be also assured.

7. Impact of AR4D

Research for development aims to promote new technologies, technical innovations and improved practices that lead to enhanced farming productivity and improve the resilience, livelihoods and food security for small-scale farmers in rural areas. Hence, to attain the desired impact, it is important to ensure that AR4D projects are properly aligned with the national priorities of the government and the technologies promoted should be applicable for use by the end-users, affordable and easy to adopt, and responsive to gender sensitivities, with no or limited adverse impact on the environment.

Egypt's Sustainable Agricultural Development Strategy (SADA 2030) listed challenges that the agriculture sector is facing and how to address them. Although AR4D projects in Egypt are aligned with the national strategy, still there are challenges that can be addressed through new technologies and improved practices and innovations developed through scientific research. AR4D is needed to solve problems encountered by small-scale agricultural producers, with tangible benefits. For instance, low crop productivities, livestock and fish, soil and water issues all can be addressed by adopting newly developed varieties, breeds, and practices.

The responses obtained from the participatory discussions indicated that the impact of AR4D projects implemented in Egypt over the last 10 years is inadequate and rated as unsatisfactory. Unfortunately, due to limited financial support for agricultural research in Egypt, the impact of AR4D projects is still not sufficiently impactful. NARS in Egypt have been doing their best to create, promote, and disseminate improved technologies but there is still much more room for improvement. In addition, the Egyptian agricultural strategy needs to be fully supported and empowered to help the NARS to achieve the targeted impacts.

The need for sufficient and stable funds for research centers and national institutions engaged in the field of AR4D is critical, where both insufficiency and instability in fund requires investing in scaling out/up AR4D projects results remains the main problem facing AR4D in Egypt. It is therefore recommended to explore the ways and means to ensure the stability of funds required for investment in agricultural research and scaling out its outputs at large scale.

©FAO

CHAPTER 3:
GUIDELINES FOR IMPROVED AGRICULTURAL RESEARCH FOR DEVELOPMENT

1. The need for AR4D guidelines

The agriculture sector in Egypt faces many interlinked challenges in achieving food security. These challenges are tied to rapid population growth, severe and increasing water shortages, climate change, low adoption of technical innovations and land fragmentation. These challenges lead to a significant decrease in farm productivity and incomes, subsequently leading to a decline in agriculture sector contribution to the GDP. Therefore, investing in agricultural research is one of the fastest possible ways to overcome these challenges. Thus, there is a need to ensure an enhanced food production system to protect the vulnerable members of society through applied agricultural research and this need is among the tasks having the highest priority.

NARS, including universities, public and private research institutions, play a vital role in advancing research on agricultural productivity. As in many developing countries, the linkage between research and agricultural development in Egypt is weak and needs to improve in many ways. AR4D, aims to improve the livelihoods of poor-resources and small-scale producers through adaptive applied, is critical for enabling resource-poor communities to improve their livelihoods. The NARS have a deep understanding of the challenges both at farm and system levels. However, NARS need the adequate technical and financial support to increase their efficiency to sustainably enhance the impacts of AR4D and achieve national food and nutrition security. Technical support, in the form of national guidelines, can provide NARS with essential tools to streamline their efforts on AR4D, increase their efficiency, and achieve better outcomes and impacts.

Based on the lessons drawn from the assessment study on AR4D, including literature review analysis and participatory discussions with various NARS actors and stakeholders in Egypt, the following guidelines are proposed to strengthen the knowledge and skills of researchers and AR4D project managers. The guidelines also include recommendations and critical elements for successful implementation of AR4D that could be considered by NARS organizations and other stakeholders to help improve the performance of the NARS in Egypt. These guidelines could also be useful to enhance collaboration among the main research organizations of the NARS and improve the institutional linkages between different actors that ensures sustainable impact of AR4D in the country.

2. Human resources

Qualifications of the human resources involved in AR4D are considered the main critical element for delivering the desired results targeted impact. The research personnel should have the necessary talents to contribute effectively to the organization's mission and mandate. However, the recruitment of the research staff in Egypt starts by hiring the new graduates from faculties of agriculture according to the law of the Superior Council of Universities based on the highest marks without fully considering the necessity of the actual talents and well-being which should be considered to drive performance and productivity of the organizations and the workplaces. AR4D organizations are critical for improving and sustaining food security, nutrition, and livelihoods in rural communities and therefore driving the real growth and development in developing economies. Hence, there is a need for a reassessment of attitudes toward job creation and personnel placement in research organizations in Egypt, if the potential and impact of AR4D is to be fully realized in the country.

Agricultural education

Egypt has 30 Faculties of Agriculture accommodating more than 20 000 faculty members who are expected to conduct research to support their teaching portfolio and to ensure their contribution to agricultural knowledge creation and outreach. In addition, at the university education level, there are 256 agricultural technical schools in 27 governorates accommodating 11 550 teachers. The primary function of agriculture colleges in AR4D systems is to educate and qualify the next generation of agricultural specialists, including researchers and extensionists to be ready to join the different agricultural labour markets. While the function of the technical schools is to educate the young professionals to be able to practice agriculture in all fields as professional practitioners.

Over the last 10 years, the type of knowledge and skills required for agricultural graduates has been changing over the time and many branches in agricultural education have been established. The agricultural education sector has recently developed a plan to advance the agricultural education in Egypt in accordance with the needs of the labour market. This plan included new and specific disciplines according to regional characteristics and needs, such as rain fed agricultural education for the north coast and in Marsa Matrouh governorate, desert agriculture in South Sinai and New Valley governorates, aquaculture in Kafr El-Shiekh, and agricultural applied technology in Port Said. However, the graduates of these universities and technical schools are still not technically qualified to meet the labour market demands, thus the quality of graduates still needs improvement; hence, there is a need for the Superior Council for Universities and Higher Education to review and update the curricula and syllabuses regularly to ensure that the graduates are well-qualified and meet the dynamic labour market demand.

Recruitment process

Human resources are considered one of the most important elements of agricultural research quality and growth in the agriculture sector. Research centers, like all government institutions, are faced with an imbalance in the structure of their staff, because of unsatisfactory hiring processes since the 1980s. This situation led to the recruitment of temporary jobs with modest salaries, which led to the tendency of these employees to obtain higher degrees with the hope of obtaining permanent research jobs. Prior to the 25 January 2011 revolution, there was a special case, where a large number of temporary employees who were employed as agricultural engineers then obtained Masters and PhD degrees, however, they were not qualified enough to work in the research field. After the January 2011 revolution, they protested, demanding research positions, despite the lack of qualifications for the requested jobs. The research centers were required to employ them, which put a burden on the quality of research products and outputs.

Attracting skilled and effective employees is critical to the success and sustainability of every professional organization, including AR4D institutions. The effective method for achieving the objectives of AR4D should be more result-driven to ensure that the results, outcomes and impact all lead to tangible improvements in the livelihoods of small-scale farmers and their households. Therefore, it is critically important to align the recruitment of research staff and their assistants with the goals and objectives of the organization.

To enhance the efficiency in the selection of staff at NARS organizations Human Resource Departments should be empowered to select staff who will contribute effectively to the achievement of the development goals, objectives, and deliverables of the organization. Therefore, the following best practices in selecting and hiring staff are suggested to be supported and facilitated by decision-makers and supporters of AR4D in Egypt:

- establish an independent and impartial recruitment process that avoids internal or external off-track influences;
- adopt a standard procedure for the recruitment and deployment of employees, supported by the relevant administrative structures and decision-making to ensure transparency and promote accountability;
- follow a regular comprehensive assessment of the staffing portfolio of the organization to identify and address any gap in the knowledge and skills of the staff:
  - implementation and documentation of staff performance monitoring and evaluation;
  - implementation and documentation of comprehensive personnel improvement and skills upgrading programmes for relevant employees.
- attract and recruit new talented employees through a guided procurement process:
  - publicize (advertise) the vacancy;
  - evaluate applications and shortlist candidates for interview;
  - notify shortlisted applicants and conduct an interview to assess their competency;
  - select the best candidate for hiring based on the result and recommendation from the interview analysis;
  - declare the results of the interview to all parties, including the interviewees and interviewers.

Staff motivation

Ensuring the necessary motivation and inspiration of competent staff should be thoroughly considered for keeping their performance at the level of quality needed. Franca et. al. (2012) defined "talents" as aptitudes that human beings are born with, and because such aptitudes are affected by the environment, they can be either strengthened or weakened if the working environment is supportive or unsupportive. Therefore, the aim of the NARS organizations should be to provide a supportive environment that encourages and strengthens the talents their staff to achieve the desired levels of performance. Some effective ways to motivate staff to sustain their effectiveness and contribution to the organization's role would be to:

- provide continuous opportunities for improvement and upgrading of their job knowledge and skills through structured and transparent capacity building programmes;
- provide competitive salaries, incentives, benefits and social security in addition to recognition of highly performing staff.

3. Functions of the NARS in AR4D

The overarching goal of NARS in AR4D is to maximize economic return per unit of land and water towards achieving sustainable food security of the country. Within the framework of the Sustainable Agricultural Development Strategy (SADA 2030), NARS in Egypt supports agricultural development through applied research and creating knowledge, innovations and technologies based on the following major actions:

- identify future research needs, priorities, and assessment of problems to achieve sustainable agricultural development;
- develop advanced agricultural technologies and technical innovations through conducting basic and adaptive research to generate a continuous flow of knowledge that increases farming productivity and reduces production costs;
- scale out promising technologies to the farming community through extension services; and monitoring their adoption by the end users;
- explore significant ways and means to conserve and better utilize the natural resources that maximizes the farming productivities in ecosystems;
- combat desertification and alleviate poverty among the inhabitants of desert areas;
- promote collaborative research programmes with international agricultural organizations and advanced universities;
- adapt modern and emerging technologies to the local conditions to benefit the agriculture sector;
- produce high-quality and high-yielding new varieties of strategic crops based on applied scientific research to achieve sustainable agriculture development.

3.1. Structure and collective functions of the NARS

The NARS in Egypt comprises agricultural education, public and private research institutions involved in agricultural research. In general, agricultural research has traditionally focused mainly on academic or basic research without sufficient consideration to the applied or adaptive research, with the exception of what the ARC does in the development of improved crop varieties, IPM practices, new livestock breeds, irrigation techniques and soil management packages. The ideal function of the research system is generating demand-driven technological options for a range of agroecological conditions to provide open-source solutions with the understanding that public extension systems would gather the interventions, technological packages, and deliver them to the farmers and irrigators. However, in reality, the agricultural research system lacks coordination among various actors, as the link between research plans in different research institutions are still very weak, and there may not be sufficient coordination between research departments, even within the same research institutions. Additionally, the link between the research and extension systems is also considered weak.

The NARS organizations may continue to exist as independent entities, however, they should collectively operate as a connected system of the various integral organizations linked by a common collaboration framework. Therefore, the main objective of the ninth programme in SADS 2030 namely "The National Project to Support Agriculture Research, Technology Transfer and Agricultural Extension" contains the following components:

- coordinate and integrate between agriculture research institutions in the implementation of the research national plan to address existing and future challenges facing the agriculture sector;
- develop, update, and maintain the infrastructure of the agriculture scientific research institutions;
- strengthen the sustainable connections among the agricultural scientific research system, the agricultural extension services, technology transfer agents and industry;
- strengthen the continuous cooperation with regional and international research institutions;
- advocate and facilitate policy options for demand-driven agricultural product value chains in the country.

3.2. Enhancing skills for scientific leadership

The NARS in Egypt require a critical mass of expertise and skills to support the functions of various AR4D activities in the country and to facilitate inter-agency collaboration among NARS actors. The researchers and key experts should be highly qualified with a minimum qualification that enables them to deliver their mandate and achieve their mission. The NARS should therefore continue to facilitate and support advanced on-job trainings and further education to constantly improve the quality of the research personnel of the country, building their capacity to innovate and providing them with proper incentives to attract and maintain the requisite staff required to effectively deliver the mandates of the NARS at

different levels. Presently, the National Project to Support Agriculture Research, Technology Transfer and Agricultural Extension is aimed at:

- enhancing the human capacity of research staff, especially young researchers and assistant staff and expose them to international experiences;
- ensuring enabling environment conducive to scientific research and innovation.

3.3. Enhancing researchers' key-knowledge and skill-related in AR4D

The key processes described in this part of the guidelines are intended to help researchers to improve their understanding of:

1. the roles and responsibilities of the National Agricultural Research System:
   - All researchers and leaders of NARS organizations in Egypt should be fully aware and familiar with the structure and collective roles and responsibilities of the NARS.
   - NARS administrators and researchers should have the ability to establish and strengthen partnerships and collaborations to enhance interactions that maximize output at a minimum cost.
2. how to properly design AR4D projects that have all the elements for a smooth implementation that ensure successful outcomes and sizable impact;
3. how to monitor the implementation and evaluate the progress and outcomes of AR4D projects;
4. how to ensure the suitability of the project outputs after project closure.

4. Institutional linkage

Linkage between various agricultural research institutions in Egypt is a key-driver to improve the efficiency of agricultural research products and outputs. The participatory diagnosis of agricultural problems that need research solutions is one of the important mechanisms to achieve this linkage, as these problems are enumerated in a specific matrix and put into action through collective implementation mechanisms to meet the needs of AR4D and thus reach the necessary applied results. Such collaborative approach is therefore important to avoid overlap and duplication and facilitate complementarity for a more efficient utilization of the scarce scientific resources of the country. This requires that the ARC, as the official designated authority responsible for applied agricultural research, plays the role of coordinating agent to unify and channel the efforts of the various players and stakeholders and explore supportive ways and means through which coordination and cooperation can be achieved and sustained.

4.1. Partnership and collaboration framework

Collective action process in research and EAS shared by various actors involved in AR4D will achieve more together, than working individually in implementing and delivering desired results under the Egyptian agricultural strategy. Collaborations and partnerships direct the stakeholders to focus more on the joint purpose of addressing a common goal. Donors are becoming increasingly interested in funding AR4D initiatives that involve multiple partners from diverse backgrounds. Efficient institutional linkages will enable partners to align the comparative advantages of NARS organizations to produce more results with wider impacts. Moreover, partnerships in research create opportunities for shared learning, resource pooling and ultimately increasing the potential for innovation. NARS organizations should actively seek and embrace partnerships including private and public corporations, civil society, donor agencies and non-governmental organizations who share a similar vision and mandate.

4.1.1. Developing and growing partnerships

Networking is the exchange of information and ideas among people with a common profession or special interest, usually in an informal social setting. Networking often begins with a single point of common ground. Professionals use networking to expand their circles of connections and links and increase their awareness of news and trends in their research fields (Investopedia, 2021).

While the partnership is an arrangement where two or more entities agree to cooperate to advance their mutual interests. Back to 1990, Egypt NARS network was facilitated and strengthened by the National Agricultural Research Project (NARP) which has succeeded in developing partnership and collaboration among research institutions in Egypt. This increased the impact of AR4D and helped to better inform policy and decision-making. However, the NARS network now needs to revive this model of cooperation, collaboration, and partnerships to streamline the benefits of information exchange, enhance the efficiency of research resources and increase the capacity of research organizations to improve AR4D impact.

To enhance the linkages between research organizations and strengthen the partnerships for higher impact of AR4D, it is suggested that the superior NARS coordination committee could:

1. facilitate the coordination and collaboration by giving oversight to the partnerships among different interested NARS partners:
    - Each partner designates representatives to the committee. This committee should provide and maintain the needed support and motivation for every partnership that has been deactivated.
    - The coordinator of the NARS could help also facilitate the coordination between NARS members and other international partners such as NGOs, private companies, research organizations, and others.

2. promote inter-disciplinary collaboration for research:
   - This type of collaboration is critical for advancing science and improving the community livelihoods.
   - Researchers and NARS organizations should not only rely on their own research capacity, but also benefit from staff resources in other advanced research organizations.
   - There is a need to reach out to find counterparts with complementary knowledge, particularly to fill critical gaps.
3. enhance communication and sharing information. A wide range of information communication technology (ICT) tools and platforms are currently available to facilitate sharing of vital information, even as global interconnectivity has become more commonplace.
4. increase public engagement by highlighting the nature and extent of the interventions and activities of the NARS and by ensuring effective dissemination of research findings derived and delivered by the NARS.

In this connection, NARS should work closely with beneficiaries in target communities, through innovative outreach programmes. They will be able to constantly receive essential and timely feedback that could help in the refinement of the relevant policy options. They should also increase and sustain partnerships between NARS organizations and policy makers as partnerships can better influence policymaking. Through partnership with policymakers, the policymakers themselves become actively connected with the problems and the solutions developed by researchers/ NARS.

4.2. NARS coordination framework

Coordination is the process of ensuring smooth interplay of the functions of management to achieve common objectives with minimum effort and resources (Narang, 2021). Through effective coordination mechanisms, the NARS can develop robust systems, standards and tools that are relevant to the needs of its members and other AR4D players, while reducing reliance on foreign models that may not always fit into the existing context of the NARS in Egypt. The guiding principles of the coordination framework should be:

- adherent to the national goals and priorities and the objectives of the NARS organizations;
- scientific integrity and professional excellence;
- productive engagement with relevant stakeholders;
- mainstreaming accountability in all AR4D efforts;
- aimed for tangible results and impact on the ground;
- decentralizing research and extension services;
- ensuring the high quality of agricultural research services.

4.2.1. Coordination body and points of contact

Although there is a NARS coordination mechanism through the Regional Council for Research and Extension, ARC of Egypt still needs to play a significant role to enforce the function of this council to be active in coordination of NARS in Egypt. The council should possess representation from each research body to ensure that all research organizations working in the field of agricultural research in the country are represented. However, the responsibilities of this council could include the followings:

- meet regularly to follow up and evaluate the results of the National Programmes for Supporting Agricultural Research, Technology Transfer and Agricultural Extension (SADS, 2030) as well as all other AR4D activities;
- coordinate among the authorities in implementing the AR4D activities and programmes;
- coordinate the efforts of international organizations and donors who are involved in AR4D in Egypt;
- develop a national agricultural research policy to guide implementation of AR4D;
- procure and approve the funding required to carry out research work with relevant stakeholders to identify AR4D trends in the country.

4.2.2. Programming tools for effective coordination of the NARS organizations

The National Project to Support Agriculture Research, Technology Transfer and Agricultural Extension and the Regional Council for Research and Extension are proposed to be a good platform that should be activated to enhance collaboration and linkage between the NARS organizations through:

1. joint programming:
   - collective effort of partners to plan, implement, monitor, and evaluate activities to achieve agreed development goals effectively and efficiently;
   - undertaking activities in a common work plan and related budget.
2. regular quarterly NARS coordination meetings;
3. annual science congress;
4. establishment of a NARS national agricultural science publication to promote local efforts.

4.2.3. Enhancing linkage between research and EAS

- get all relevant stakeholders together regularly to put into perspective and prioritize the research needs of the country and together set the short-term and long-term research agenda;
- develop strategies for addressing the relevant needs;
- develop action plans for implementation;
- assign responsibilities for implementation, monitoring and evaluation and review implementation progress;
- hold regular joint meetings between AR4D and the extension sector.

5. Organizational scope for the NARS efforts in AR4D

AR4D, also known as actionable research, leads to development based on the realization that research designed and implemented by multi-disciplinary teams from different institutions and stakeholder groups can solve complex problems to better meet multiple objectives and result in the development of a full range of technological, policy and institutional options that are needed to benefit and support a broader set of end-users (Daane and Booth, 2004). The NARS in developing countries has largely evolved in response to the growing interest in linking agricultural research more directly with regional and national development objectives. The links between R&D objectives essentially involve transforming development objectives into system objectives, system objectives into organizational strategic objectives, and strategic objectives into programme and project priorities (Mbabu and Ochieng, 2006).

The development objectives of Egypt's agriculture sector are articulated in the recently updated SADS 2030 which clearly defines, in detail, the national realistic agriculture projects and programmes needed to be accomplished in the framework of this strategy in the 10-year periods (2020-2025 and 2025-2030), whether for production, service, research or extension programmes and projects; in areas of crops, livestock, aquaculture, soil and irrigation for vertical and horizontal agriculture expansion programmes. Each programme or project of the Action Plan has specific objectives and outputs to be delivered. It was noted to have these objectives are in line with the objectives of the strategy and in coherence with Egypt 2030 National Vision and the SDGs.

Before developing any AR4D project, the following comprehensive criteria and checklist to ensure better R&D linkages are important to ensure successful implementation of the project. The following criteria and checklist will be demonstrated in details hereafter in this section of the guidelines:

- alignment with the national research priorities and strategy;
- community-based and demand driven;
- community consultation preceded implementation
- benchmarking of introduced technologies and innovations;
- the introduced interventions include (applicability, affordability, cost-effectiveness, and gender aspects);
- monitoring, evaluation and learning systems are in place;
- continuous feedback mechanism from stakeholders;
- exit strategy and sustainability plan;
- documentation and lessons learned;
- communication strategy and out-scaling of the project outputs;
- stakeholders' ownership of project outputs and outcomes.

6. Designing AR4D projects

6.1. Identification and analysis of AR4D stakeholders

The research programme has to be designed based on a participatory approach by all stakeholders; i.e. from farmers as the end user to the research team leaders according to needs and to solve development problems based on stakeholder analysis tools. Stakeholder analysis is an approach, a tool or set of tools for generating knowledge about actors – individuals and organizations to understand their behavior, intentions, inter-relations, and interests; and for assessing the influence and resources they bring to bear on the decision-making or implementation processes. Stakeholder identification and analysis should always be done at the beginning of a project, as it can be used as a basis for formulating a good stakeholder engagement, geared towards winning the support of the key stakeholders. The key steps in stakeholder analysis include:

- identifying the relevant stakeholders of the project;
- prioritizing the stakeholders based on their roles;
- understanding the key-function of each stakeholder.

Identification of stakeholders begins with brainstorming and listing all the people who would be affected by the project, people who have influence or power over it, or people who have an interest in its successful or unsuccessful conclusion, remembering that certain stakeholder groups might be pre-determined through regulatory requirements (IFC, 2007; MindTools, 2021). Depending on the level of power and/or interest, the different individuals or groups may have over and/or in the project, the researcher can prioritize them by deciding what actions need to be taken:

- Those found to have high power, and to be highly interested in the project should be managed closely, i.e., the project must fully engage these people, and make the greatest efforts to satisfy them.
- Those found to have high power, and to be less interested should be kept satisfied, i.e., the project must give enough work to these people to keep them satisfied.
- Those found to have low power, and to be highly interested must be kept informed, i.e., the project must adequately inform these people, and talk to them to ensure that no major issues are arising. People in this category can often be very helpful with project details.
- Those found to have low power, and to be less interested must be monitored, i.e., the project must monitor these people and avoid excessive communication with them.

Finally, understanding the stakeholders will mean discovering how the key stakeholders feel about the project. The project will also need to work out how best to engage them, and how to communicate with them.

6.2. Identification of research gaps and community needs

Bring representatives of all the relevant stakeholders together and collectively define the desired or expected level of output/quality of AR4D, with specific targets for each indicator. The identified expected outputs and outcomes should be specific, observable, and measurable and should be relevant to the goals and NARS strategies. It is critical to find the underlying reasons for the gaps so that interventions can target the root causes to enhance effectiveness and impact. Researchers should conduct root cause analysis by using common methods such as the "five whys" or "why tree" process and the "fishbone" or "cause and effect" Diagram proposed by Murphy and Sebikali (2014):

1. "five whys" or "why tree" process:
   - state the problem/gap as precisely and concisely as possible;
   - list the possible causes of the problem/gap by asking the question;
   - "why?" or "why is that true?" or "why is that happening?";
   - for each of the causes, again ask the question "why?", and list the responses;
   - continue this process at least 5 times or until you have reached the source of the problem, the lowest level cause that stakeholders can do something about.
2. fishbone or cause and effect diagram:
   - agree on a problem statement (effect);
   - write it at the center right of the flipchart and draw a box around it and draw a horizontal arrow running to it;
   - brainstorm the major categories of causes of the problem;
   - write the categories of causes as branches from the main arrow;
   - brainstorm all the possible causes of the problem and ask: "why does this happen?" as each idea is given, the facilitator should write it as a branch from the appropriate category, along which causes can be written in several places if they relate to several categories;
   - ask "why does this happen?" about each cause, write sub-causes branching off the causes, continue to ask "why?" and generate deeper levels of causes as layers of branches indicate causal relationships.

6.3. Basic criteria and considerations for determining/selecting AR4D topics

Successful AR4D projects should be/have:

- demand-driven;
- aligned with a country's research priorities;
- participatory, involving the major stakeholders from the planning to implementation and evaluation stages;
- adoptable, cost-effective, scalable, and affordable to adopt;
- responsive to gender and environmental sensitivities;
- a sustainability plan and exit strategies;
- well documented outcomes.

Research scientists should ensure that the AR4D projects they design and implement always include the above minimum criteria.

6.4. Selection and design of the interventions

Following the identification of the root causes of the gaps, the stakeholders can then select and design interventions that will address the root causes of the priority gaps. The process of selecting the intervention involves stakeholders brainstorming and proposing possible interventions and ultimately selecting the priority interventions, based on agreed selection criteria, such as response to root cause(s) of problems, practicality, affordability, feasibility, appropriateness, acceptability, and benefit.

Once the interventions are selected, the stakeholders can then develop an intervention design plan. The design plan should include the process, approach, and steps to be used to design the interventions, the people responsible for each step, and the timeframe. The testing process should include reviews with end-users and subject-matter experts, or actual trials with members of the target groups in the community in which the intervention will be implemented. Feedback from the process should be used to revise the work plan accordingly.

6.5. Identification of national agricultural research priorities

To identify national agricultural research priorities, it must design list of priorities scored against a set of criteria and user-defined weights, qualitatively comparing and ranking the short-listed priorities based on a set of criteria derived from the objectives of the AR4D project. The shortlisted opportunities will be analyzed at a high level from the perspectives of financiers and policymakers in addition to NARS consultants.

It should also give attention to an overview analysis that highlights significant results of certain indicators, such as impact pathway, existence of demand, capital intensity and degree of innovation, degree of value-addition, labour intensity and favorability to women. It should also shed light on the diversity of the AR4D programme and their potential for local socioeconomic development and positive environmental impact and finally the relevance to food security and nutrition.

6.6. Adoptability and scaling out

Designing demand-driven AR4D projects that either solve or reduce the extent and scope of the challenge faced, or provide greater benefit and improve livelihoods, can be considered applicable and tend to have greater chances of generating interest for adoption. However, sustainable adoptability of the proposed technology and/or innovative practice will depend on its large-scale accessibility and affordability. Ensuring that AR4D projects need to possess well thought out impact pathways and theories of change that consider key factors including applicability, adoptability, and affordability of proposed solutions.

7. AR4D project implementation

In general, there are four stages in implementing AR4D like every other intervention. The Center for Effective Services (2021) identified these stages as:

1. exploring and preparing;
2. planning and resourcing;
3. implementing and operationalizing;
4. full implementation.

The first stage, exploring and preparing, is a key decision-making phase in implementation, wherein the research team will need to spend quality time assessing the needs of those affected by the interventions, consulting with stakeholders to secure buy-in, building a supportive climate and identifying champions who will drive the change, and assessing readiness and capacity for implementation.

During the planning and resourcing stage, the foundation is laid for effective implementation, at which time an implementation team is identified and a clear plan put in place for implementation, outlining the tasks required, people responsible, timelines for delivery, and arranging funding and other necessary resources. During stage three, the intervention is initially implemented for the first time, usually on a pilot basis before later being rolled out fully, using the implementation plan developed in stage-2 to guide the activities. During this stage, the plan can be reviewed and updated/adjusted, if necessary, to reflect changing contexts and circumstances. The project finally becomes operational and integrated into the setting during the full implementation stage. By this time, the outcomes of the intervention are ready to be evaluated, as this provides an opportunity to show the impact and progress of the intervention through continuous cycles of evaluation and improvement. There are several activities that could be conducted under each stage of the implementation process. These activities are listed as below:

1. **The key activities during the exploration and preparation stage are:**
   - identifying community needs and gaps or assessing needs and the evidence base for the intervention;
   - assessing fit, feasibility, and appropriateness, including alignment with country's research priorities;
   - assessing implementation readiness;
   - developing roles and leadership for implementation;
   - engaging stakeholders and identifying their roles;
   - designing the intervention's setup;
   - identifying outputs and outcomes;
   - developing a theory of change and logical framework.

2. **The key activities during the planning and resourcing stage are:**
   - assessing enablers and barriers for implementation;
   - developing an implementation plan with timeframe and associated budget;

- establishing implementation team(s) and other structures to support implementation;
- securing sufficient resources to ensure full implementation;
- identifying champions to support implementation;
- designing monitoring, evaluation, and feedback systems;
- determining and delivering staff training, stakeholders' capacity building and support requirements;
- planning for exit and sustainability.

3. **The key activities during the implementing and operationalizing stage are:**
   - maintaining ongoing communication with key stakeholders, explaining why the intervention is necessary and securing continued buy-in and ownership;
   - providing ongoing professional development opportunities, coaching, and mentoring for stakeholders implementing and delivering the intervention;
   - monitoring, evaluation and learning of implementation process and services;
   - using data and feedback to inform ongoing improvements;
   - adapting for local context where appropriate.

4. **The key activities during the full implementation stage are:**
   - maintaining skillful practice;
   - developing more efficient and effective structures;
   - evaluating implementation, service, final outputs, outcomes, and achieved impact;
   - widely communication of the results and outcomes with stakeholders and interested partners;
   - engaging in continuous improvement cycles.

The key broad steps in the implementation of AR4D projects involve:

Step 1: Structuring the implementation team, whose role should be to:
- develop an implementation/action plan;
- identify personnel/organizations with appropriate expertise/experience to implement the interventions;
- assure that team members know their roles, responsibilities, and expectations for interventions;
- identify and mobilize resources;
- carry out and manage interventions.

Step 2: Developing a detailed implementation action plan, which should include:
- planned activities with timeframe and budget;
- person responsible for each activity;
- required resources and facilities;
- date by which each activity will be accomplished;
- expected result and how it will be measured.

Step 3: Conducting and monitoring the project activities

- assess milestone goals, provide feedback, and use monitoring data to make decisions;
- monitor actual costs or expenses against allocated budget in an integrated manner with other monitoring activities;
- regularly check to ensure that the team is successfully integrating the changes that should be occurring as part of the implementation process.

8. Monitoring and evaluating AR4D projects

Monitoring and evaluation is a key part of implementing successful AR4D project, it is often the part of the implementation process that is less prioritized. In most cases budget for monitoring and evaluation is rarely included or planned for. Availability of a monitoring and evaluation system is often missing or perhaps is the weakest link, particularly with respect to monitoring.

Some projects include monitoring and evaluation mechanisms, but others do not have such mechanism and sometimes it is not performed properly.

The progress and performance of AR4D projects should be monitored, evaluated, and documented to measure any changes in performance or to capture the expansion of high performing areas arising during implementation. Monitoring refers to the routine tracking of data that measures progress according to the set workplan toward achieving objectives of the intervention. In other words, monitoring provides records of activities and results, and signals problems to be remedied along the way. It is descriptive and may not be able to explain why a particular problem has arisen, or why a particular outcome has occurred or failed to occur. The purpose of monitoring should be:

- to ensure that the project activities are implemented according to plan, timeline, and budget;
- to identify activities or resource allocation or budget shortfalls that may need to be adjusted or improved to achieve desired results;
- to provide information for decision-making and programme evaluation;
- to support reporting requirements;
- to facilitate advocacy.

Evaluation is the process of collecting and analyzing data to measure how well a programme or intervention has met expected objectives. However, it deals with questions of cause and effect. It is assessing or estimating the value, worth, or impact of an intervention and is typically done on a periodical basis – perhaps annually or at the end of the project. The purpose of evaluation is to confirm that adopted strategies and available funding produced the desired results and to assist stakeholders in decision-making about future projects and implementation through:

- providing an objective and reliable assessment of the activities;
- providing feedback to local organizers and other stakeholders about:
  - the outcomes of the activities;
  - strengths and weaknesses;

  - other influencing factors;
  - suggested measures for further improvement.

In this context, monitoring and evaluation systems should include:

- developing the M&E plan;
- monitoring routinely and recommending changes for adjustment;
- repeating the baseline data collection process using the same indicators and instruments;
- comparing results with baseline data;
- reporting and communicating evaluation results.

9. Stakeholders' feedback mechanism

Effective feedback and response mechanisms are critical to project success and accountability. According to MEAL DPRO (2019), feedback-and-response mechanisms are two-way communications systems designed specifically to gather and respond to feedback from project participants and other community stakeholders. The Project Management Alliance (2021) indicated that stakeholders' feedback is important because it:

- facilitates the free-flow of information during project implementation;
- enables the project team to address problems more quickly;
- requests for feedback encourages stakeholder engagement and ownership of the project outputs;
- opens up feedback that is critical for ongoing improvement in project implementation.

For project managers to ensure that they get the right levels of input from the right stakeholders they need to apply a good strategy to gather feedback and reactions from relevant stakeholders. To effectively gather and analyse stakeholders' feedback, the project manager should:

- schedule and hold regular stakeholder team meetings:
  - apply actively listening and considering all stakeholder conversations and discussions;
  - apply effective and continuous meeting facilitation strategies (i.e., planning and sticking to an agenda).
- constructively handle the reactions of the stakeholders by creating action plans that specify roles and responsibilities for resolving project issues raised by stakeholders and consider them in the adjusted work plan.

10. Exit strategy and sustainability plan

10.1. The need for exit strategy

The aim of every development programme is to deliver sustainable positive changes and impact on the served community. This means the changes introduced by projects should not depend on external support once the project ends, but the beneficiaries need to have the capacity to continue with the changes thereafter. Studies have shown that for lasting changes to take place, a well-managed termination of the project needs to be planned in advance (Gardner et. al, 2005). The project termination should always be considered in its exit strategy to ensure that the project results will remain to benefit its beneficiaries or right-holders even after it is completed. An exit strategy is therefore a contingency plan that is executed by a project in an expeditious manner to end its intervention once the predetermined criteria for ending the project have been met or exceeded. The goal of an exit strategy is to ensure the sustainability of impacts after a project ends. An exit strategy can, therefore, contain a project sustainability plan. Lee (2017) explained that the exit strategy is a process that follows through all stages of the project cycle:

- The preliminary exit plan is drafted together with all partners during the project planning stage;
- The plan is clearly defined during the project implementation;
- The necessary modifications to the exit plan are made with the help of the follow-up and monitoring data;
- During the project implementation, monitoring and evaluation process, the exit strategy puts emphasis on learning together with the stakeholder and documenting the lessons learned.

Rogers and Coates (2016) also indicated that incorporating the lessons for sustainability into project design may improve the likelihood that development projects continue to offer benefits after project completion.

10.2. Universal approaches to exit strategies

The three basic approaches to exit strategies are:

1. Phasing down

Phasing down is a gradual reduction of programme activities, utilizing local communities/ beneficiaries to sustain programme benefits while the original sponsor (or implementing agency or donor) deploys fewer resources. Phasing down is often a preliminary stage to phasing over and/or phasing out.

2. Phasing out

This refers to a sponsor's withdrawal of involvement in a programme without turning it over to another institution for continued implementation. Ideally a programme is phased out after permanent or self-sustaining changes are realized, thus eliminating the need for additional external inputs.

3. Phasing over
In the phasing over approach, a sponsor transfers programme activities to local institutions or communities. During programme design and implementation, emphasis should be placed on community capacity building so that the services provided can continue through local structures.

10.3. Criteria used to determine when to exit a project

Criteria used to determine when to exit programmes vary. However, they can be grouped into three general categories.

1. Time limit
Exit time limits are normally indicated by donor according to the funding cycles. Time limits may increase a programme's focus in establishing systems of sustainability or they may impose time constraints.

2. Achievement of programme impacts
Although achieving the intended programme impact is often a challenging task within a given timeframe, indicators of programme impact can sometimes be used as exit criteria. These can be used to focus programme graduation efforts on the more self- reliant communities or the effective programme components. Thus, impact indicators can help to inform and guide the exit strategy timeline.

3. Achievement of benchmarks
Benchmarks are defined as the measurable indicators of identified steps in the graduation process of an exit strategy. They are part of the Monitoring and Evaluation planning matrix from the onset. Benchmarks should be linked to the graduation process and to the programme components to be phased out or over.

10.4. Setting the timeframe for project exit

There are several considerations when establishing the timeframe for programme exit strategies. Establishing an exit timeline that links to the programme funding cycle and to be essentially communicated to the community. Since programme implementation will influence exit strategy activities, it is important that the exit plan remains flexible with the expectation that some of the exit criteria and benchmarks may need to be modified during the project cycle.

Further, implementing exit plans in a gradual, phased manner is recommended to ensure sustainability of outcomes by applying lessons learned from earlier projects to those that come later. Lastly, after phase-over or programme phase-out is complete, continued communication with communities will help to support sustainability of outcomes.

11. Documentation and lessons learned

11.1. Importance of documenting lessons learned

Lessons learned are the documented information that reflects both the positive and negative experiences of a project; they are knowledge and understanding acquired via experience (Keefe, 2021). Lessons learned represent the organization's commitment to project management excellence and the project manager's opportunity to learn from the actual experiences of others. Documenting the lessons learned is important to:

- understand what went well or wrong and why;
- identify what can be done differently in the future;
- possibly duplicate the appropriate steps across all teams and yield positive results with other projects.

11.2. Documenting lessons learned

Documentation of the lessons learned from implemented research for development programmes could include the following list:

1. solicit information concerning the lesson's impact;
2. describe the scope of the lesson;
3. a description of the problem or success;
4. the impact on the project;
5. recommendations to improve the process (lessons learned);
6. publish a report: once all information is collected, examined, and revised as needed, it should be interpreted and simplified in reports to be widely distributed so everyone involved, from the team to the upper management, is aware of and well understands all lessons learned;
7. a lesson learned document to guide future projects;
8. reports accessability: all reports should be kept in an accessible central database so that other research staff and project managers involved in AR4D can adopt successful routines and avoid mistakes from previous projects.

©FAO

REFERENCES

The Center for Effective Services (CES). 2021. *The CES Guide to Implementation.* Dublin: The Center for Effective Services, Cited 10 September 2021. https://implementation.effectiveservices.org/

Daane, J. & Booth, R. 2016. Integrated agricultural research for development: lessons learnt and best practices. *Uganda Journal of Agricultural Sciences*, 9(1): 126–131. https://doi.org/10.4314/ujas.v9i1.

Franca, Z. P., Philemon, A., Woyengu, A., Tumae, S., Pono, J., & Mbabu, A. N. (2012). *Empowering the Human Side of the Organization to Lead the AR4D Approach.* In A. N. Mbabu & A. Hall (Eds.), Capacity Building for Agricultural Research for Development: Lessons from Practice in Papua New Guinea, pp. 133-159. Maarstricht, the Netherlands: UNU-MERIT.

Gardner, A., Greenblott, K. & Joubert, E. 2005. What We Know About Exit Strategies. Practical Guidance For Developing Exit Strategies in the Field. https://www.alnap.org/system/files/content/resource/files/main/a02c7b78fb2b408b852570ab006ec7ba-what-we-know-about-exit-strategies-sept-2005.pdf

Grun, R. E. 2006. *Monitoring and Evaluating Projects: A step-by-step Primer on Monitoring, Benchmarking, and Impact Evaluation,* The International Bank for Reconstruction and Development / The World Bank 1818 H Street, NW Washington, D.C. 20433.

International Finance Corporation. 2007. *Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets.* Cited 10 September 2021d. Washington, D.C., International Finance Corporation (IFC).

Investopedia. 2021. *Networking: What It Is and How to Do It Successfully.* Cited 10 September 2021. https://www.investopedia.com/terms/n/networking.asp

Keefe R. 2019. *Lessons Learned: A Simple Framework for Project Managers.* Cited 10 September 2021. https://toggl.com/blog/lessons-learned-for-project-managers

Lee, H. 2017. Exit Strategy for Aid Programs: Planning Exit before Entering. *International Journal of Social Science Studies*, 5(7): 22–28. https://ideas.repec.org/a/rfa/journl/v5y2017i7p22-28.html

Lynam, J. & Elliott, H. 2004. *Organizing agricultural research: fitting institutional structure to the research agenda.* Transformation of agricultural research systems in Africa: lessons from Kenya: 145–169.

Mbabu, A.N. & Ochieng, C. 2006. *Building an Agricultural Research for Development System in Africa.* ISNAR Division Discussion Paper 8. Washington, D.C., International Food Policy Research Institute.

MindTools. 2021. *Stakeholder Analysis: Winning Support for Your Projects.* Cited 10 September 2021. https://www.mindtools.com/pages/article/newPPM_07.htm.

MoALR. 2009. *Egypt's Sustainable Agricultural Development Strategy towards 2030.*

MoALR. 2016. *Egypt Vision 2030.*

Monitoring, Evaluation, Accountability and Learning for Development and Humanitarian Professionals. 2019. *Feedback-and-Response Mechanisms. Monitoring, Evaluation, Accountability and Learning for Development and Humanitarian Professionals (MEAL DPRO).*

Murphy C and Sebikali B. 2014. *Guide to Optimizing Performance and Quality: Stages, Steps, and Tools.* Chapel Hill: IntraHealth International.

Narang, M. 2021. Coordination. Cited 10 September 2021. https://www.economicsdiscussion.net/management/coordination/coordination/31831

Project Management Alliance. 2021. 4 Reasons Project Stakeholder Feedback is Important, PMAlliance. Cited 10 September 2021. https://pm-alliance.com/project-stakeholder-feedback/

National Agricultural Research Systems (NARS), including universities, public and private research institutions, play a vital role in advancing research on agricultural productivity. As in many developing countries, the linkage between research and agricultural development in Egypt is weak and needs to improve in many ways. AR4D, aims to improve the livelihoods of poor-resources and small-scale producers through adaptive applied, is critical for enabling resource-poor communities to improve their livelihoods. The NARS have a deep understanding of the challenges both at farm and system levels. However, NARS need the adequate technical and financial support to increase their efficiency to sustainably enhance the impacts of AR4D and achieve national food and nutrition security. Technical support, in the form of national guidelines, can provide NARS with essential tools to streamline their efforts on AR4D, increase their efficiency, and achieve better outcomes and impacts.

Based on the lessons drawn from the assessment study on AR4D, including literature review analysis and participatory discussions with various NARS actors and stakeholders in Egypt, the following guidelines are proposed to strengthen the knowledge and skills of researchers and AR4D project managers. The guidelines also include recommendations and critical elements for successful implementation of AR4D that could be considered by NARS organizations and other stakeholders to help improve the performance of the NARS in Egypt. These guidelines could also be useful to enhance collaboration among the main research organizations of the NARS and improve the institutional linkages between different actors that ensures sustainable impact of AR4D in the country.

Office of Innovation
oin-director@fao.org

Food and Agriculture Organization of the United Nations
Rome, Italy

CC6053EN/1/06.23