Final Evaluation of the Food & Business Applied Research Fund (ARF)

Final Evaluation Report
June 2019
NWO-WOTRO

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<tr>
<td>ARF</td>
<td>Food &amp; Business Applied Research Fund</td>
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<td>CGIAR</td>
<td>Consultative Group on International Agricultural Research</td>
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<tr>
<td>DDE</td>
<td>Department for Sustainable Economic Development, Dutch Ministry of Foreign Affairs</td>
</tr>
<tr>
<td>DGIS</td>
<td>Directorate-General for International Cooperation, Dutch Ministry of Foreign Affairs</td>
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<tr>
<td>F&amp;BKA</td>
<td>Food and Business Knowledge Agenda</td>
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<td>F&amp;BKP</td>
<td>Food and Business Knowledge Platform</td>
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<td>FTR</td>
<td>GCP Fast Track Research</td>
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<td>GCP</td>
<td>Food &amp; Business Global Challenges Programme</td>
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<td>IAC</td>
<td>GCP International Advisory Committee</td>
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<td>IP</td>
<td>GCP Integrated Projects</td>
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<tr>
<td>LMIC</td>
<td>Low and Middle-Income Country</td>
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<td>MASP</td>
<td>Multi Annual Strategic Plan</td>
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<td>MEA</td>
<td>Dutch Ministry of Economic Affairs</td>
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<td>MFA</td>
<td>Dutch Ministry of Foreign Affairs</td>
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<td>NWO</td>
<td>Netherlands Organisation for Scientific Research</td>
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<td>ODA</td>
<td>Official Development Assistance</td>
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<td>PIE</td>
<td>ARF Pool of International Experts</td>
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<td>WOTRO</td>
<td>Science for Global Development, NWO division</td>
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Executive Summary

Background

The global food system today is beset by serious challenges and risks. Major demographic shifts are increasing and changing the demand for food, with a rapidly growing population expected to reach 9.5 billion people by 2050 and drive global demand for food up by 60%. These shifts are driving new threats to populations, systems and environment. At the same time, some 795 million people go hungry every day, with 2 billion people lacking the nutrients to live a healthy life.

These challenges are systemic and interconnected, driven by the actions and interactions of many diverse actors across the food system. Such large-scale, complex challenges require scientific research and innovations to develop solutions that contribute to long-term access to affordable, safe and nutritious food for vulnerable and resource-poor populations. Moreover, these solutions have to be readily applicable and contribute to the enhancement of sustainable food security for these most vulnerable populations.

Against this background, the Ministry of Foreign Affairs developed a new knowledge and research policy in 2011 that should strengthen Dutch development policy and its implementation, as well as contribute to development and self-reliance in developing countries. To this end five knowledge platforms were established for the four thematic priority areas – food security being one among them – where learning can take place, as well as discussions on the knowledge agenda, a coherent research agenda and the utilisation of existing knowledge.

The main instruments to generate this new knowledge for the platform on food security are the Applied Research Fund (ARF) and the Global Food Challenges Programme (GCP). Both instruments aim at having an impact on food security in order to improve the situation of food insecure populations in developing countries and to generate research findings as well as innovative solutions that are relevant for development policy in the domain of food security and the challenges the global food system is facing today.

Purpose of the Final Evaluation of ARF

The ARF instrument possesses a monitoring and evaluation framework in which a baseline study, a mid-term and final evaluations have been carried out. NWO-WOTRO commissioned Syspons GmbH to implement this framework. In this regard Syspons assessed the contribution of ARF to food security and private sector development in Dutch partner countries. The objective of this evaluation and monitoring framework is also to account for public expenditure and to contribute towards future policy development and implementation.

For this final evaluation of ARF, Syspons was asked to deliver insights into the aspects of effectiveness, impact, and sustainability concerning ARF. Furthermore, the final evaluation’s aim is to provide recommendations for the future implementation of ARF or the design of future research-based food security instruments. The final evaluation focused on finalised or almost finalised ARF projects. This final evaluation report therefore complements the mid-term evaluation report. As such, a synthesis report of both will be submitted in 2021 together with the synthesis report of GCP.

The final evaluation was undertaken from June 2018 to June 2019. Within the given timeframe the evaluation team conducted an in-depth analysis of all relevant documents and data (e.g. project reports), an online survey among all consortia members as well as three case studies in Ghana, Uganda and Benin in which nine ARF projects from the first and second ARF call for proposals were analysed.

Key Findings and Conclusions

One of the strengths of the ARF programme is that it is largely effective, meaning that most outcomes are reached across the programme. For example, the evaluation finds that farmers and other producers adopt and apply new knowledge and innovation. This outcome was observed in the three case study countries Benin, Ghana and Uganda. Furthermore, the evaluation finds that the programme is successful in raising awareness for the food security issues that are being researched. For example, a project in
Benin demonstrated that communicating the research outputs in formats specifically adapted to the target groups can lead to high acceptance of research findings. Moreover, the evaluation finds that the ARF programme has been successful in fostering collaboration between Northern and Southern researchers. For this success, the ARF programme design, which requires teamwork and co-creation between Northern and Southern consortium members was key. In addition, the results show that it is possible to develop business models and value chains in inclusive ways, as assumed by NWO-WOTRO in calls of proposal.

Overall, the evaluation finds that the main design features of the Food and Business Applied Research Fund are a main source of success of the programme, as they are instrumental for ensuring its effectiveness. In this regard, the F&BKP was a useful feature, as projects used it to share their results and some projects used the opportunity to expand their networks and explore further cooperation, such as starting similar projects in other countries. Moreover, by funding multi-stakeholder consortia and encouraging co-creation, the ARF instrument ensures access to the target groups and other external stakeholders. Regarding co-creation, the evaluation finds that consortium members particularly engage in information seeking and advocating for their joint projects. Moreover, the case studies showed that co-creation involved using networks of consortium members to access political actors and therefore influence policy change. In addition to co-creation, research uptake strategies are important for achieving the project outcomes. In this vein, the evaluation finds that it is important to communicate the results appropriately to the target group to ensure their willingness to be informed by the research results.

In terms of the impact, the interim progress evaluation concluded that the step from outcome to impact was too far, as the transfer of a technology adopted by the ultimate target group to the application on a national level in a country was a bar set too high. In the revised impact pathway, the ARF seeks to contribute to changing food security at local and / or regional levels in ARF countries. Accordingly, the final evaluation identifies successful examples of projects contributing to changing food security at local or regional levels.

In addition, the evaluation finds that the ARF programme uses successful measures for ensuring its sustainability, particularly regarding the technological and institutional sustainability. In this sense, human resources, processes and procedures of the project have been incorporated into the structures of the consortium members (institutional sustainability), and newly developed methods and technologies can be used by the target groups without external assistance and maintenance support after the project (technological sustainability). For achieving institutional sustainability, the close collaboration between project stakeholders in their consortia, their connections to the research topic and a focus on qualifying personnel are identified as important contributing factors. Therefore, the Capacity Building approach that is pursued in the ARF programme is a success factor for ensuring institutional sustainability. Moreover, for ensuring the technological sustainability of the projects, the ARF projects integrated their research into existing value chains and managed to integrate efforts for technological and institutional sustainability. Furthermore, projects that develop technologies which can be turned into business ideas were particularly prone to secure the continued investment of the private partner.

Next to these strengths, the evaluation team also finds some challenges in the ARF programme, which can serve as starting point for the further development and improvement of the programme. In terms of reaching and sustaining the research outcomes, the evaluation finds that local authorities mostly lack the capacities to adopt and eventually sustain the project activities and to follow-up on learned topics to further implement and spread knowledge, e.g. to other parts of the intervention region.

Additionally, regarding co-creation, the evaluation finds that it can be challenging to bridge the interests of consortium members for whom research is more important, and those for whom action and application is more relevant. Thus, even though the collaboration between various partners can lead to synergies, the assumption that the interests and world views of partners will align through collaboration cannot always be confirmed.
Furthermore, the evaluation finds that many ARF projects implemented fewer activities for research uptake than they initially planned. According to the online survey, challenges were that stakeholders did not feel like they had enough time to organise the research uptake and that they encountered unanticipated challenges in the research uptake process.

Moreover, the evaluation finds that some projects struggle with contributing to food security at an impact level. On this issue, the evaluation identifies challenges to achieving impacts across the programme. First, the evaluation finds that some of the basic assumptions of the Food Security Policy that underly the ARF’s revised impact pathway could not be validated. Specifically, the evaluation finds that while the projects contribute to an increase in income of the ultimate target group, this does not necessarily lead to an increase in spending on food or savings and therefore higher food security. In this regard, the case studies showed that the farmers did not see themselves as being food insecure and thus spend the additional money on transportation or education for their children. Moreover, the evaluation finds that a “trade-off” exists between the two ARF programme objectives of fostering private sector development and supporting food insecure target groups. ARF projects that aim to establish a business model do not consistently focus their efforts on vulnerable target groups that suffer under food insecure in the partner countries, but on those who can contribute to the business effort (which mostly are farmers with sufficient income and education). These are for example farmers that can deliver a certain food or seed quality to be further processed, and which are normally not part of the most vulnerable groups.

Regarding the financial sustainability, the ability to acquire additional funding during the project and to carry on project activities after the project has ended has shown to be a challenge across many of the ARF projects. This challenge was already identified in the mid-term evaluation and it has persisted after the projects have ended. In this regard, the final evaluation finds that many projects did not implement measures to ensure that financial resources were available after the projects ended. In addition to the financial sustainability, the evaluation finds that social and ecological sustainability are not taken into consideration in some ARF projects and therefore are sometimes disregarded in the project design. As a result, the case studies have shown some unintended negative effects due to consortium members not showing sufficient awareness of the potential social or ecological harms that may be caused by their projects.

**Strategic-Level Recommendations**

1. Key programme design features, like co-creation, using research uptake strategies, encouraging the regular interaction with stakeholders and the involvement of private sector stakeholders should be considered for further implementation of programmes by NWO-WOTRO and the Ministry of Foreign Affairs.

2. The Dutch Foreign Ministry and NWO-WOTRO should revise the assumptions underlying the impact pathway, especially concerning the connection between income and food security, ensuring that they reflect the realities of the contexts in which projects operate.

3. The Dutch Foreign Ministry and NWO-WOTRO should make a clear decision about the focus of the ARF instrument or acknowledge the existence of a trade-off effect between the objective of involving vulnerable groups and enhance private sector development. In this regard, the programme can either (a) focus more clearly on vulnerable groups suffering from food insecurity (b) focus more clearly on the development of inclusive private businesses and value chains or (c) accept that there is often a trade-off between the two objectives.

**Operational-Level Recommendations**

1. NWO-WOTRO should make the reduction of harm to ensure social and ecological sustainability a more explicit focus in the project planning stage.

2. To ensure the financial sustainability of the projects, NWO-WOTRO should increase its scrutiny of sustainability strategies and their implementation during the projects’ lifespan.
3. The time frame of projects and the time in which outputs and outcomes can be achieved and observed should be aligned, so that the ARF impact pathway can be accomplished to the output level and initiated to the outcome level within the allocated project time frames.

4. NWO-WOTRO should consider using a standardised online monitoring tool that supports and structures the collection of information from projects to ensure the compliance with quality standards for reporting.
1. Introduction

NWO-WOTRO has commissioned Syspons to assess the contribution of the Food & Business Applied Research Fund (ARF) and the Global Challenges Programme (GCP) to food security and private sector development in the Dutch partner countries and globally for selected geographic and thematic areas. Moreover, the objective of the evaluation is to account for public expenditure and contribute to future policy development and implementation. Accordingly, the key users of the evaluation are NWO-WOTRO, the Ministry of Foreign Affairs, the Ministry of Economic Affairs, the Ministry of Education, Culture and Science, the Ministry of Agriculture, Nature and Food Safety, and the Food & Business Knowledge Platform. In addition, actors who were implementing the ARF projects are another target audience of the evaluation. These include Southern and Dutch research institutions and universities, private sector actors and non-profit organisation.

Overall, the time frame of the evaluation of the ARF programme extends from 2014 to 2019, while the time frame of the GCP evaluation extends until 2020. In the inception phase, two inception reports were delivered in 2014 and 2015. These outlined the policy backgrounds of the Applied Research Fund and the Global Challenges Programme and the methodological approach of the evaluation. In 2017, Syspons delivered an interim progress evaluation report with insights into the evaluation criteria of policy coherence, relevance, implementation efficiency and (first) outcomes. Building on these results, the final evaluation report at hand presents the results for the ARF programme regarding the criteria effectiveness, impact, and sustainability. In 2021, a joint final report will be presented to NWO-WOTRO, synthesising the results from the evaluation of the ARF and GCP programmes.

In the interim progress evaluation, an online survey among the ARF project consortium members of the first and second call was conducted. The target group of the online survey included Dutch and Southern research organisations as well as private or public practitioner organisations. For the final evaluation, a follow-up of the online survey was conducted, contacting the same participants. Furthermore, in the interim progress evaluation, three case studies in each of the three target countries (Uganda, Ghana and Benin) were conducted. At the end of the projects, another round of case studies of the same nine projects was conducted. Therefore, the case studies and the online survey of consortium members are the main primary data sources for the final evaluation report. In addition, an analysis of documents and secondary data was conducted, among others to contextualise the impact assessment of the programme.

The final evaluation report is structured in the following way:

- **Chapter 2** gives a short overview the Food & Business Applied Research Fund, including the political background, the structure of the programme and the revised impact pathway.
- **Chapter 3** presents the results of the final evaluation of ARF and includes an assessment of the evaluation team.
- **Chapter 4** presents the conclusions and recommendations.
- In the **Annex**, the evaluation process and methodology are outlined. It also contains the list of literature used.
2. ARF at a Glance

Together with the Global Challenges Programme, the Applied Research Fund is a research-based modality of the Food & Business Knowledge Agenda. The Food & Business Knowledge Platform was established to support the knowledge management activities of this Agenda. The following section outlines the political background, the structure of the programme and the impact pathway, which has been revised in 2018 and 2019. Aspects of this section, such as the policy background, seek to give an overview of the programme for those who are unfamiliar with it.

2.1 Political Background

In March 2011 the “focusbrief ontwikkelingssamenwerking” (MFA, 2011) defined food security as one of the four priority areas of Dutch development cooperation. This approach was elaborated further in a joint letter to Parliament from October 2011 by the MFA and the MEA (MFA & MEA, 2011) by delineating the four pillars of the food security priority area:

- Pillar 1. Sustainably increased food production;
- Pillar 2. Better access to good quality food;
- Pillar 3. Functioning markets and;

The joint letter to Parliament also stressed the importance of investment in research and innovation in relation to these four pillars, as well as the collaboration with knowledge institutions and the private sector. Both letters thus brought together the Netherlands government’s Top Sector approach of the Ministry of Economic Affairs (MEA) (specifically with the Top Sectors Agri&Food as well as Horticulture & Propagation Materials) and the development policy on food security of the Ministry of Foreign Affairs (MFA) in order to create synergies between these two policies.

These letters were followed up with the “kennisbrief” to Parliament (Directorate-General for International Cooperation, 2011), which outlined a Directorate-General for International Cooperation (DGIS) responsible for the new knowledge and research policy of the MFA. In this new policy, knowledge and research for development should strengthen Dutch development policy and its implementation, as well as contribute to development and self-reliance in developing countries. To this end five knowledge platforms were established for the four thematic priority areas – food security being one among them – where learning can take place, as well as discussions on the knowledge agenda, a coherent research agenda and the utilisation of existing knowledge.

Since the inception of the Applied Research Fund in 2013, there have been three calls of proposals for interested projects, with various selection rounds per call. The focus of the evaluation is on the first and second call to allow for the completion of the projects within the time frame of the evaluation.

2.2 Structure of the Programme

2.2.1 Objectives and Characteristics of ARF

The Applied Research Fund as one of the research-based modalities of the Food & Business Knowledge Agenda aims to have an impact on food security in order to improve the situation of food insecure populations. Further, it seeks to generate research findings that are relevant for development policy in the domain of food security (cf. NWO-WOTRO, 2013, pp. 10). The objectives of ARF are specified in the programme documents of NWO-WOTRO and are defined as the following:

- Overall objective: To promote “research supported innovations that are readily applicable and contribute to the enhancement of sustainable food security for the most vulnerable populations in the 15 Dutch partner countries” (NWO-WOTRO, ndc).
• **Specific objective**: To “contribute to the enhancement of sustainable food security for the most vulnerable populations in partner countries” (NWO-WOTRO & MFA, 2013, p. 5).

• **Specific objective**: To integrate “practitioners’ and scientific knowledge in joint research (co-creation) in order to generate new knowledge and insights that add new value to products, services, technologies and policies that are readily available to governments, markets and society” (ibid).

The **type of research** conducted under ARF is applied and demand-driven in order to “meet knowledge questions and innovation needs that spring from development challenges in these countries” (NWO-WOTRO, 2013, p. 19). As a result, the **research outcomes** of the ARF are that target groups like farmers or policy makers apply the new knowledge and integrate it into their practice, contributing to food security. Therefore, ARF projects are research projects that aim to contribute to a development objective.

Furthermore, the **areas of priority** of the ARF are to contribute to at least one of the four pillars of Dutch food security policy (NWO-WOTRO & MFA, 2014, p. 6). Moreover, the funded ARF projects must align with the priorities defined in the Multi-Annual Strategic Plans (MASP) under the first call and with regard to the food security of the respective partner countries defined in the MASP under the second call (NWO-WOTRO, 2013, p. 19).

Moreover, the ARF projects are organised in **consortia**. The main applicant for ARF consortia under the first and second ARF call had to be a practitioner organisation from one of the 15 partner countries applying jointly with a research organisation from those countries or the Netherlands. In the second call a Dutch partner was required (NWO-WOTRO & MFA, 2014, p. 8; NWO-WOTRO, ndc).

In terms of the **organisation of the programme**, the Ministry of Foreign Affairs assigned the responsibility to manage and administer ARF to NWO-WOTRO (NWO-WOTRO, 2013). The implementation process of ARF can be divided into the following four phases: drawing-up of the research agenda, call procedure, assessment procedure and project implementation. The project implementation phase further consists of three processes: project implementation, knowledge sharing and research uptake and monitoring and evaluation. In the project implementation phase, all members of the consortium of the research projects are equally responsible and should be equally engaged in the implementation of the project. Furthermore, the main applicants’ organisation will take responsibility for the project secretariat, the day-to-day management and all financial affairs of the project. Next, in terms of knowledge sharing and research uptake, all research projects are required to actively engage with the Food & Business Knowledge Platform (F&BKP) and its local networks in order to assure the dissemination and sharing of the created knowledge. Finally, for monitoring and evaluation, projects need to draft an annual progress report reflecting on their impact pathways and progress. At the end of the projects, each consortium performs a self-assessment through a workshop, holds a discussion with external stakeholders and creates a final report evaluating progress with regard to the impact pathway and the conclusions of the workshop. The progress and final reports and other knowledge products are shared with the F&BKP.

### 2.2.2 Description of the Target Group of ARF

According to the programme documents, the target groups for the first call can be divided into three different categories: the ultimate target group, the intermediate target group and the immediate target group (NWO-WOTRO & MFA, 2014, p. 7; NWO-WOTRO, 2013).¹

- The **ultimate target group** are those that will ultimately benefit from the research instruments, i.e. “the poor, food insecure people and people suffering from malnutrition, especially women and children” (NWO-WOTRO & MFA, 2014, p. 7).

- The **intermediate target group** is defined as “those individuals and organisations that will be directly impacted by the outcomes of the instrument, that is to say those that will adapt, adjust and apply newly generated knowledge and insights in order to wield new tools and technologies

¹ These definitions were developed based on official documents and included in the inception report for this evaluation.
and apply new perspectives for action for pro-poor sustainable development” (ibid). This may include the primary producers (farmers), consumers, businesses along the food chains, as well as organisations in the domain of governance and management of the food and business sector or institutions representing (professional) end-users (ibid).

- The immediate target group are those stakeholders that are part of the ARF consortia. They may include businesses, public institutions or research organisations from the Netherlands or the partner countries in which the research projects take place (ibid).²

### 2.3 Revised Impact Pathway

Based on the results and conclusions of the interim progress evaluation, the impact pathway of ARF was revised by the NWO-WOTRO team. The interim progress evaluation concluded that the step from outcome to impact was too far, as the transfer of a technology adopted by the ultimate target group to the application on a national level in a country was a bar set too high. As a result, the main changes between the original impact pathway and the revised impact pathway include:

- In the revised impact pathway, an additional level between research outputs and research outcomes was included. The level of intermediate research outcomes was added, drawing attention to the steps necessary to move from generating research insights to their adoption by a wider population. Moreover, the outcome level was revised to align more with the financed ARF projects.

- The objectives on the level of impacts were formulated more realistically. In the revised impact pathway, the ARF seeks to contribute to changing food security at local and/or regional levels in ARF countries.

- The underlying assumptions of the impact pathway were formulated separately from the impact pathway. In this way, the research outputs, outcomes, and impact can be examined separately from the causes and problem areas that are supposed to be addressed by the programme.

According to NWO-WOTRO, the ARF impact pathway is organised along the following categories:

- **Research Outputs** are the direct and immediate insights generated through a research project or programme.

- **Intermediate Research Outcomes** are positive steps taken by stakeholders resulting from the exchange of knowledge and research outputs towards changing the stakeholders’ behaviour, relationships, actions and activities.

- **Research Outcomes** are the changes in behaviour (relationships, actions and activities) of stakeholders in the business and policy environment, which result from the exchange of knowledge and the uptake of research output.

- **Research impacts** are the ‘big picture’ changes in economic, environmental or social conditions to improve food and nutrition security.

Moreover, NWO-WOTRO differentiates between the sphere of control (that includes outputs), the sphere of influence (that includes outcomes) and the sphere of interest (that includes impacts). Overall, NWO-WOTRO reformulated six impacts of the ARF that are linked to the Dutch policy objectives on food security.

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² For the second ARF call the immediate target group was dropped as the funded research should focus beyond the consortium on the ultimate and intermediate target group (ibid.). As a result, the second ARF call only defined two target groups: the ultimate and intermediate target group.
First, ARF seeks to contribute to **increased sustainable production of quality food at local levels** in ARF countries. To achieve this impact, ARF promotes the research outcome of farmers and other producers adopting and applying new knowledge and innovations. These relate to high-yield, highly nutritious and resistant varieties as well as (more) affordable practices and means of production of new and existing nutritious varieties, fish and livestock. In addition, ARF promotes the research outcome of practitioners’ organisations or local or national institutions integrating new knowledge and innovations. Further, these actors should implement training and skills development for (future) farmers and other producers to produce high yielding, nutritious and resistant varieties in shorter, circular cycles in climate-smart ways. To this end, research outputs – insights from knowledge, innovations and methods – on the treatment of soil to enhance and sustain fertility in sustainable ways, for integrated pest management, on barriers for youth and current farmers to adoption or continuation of farming or fishing as livelihood, on closing of cycles and shortening of supply chains, and to develop climate-smart agricultural practices should be implemented by the ARF projects.

Second, ARF aims to contribute to **decreased food losses along local or national food chains from production to consumption** in ARF countries. To achieve this impact, ARF promotes the integration of knowledge, methods and innovations for preventing food waste and recycling of waste into policies and practices at local or national level and the showing of awareness of food waste by consumers. In order to promote these policy and behavioural changes, ARF facilitates research into preventing waste and recycling of waste and left-over materials as well as potential barriers to adoption.

The third intended impact of ARF is to contribute to **increasing food safety and nutritional value** in response to local dietary needs at local levels in ARF countries. To this end, value chain players are supposed to integrate new knowledge and innovations into policies and practices. Such knowledge can relate to institutional arrangements, policies and practices in need of transformation for enhancing food safety across value chain activities; insights and innovations for enriching nutritional values of food products, throughout the value chain and insights into consumer diversification, such as urban versus rural and limitations in access to nutritious food.

Fourth, ARF seeks to contribute to **increasing income of farmers at local levels in ARF countries**. Together with the second and third impact, ARF thereby links to the Dutch policy objective of enhancing access to quality food. For this impact, farmers as well as local value chain players, including policy actors, are supposed to apply knowledge and innovations for market integration of enhanced production of quality food into policies and practices.

The fifth impact of ARF entails the **improved integration of local small-scale farmers and entrepreneurs in local or national functional markets** in ARF countries. Based on insights into local or national trends in consumer diversification, such as gender or age, needs and demands, extension agencies are supposed to be trained to promote demand-driven production and resulting in a changed practice or policy (research outcome). Furthermore, building on knowledge on how to align production with trends in consumer diversification, farmers are trained and subsequently adopt promoted practices relating to consumer demand. Moreover, as research produces knowledge and innovations for the enhancement of business models inclusive of small-scale producers, farmers become more organised and inclusive business models are being implemented by value chain stakeholders. In addition, ARF aims for credit providers to include small-scale producers in fair credit schemes building on knowledge and innovations for enhancing access to credit and other finance, which is affordable and fair to small-scale farmers. Lastly, to achieve the fifth impact, ARF seeks for policy actors as well as actors in communication infrastructure to integrate knowledge and innovations in policy and mechanisms for (investments in) communication infrastructure. This research outcome is supposed to build on research outputs on infrastructure for communication or information on weather predictions and market prices accessible for small-scale farmers.

Sixth, ARF aims to contribute to **local institutionalisation of learning and local research infrastructures** in ARF countries. This relates cross-cuttingly to all policy objectives of the Dutch policy on food security. To achieve this impact, ARF promotes the use of platforms, collaborations, networks for exchange and learning to knowledge and innovations to enhance food and nutrition security on
selected issues. The research aims to generate insights into requirements for practice and policy to be conducive for the adoption of new knowledge and innovations. This newly generated knowledge is supposed to be taken up by value chain stakeholders, including policy actors into their agendas and expert meetings and into practices and policies. In addition, through the collaboration of Northern and Southern researchers and partners in the ARF projects, knowledge is co-created and insights into the requirements for capacities to adopt knowledge and innovations are gained. Based on this experience with the project teams, partners can continue and/or institutionalise their collaborations in research.
3. Evaluation Analysis and Results

This chapter presents the results from the final evaluation of the ARF programme. It builds on the results from the interim progress evaluation, outlining developments that have occurred since then. Since the mid-term evaluation report already analysed the criteria of relevance and policy coherence, these issues are not revisited in this chapter. Thus, the chapter is structured in four sections: effectiveness, impact, and sustainability.\(^3\)

As in all evaluations, we encountered methodological limitations that need to be considered in this report. The first methodological limitation refers to data quality of indicators. One relevant source of data were the project annual and final reports. The information and data included in these reports has been used in this evaluation. However, the quality of the reports varied considerably between projects. Most notably, many projects changed and/or stopped reporting on specific results indicator sets during the project lifespan. Therefore, baseline and final reporting data often do not match. Moreover, in many cases baseline data was not collected by the projects for all indicators due to financial constraints. For those projects included in the project sample of the evaluation, the baseline was reconstructed by the evaluation team. This however constituted a second methodological challenge because in many cases reliable (quantitative) data was not available and had to be described qualitatively or had to rely on approximations given by interview partners. During the case studies, this data was validated through triangulation to improve data quality by involving not only project personnel and target group members but also external interview partners from local governments, national ministries and international organisations.

A related third methodological challenge was that the focus of the indicators for the ARF instrument changed during the evaluation process due to the revision of the impact pathway. While at the beginning, ARF impact was only foreseen to be measured at the country level, after the revision of the impact pathway, the local level became more relevant. This was a result of the mid-term evaluation’s conclusions and thus local level baselines had to be – once again - reconstructed. Efforts to do so however proved very challenging, as access to this kind of data was very limited or not existent. Also, the collection of country-level indicators was challenging and resulted in the sampling of a set of different country indicators for Benin, Ghana and Uganda. In most cases, available country data (e.g. from the FAO database) referred to different aspects of food security in each country or had not been updated recently, resulting in a different set of indicators per country.

Fourth, a challenge emerged due to the variety of project designs, content, objectives and means of measurement, which was reflected in very different project indicators. Therefore, the evaluation distinguishes between programme-level indicators, which due to the diverse nature of the projects needed to be on a more aggregated level (e.g. mean rate of project success), and the specific project level indicators, which more directly address the intended changes (e.g. adoption of a certain practice (compost use) has increased from 10% to 30%; the productivity among adopters has increase from 1 to 1.5t/ha). These specific indicators for the project sample can be found in the project fact sheets included in the annex of this report.

Finally, the evaluation also presents data gathered by the online survey of northern and southern project partners. The data offered by them regarding the effects and impacts was triangulated by using data from the case studies and the project final reports. Therefore, the data presented on e.g. number of early adopters reached (chapter on impacts) already takes into account the results gathered during the case studies. Data submitted through the survey was therefore – if possible and necessary – revised. The limitation here however is, that this was done for 9 out of than 26 projects that self-reported their level of achievement.

\(^3\) Figures on the response rate of the online survey can be found in the annex.
3.1 Effectiveness

By focussing on the evaluation criterion of effectiveness, the question of target achievement at a programme level is addressed. While the interim progress evaluation examined the extent to which projects were underway to reach their objectives, this final evaluation examines the extent to which projects have reached their objectives. To situate and understand the achievements of the individual project, Figure 1 provides an overview of the case study projects and their main innovations. In the analysis, connections to the developments that were observed during the interim progress evaluation are made wherever pertinent. However, as NWO-WOTRO revised the impact pathway as part of a learning process since the interim progress evaluation, it is not always possible to make direct links between the results of the interim progress evaluation and the final evaluation. Moreover, the individual ARF projects also revised their Impact Pathway as part of their learning process. In the following, the achievement of programme-level outcomes and important explanatory factors are outlined. While the following figure gives an overview of the effectiveness of the projects within the project sample, the details for all relevant project indicators can be found in the annex (project fact sheets).

Figure 1: Overview of Case Study Projects

<table>
<thead>
<tr>
<th>ARF Call</th>
<th>Project Name</th>
<th>Country</th>
<th>Main Results (Innovations) according to the Evaluators' Assessments</th>
</tr>
</thead>
</table>
| 1st Call | Cashew nuts for farmers’ income Uganda           | Uganda       | • The main goal of enhancing cashew nut production and productivity by introducing, developing and maintaining new cashew nut varieties has not been achieved.  
• Farmers did not receive proper training and were not sufficiently accompanied by the project, which lead to high tree losses among farmers |
| 1st Call | Stabilizing sesame productivity in northern Uganda | Uganda       | • A new sesame variety has been introduced and is being used by sesame farmers.  
• The sesame project was successful in transferring knowledge and innovation about climate smart sesame production to the target group members. |
| 1st Call | Farmer-led innovations to sustainable food production | Uganda       | • Approaches on Conservation Agriculture in Northern Uganda have been researched, leading to a better understanding of Conservation Agricultural principles to increase productivity, sustainability and resilience.  
• The project was successful in setting up experimentation fields, so that knowledge on Conservation Agriculture could be transferred from farmer to farmer. |
| 1st Call | Improving agricultural productivity using organic waste | Ghana       | • A system of collecting waste by market vendors and producing organic compost by youth entrepreneurs was developed. For this, trainings were conducted to train and sensitize the market vendors as well as the youth entrepreneurs.  
• Agricultural extension officers and farmers were trained in the production of organic compost, but the adoption rate remained low. |
| 1st Call | Solar Drying Technology for Smallholder Farmers in Ghana | Ghana       | • A mango drying oven was developed that can run on solar energy and uses locally sourced (Ghanaian) materials.  
• With the drying oven, the prerequisites were laid to set up a factory to dry mango and other produce and thereby reduce post-harvest loss. |
Table 3.1: Achievements of the Second Call Projects

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Country</th>
<th>Achievements</th>
</tr>
</thead>
</table>
| 1st Call Water and Weather Monitoring Services for Cocoa Farmers in Ghana           | Ghana           | ● The project developed an innovative system through which weather stations could be set up in schools and be maintained by teachers, while having an educational value.  
● As a result of this system, more systematic and real-life data is collected. |
| 2nd Call Improving the resilience of the inland fisher communities and aquatic systems to overfishing and water resource degradation in Benin | Benin           | ● Project generated insights into the vulnerability of fisher communities to water resource degradation as well as the functioning of formal and informal institutions to protect these resources.  
● Awareness was raised in relevant organisations to increase the protection and improve regulation of water resources and fishing. |
| 2nd Call Designing appropriate agronomic and processing practices for pineapple supply chains in Benin | Benin           | ● Quality attributes of pineapples that would satisfy the demands of producers, traders and businesses transforming pineapple into juice were researched.  
● On the basis of this, agricultural techniques (density of planting, fertiliser) were researched that would produce the fruit satisfying the demands. |
| 2nd Call Ensuring Sustainable and Sustained Food Security by Enhancing local parboiled rice value-Chain Competitiveness in Gogounou and Banikoara areas in Benin (PARCR) | Benin           | ● Different varieties of rice and different farming techniques were researched and tested to improve rice productivity  
● New approaches of promoting local parboiled rice were developed. |

In the ARF programme, the individual projects are intended to be designed along the impact pathway to plausible contribute to programme-level outcomes. In this section, we analyse to what extent the outcomes are addressed and reached by zooming into individual outcomes. For this, we use the results of the online survey as well as the case studies. All figures on project success rates and number of individuals or organisations reached are the result of the self-reporting of the projects in the online survey. In the case studies, we used qualitative data collected in interviews to validate the data reported in the final reports of the projects sampled in Ghana, Uganda and Benin. The data from the online-survey shows that all programme-level outcomes have been addressed by the ARF projects. It also shows that the level of achievement varies between the outcome indicators formulated in the impact pathway between 42 and 76 %. In the following, we will analyse the individual outcomes.

3.1.1 Achievement of Outcomes

The first ARF outcome according to the new impact pathway maintains that farmers and other producers adopt and apply new knowledge and innovation that are developed in the ARF projects (Outcome 1.1 according to the new impact pathway). Overall, this outcome is reached to a large extent according to the survey and case study results, with projects using techniques such as experimentation fields and trainings to successfully transfer knowledge. The case studies in Benin, Ghana and Uganda revealed successful techniques to encourage farmers to adopt and apply the new knowledge and innovations. Projects in Uganda for example used previously established cooperatives and farmer groups to ensure that the knowledge on new techniques about seed varieties and use of agrochemicals is transferred from early adopters to a larger part of the target group population. Moreover, the case studies in Uganda and Benin highlighted experimentation fields as a successful method to demonstrate the benefits of new techniques to farmers. For example, projects in Uganda and Benin used experimentation fields in the regions where the beneficiaries live to show that the new techniques would lead to higher yields. In the focus group discussions, farmers expressed that they could already see first signs that these new techniques would bring higher yields and that they planned to adopt them more
widely in the future. In Uganda, this experimentation included the use of new seed varieties and the innovative use of agricultural techniques regarding e.g. crop rotation, intercropping permanent soil cover, minimum tillage and soil disturbance.

The interim progress evaluation already showed that the uptake of new agricultural production techniques and technologies by early adopters was addressed by 80% of the respondents (n=79). It also highlighted first steps that were being taken towards the achievement of the ARF outcome. By the end of the ARF projects from the first and second call, an average success rate of 70% is reported by the projects (see Figure 2). In the three project countries, the success rate ranged from 73% in Uganda, via 70% in Benin to 66% in Ghana.

**Story of Change from Uganda**

In Uganda the project on farmed-led innovation selected model farmers that were willing to experiment how Conservation Agriculture influences their yields. These model farmers experimented on plots and participated in focus group discussions in which they could share their experiences. During the experiments, model farmers received training and support from the project consortium to make sure that the experiment was conducted appropriately. At the same time, they were made aware of their role as multipliers for other interested farmers. The experimentation plots were often placed in fields near the road. This approach was aimed to create interest and awareness of the benefits of using Conservation Agricultural techniques. The model farmers were able to then showcase and explain to other farmers, how they were able to reach better yields and to pass-on knowledge. This was often the case through “job shadowing”, meaning other farmers visiting and observing how the model farmers used Conservation Agriculture techniques.

Next to aiming that farmers adopt new techniques, the first ARF outcome also seeks to encourage practitioners’ organisations or local or national institutions to integrate new knowledge and innovations and implement training and skills development for (future) farmers and other producers to produce high-yielding, nutritious and resistant varieties produced in shorter, circular cycles in climate-smart ways (Outcome 1.2 according to the new impact pathway). This outcome builds on the assumption that a contribution to food security can be achieved through cooperation and involvement of (public) governance and outreach stakeholders that can diffuse knowledge and innovation. Moreover, it assumes that stakeholders are well organised and part of well-functioning institutions.

The evaluation shows that many projects aim to utilise existing national structures and practitioners’ organisations for their knowledge dissemination, but face challenges regarding the capacities of these institutions. To disseminate knowledge to farmers, multiple projects in the case studies used governmental agricultural extension services. Nevertheless, the data collected during the final evaluation highlighted challenges regarding the capacities of these actors, which were mostly already identified during the mid-term evaluation. Specifically, it showed that local authorities mostly lack the capacities to adopt and eventually sustain the project activities and to follow up on learned topics to further implement and spread knowledge, e.g. to other parts of the intervention region. This challenge persisted until the end of the projects. Therefore, the assumption that public governance and outreach stakeholders can diffuse knowledge and innovation was not validated. Moreover, the data shows that stakeholders are not necessarily well organised and part of well-functioning institutions. For instance, in projects in Uganda and Ghana extension officers were underfunded (and partly unwilling) and therefore unable to deliver training or actively participate in knowledge dissemination. Some farmers also reported low levels of trust regarding local extension officers. Next to the engagement of extension officers, the case studies showed that involving local government can lead to mixed results, as any connections between the project and the government are highly susceptible to government changes (see Story of Change from Ghana below). However, positive interactions with local governments were

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4 In the online survey, individual consortium members were questioned. The responses were then aggregated to a project level, highlighting instances where individual project members gave contradicting answers. In this section, we report on the number of projects, in which all consortium members replied in the same way to the respective questions.
also identified during the case studies. For example, in Uganda the district and sub-county local governments in three districts (Otuke, Lira and Amolatar) have prioritized sesame varieties promoted by one ARF project as a commodity in their development plans to support food security due to an increasing number of farmers wanting to get access to the new seed varieties. Overall, the survey results reflect these mixed results. Among the 17 projects of the first and second call working towards this programme-level outcome, a mean success rate of 67% was reached. In the three case study countries Ghana, Uganda and Benin, the mean success rate ranges lower, between 57% and 59%.

**Lesson Learned from Ghana**

The organic composting project in Ghana illustrated how the support from government can be highly dependent on personnel or party changes within government. The interim progress evaluation showed that promising connections had been built with the local assembly, which was integrated in the project as a consortium member. The local assembly was supposed to support the project by supporting the agenda of organic composting and organic farming. By the end of the project, however, there had been a government change, making the collaboration between other consortium members and the local assembly more difficult. After the government change, the local assembly did not show ownership of the project anymore and became less responsive.

**Figure 2 - Mean Success Rate of the Projects – Outcome 1 and 2**

In addition, ARF aims for policy and value chain actors to integrate knowledge, methods and innovations for **preventing food waste and recycling of waste** into policies and practices at local or national level, and for consumers to show **awareness of food waste** (Outcome 2.1). Overall, there is a clear difference between the achievement of the two aspects of the outcome: While many projects successfully encourage value chain players to integrate new knowledge (mean success rate of 71%, reaching around 20 value chain organisations, n=17 projects), encouraging consumers to reduce food waste proves to be more challenging (mean success rate of 58%, n=12 projects). These differences are illustrated by the organic composting project in Ghana. The interim progress evaluation already demonstrated that the project was successfully working along the value chain, involving different value chain stakeholders. For instance, they ran short trainings for market women to collect their organic waste. Additionally, the project trained unemployed youth in waste collection and compost production to promote the recycling of waste. Nonetheless, the project did not address the primary issue of waste production, which would involve household consumers and their awareness of food waste. Regarding this issue, project stakeholders argued in interviews that there was a lack of awareness in “normal” households for waste production, making waste separation and waste collection at a household level impossible. The project itself identified a viable alternative source for organic waste collection, namely market women.
Moreover, ARF aims for the integration of knowledge and innovation into policies and practices, based on the assumption that actors from policy and practice are willing and able to be informed by knowledge and that this new and pertinent knowledge is used in decision-making. This goal applies to knowledge and innovations on enhancing food safety and nutritional value responsive to diverse dietary needs (Outcome 3.1), on the production of quality food (Outcome 4.1) and enhancing food and nutrition security on selected issues (Outcome 6.1). To achieve these outcomes on a high level, the evaluators identified different methods and techniques in the case studies as successful ways for integrating knowledge and innovation into policies and practices. For example, the fisheries project in Benin demonstrated that communicating the research outputs in formats specifically adapted to the target groups can lead to high acceptance of research findings. In this way, authorities reported that they appreciated the format of the policy briefs that were produced by the project. In addition, many projects used events to raise awareness for the issue they were researching. In this way, the rice project in Benin organised a national rice day, during which the results of the project were presented to a large audience. Moreover, bringing different value chain actors together demonstrated to be one successful method to achieve this outcome. For instance, a sector roundtable for pineapples was established in Benin, which is a multi-stakeholder organisation put into place by the Ministry of Agriculture. Its members include producers, traders, and businesses processing pineapple. The formation of this organisation for the integration of knowledge by value chain players was favoured by the fact that pineapple is a priority area for the Beninese government. Therefore, the results illustrate the importance of communicating the results appropriately to the target group to ensure their willingness to be informed by the research results.

According to the results of the online survey, integrating knowledge on the production of quality food (Outcome 4.1) has been one of the most successful outcomes on a programme level (mean success rate of 76% addressed by 21 projects) (see Figure 3). Similarly, Outcome 3.1 (knowledge on food safety and nutritional value) was achieved with mean a success rate of 72% (15 projects).
Stories of Change from Benin

The fisheries project in Benin has been very effective in involving policy actors. By actively involving policy actors and leaders of the fishing communities in the data collection phase, the project has managed to raise the interest of the authorities in the research results. The project has asked the authorities in charge of the fishery sector to accompany them in interviews with fisher communities. These interviews informed a study on how to increase the resilience of inland fisher communities (communities fishing on lakes) in the face of overfishing. Subsequently, the project has condensed the research results in several policy briefs. The format of these documents had been praised by the authorities as highly readable. Local authorities were further involved through the participation in a six-day tour of fishing communities to sensitize populations on rules and regulations related to inland fisheries. In addition, a large workshop on improving the resilience of inland fisher with more than 100 participants has been organized by the project. It brought together authorities, researchers and fisher communities. At the time when the ARF funding for the project ended, however, it was not yet possible to discern whether this information campaign had led to any changes in policy or practice. Regarding this aspect, the evaluation team found in the case study that such changes would take longer than the project duration.

In the rice project, an innovation platform on rice has been initiated by the project to foster exchange between the different actors along the value chain. This innovation platform meets twice a year, once at the beginning and once at the end of the rice season. The actors who were invited to take part in the innovation platform were identified by the sociologist who is part of the research team at the Beninese partner university, after a study on value chains in the rice chain had been completed. The starting point was the observation that actors along the value chain experienced difficulties e.g. regarding access to credit and access to agricultural inputs, especially fertilizer. The innovation platform now brings together actors ranging from farmers, women active in parboiling rice, welders producing the equipment for parboiling rice, microfinance institutions, local authorities, and local tribes making compost available for the farmers. While the platform was initially instigated by the project, the local authorities (ATDA and UCP) have stated their willingness to ensure continuation of the platform once the project has ended. The interviewed members of the innovation platform view it as a success, stating that it has led to increased trust between farmers and women parboiling rice regarding prices, as well as to better access to compost and to credit for farmers.

In addition, ARF seeks to contribute to the institutionalisation of learning and collaboration in research (outcome 6.2) by fostering continued collaboration with partners. The case studies showed in this regard that in most cases research collaboration and co-creation was assessed very positively (see chapter 3.1.2) by the involved organisations. However, the institutionalisation of collaboration and joint learning was difficult to achieve. A positive example was found in the solar drying project in Ghana. As it became apparent in the case study, the partners continued to collaborate and institutionalised cooperation by registering a joint business with all consortium members. This was due to the high collaboration level achieved in the project between all involved stakeholders. This high level of collaboration resulted in project members engaging together in a joint learning process, in which each stakeholder fulfilled their own role (e.g. ranging from developing the oven, testing the dried mangos and establishing a business plan). Based on this close collaboration, the project stakeholders decided to found a business to continue the project together, knowing that each member can add relevant strengths to the new business. In contrast, sampled projects in Uganda were less successful in establishing continued collaboration. Even though one of the projects explored opportunities to embed collaborations in the international research and policy community by jointly bidding for a project in Uganda, Malawi and two Asian countries, no active collaboration in research continued after the end of the three sampled projects. The main reason behind this lack of institutionalisation so far was the lack of opportunity and funding. Therefore, project members in Uganda explained that they do not have the financial means to finance ongoing costs like transport costs or needed equipment for experiments and further research once the external financing project funding has ended.

Despite these mixed results from the case studies, the results from all ARF projects are more positive. According the online survey (Figure 3), the programme has been successful in fostering collaboration...
between Northern and Southern researchers on different issues, with most success rates on these outcome indicators at above 70% (n=20 projects).

**Figure 4 - Mean Success Rate of the Projects – Outcome 5**

![Graph showing mean success rates for different outcomes](image)

Moreover, to apply newly researched techniques, the ARF programme seeks to promote demand-driven production. For this, extension agencies are supposed to promote demand-driven production (outcome 5.1) and farmers are supposed to adopt promoted practices that relate to consumer demand (outcome 5.2). In this regard, the challenges with involving extension agencies were largely similar to those for outcome 1.2 (see above). Concerning outcome 5.2, especially the case studies in Benin demonstrated that projects were able to reach the outcome through different approaches. In the rice project in Benin, consumer demands were disregarded at the outset of the project. Nonetheless, because the project created the innovation platform (see above), it got the feedback that the rice was not aligned with consumer demands and the project was able to adjust accordingly. In contrast, the pineapple project in Benin already researched consumer demands from the start of the project. The interim progress evaluation showed that the project was underway to develop quality criteria for pineapple (juice) by different actors along the value chain. The final evaluation case study visit showed that research had been conducted on what type of agricultural techniques (density of planting, fertiliser) would produce the fruits that satisfied this demand. Similarly, in Uganda, the sesame project was successful in increasing awareness of participating farmer cooperatives of consumer demands by discussing the benefits of ensuring high-quality seed production with farmers. The project member cooperative supported the possibility to certify sesame seeds from its member farmers to be able to meet consumer demands. Overall, the results of the online survey illustrate that on average, projects in the ARF programme were more successful in involving farmers (outcome 5.2: 74% success rate) than involving extension agencies (outcome 5.1: 60 % success rate) (see Figure 4).

Furthermore, ARF seeks to promote the organisation of farmers or value chain players in new business models that are inclusive of small-scale producers (Outcome 5.3). The achievement of this outcome through the foreseen impact pathway relies on the assumption that it is possible to develop business models and value chains in inclusive ways. The research outcome is achieved by many projects and the case studies highlight that the connection between intermediate research outcome and research outcome could be confirmed in most cases, though not all. Overall, the online survey shows that the outcome was addressed by 18 projects with a mean success rate of 67%. According to the ARF impact pathway, this research outcome is achieved through the intermediate outcome of first adopter farmers and value chain players who are piloting business models inclusive of small-scale producers. This connection could be illustrated in the case study in Uganda. For the sesame project, the interim progress evaluation had shown that first farmers were organised into cooperatives with the aim of improving their position in the value chain through seed production. By the end, the project had successfully
organised farmer groups and integrated a part of the target group to also sell and produce (certified) sesame seeds. In contrast, the rice and pineapple projects in Benin illustrated that the economic situation and position of farmers could improve without piloting inclusive business models (intermediate research outcome). While the business models of the farmers did not fundamentally change, the farmers are more organised and the communication along the value chain has improved. Therefore, the results show that it is possible to develop business models and value chains in inclusive ways, as assumed by the Dutch Food Security Policy and stated by NWO-WOTRO in calls of proposal.

In addition to developing more inclusive business models, the ARF programme has the objective of ensuring the provision of fair credit schemes to small-scale producers (outcome 5.4). Overall, the achievement of this outcome has been comparatively low (compared to the other outcomes), but the case studies highlighted the importance of credit provision to small scale farmers. The online survey showed that only 11 projects saw a match between their project goals and the programme-level outcome of credit provision. Moreover, the case studies showed that even in projects where credit provision was not one of the project goals, stakeholders identified access to credit as a significant challenge. For instance, the case study in Ghana showed that there are no possibilities for small-scale farmers to access credit. Independent of the focus of the ARF projects, the farmers reported that they were not able to access credit to further develop their farms, because only few financial institutions were accessible, and they were not willing to loan to farmers.

### 3.1.2 Influence of Programme-Level Features on Effectiveness

The ARF programme uses several support functions to support and facilitate the achievement of programme-level outcomes by the individual projects. These include the collaboration in project consortia to encourage co-creation, the engagement and interaction with external stakeholders and the target groups, and the provision of the Food & Business Knowledge Platform (including the organisation of projects and a country workshop in Benin, Uganda and Ghana with 11, 10 and 5 projects respectively). This section first looks at how these aspects where implemented throughout the programme and then analyses to what extent they contributed to reaching the programme-level outcomes described above. Overall, it finds that the support structures that are part of the ARF programme are beneficial to the reaching of programme-level outcomes.

The ARF programme encourages consortium members to engage in co-creation to promote the achievement of the programme’s objectives. Specifically, the ARF programme relies on the assumption of the Food Security Policy that collaboration between various partners leads to synergies and as a result, their interests and world views align. In the context of ARF, co-creation has been defined as “a form of cooperation in research where different parties (stakeholders, target groups) in the knowledge (demand and supply) process are engaged in interaction and joint learning on the problem definition, formulation of possible solutions, design of the research, conducting the research, the assessment of the results, and the translation of these in new practices and products” (NWO ARF Call for Proposal 2013: 5). For the purposes of the evaluation, co-creation within the consortium was operationalised in the online survey in seven dimensions (information seeking, information sharing, responsible behaviour, feedback, advocacy, helping, and tolerance) (Yi & Gong, 2013). Overall, the results from the online survey and the case studies highlight that consortium members particularly engage in information seeking and advocating for their joint projects. In contrast, aligning different perspectives on research and different quality standards is more challenging.

Generally, co-creation occurs across the ARF programme and positively contributes to achieving the outcomes. More specifically, the online survey shows that co-creation is generally high, especially regarding the dimensions of advocacy and information seeking. In the dimension of advocacy, 100% of respondents at least somewhat agree that they have said positive things about the joint project to others (n=41) and that they have recommended the joint project (such as the findings or dissemination events) to others (n=41). In the dimension of information seeking, 100% of respondents at least somewhat agree with the statement that their partners in the consortium have asked them for information for the purpose of achieving the research objectives (n=41). In line with these results, the case studies in the interim progress evaluation already pointed to benefits of co-creation, such as
receiving regular feedback from beneficiaries through organisations directly working with them and accessing past experiences and networks of consortium members. In the case studies for the final evaluation, these benefits were confirmed and more benefits could be identified. The three country case studies showed that practitioners in the lead of the ARF consortia generally had good access to the target groups. They used this access to ensure the relevance and application of research results that were jointly achieved by the consortium members. Moreover, the case studies showed that co-creation also involved using networks of consortium members to access political actors and therefore influence policy change. For instance, in the rice project in Benin, one of the agronomists involved in the project was a member of the national commission on rice and was therefore able to sensitize policy actors on the potential of the “system of rice intensification”. The benefits of co-creation also extend to achieving the programme-level outcomes. Overall, projects in which consortium members reported more co-creation tended to have higher success rates in terms of contributing to the programme-level outcomes on average \( r=0.45, p<0.05 \). This relationship is especially strong for the dimension of information sharing \( r=0.57, p<0.01 \). This means that in projects, where consortium members share more information amongst each other, outcomes are achieved with higher success rates.

**Story of Change from Ghana**

In the organic composting project in Ghana, multiple stakeholders collaborated to establish a system of waste collection and compost production. Through this process of co-creation, each of the partners benefitted in their own regard. For instance, the university was in charge of the research and therefore benefitted from the project in this regard. They could conduct research on the nutritional value of organic produce, the re-fertilisation of soil and establishing methods for waste collection and awareness-raising. In addition, the private sector stakeholder stated in the interview that they gained credibility from working with the university. Specifically, farmers were more likely to trust a university when they stated that the compost was of high quality instead of trusting a private company. Moreover, the private partner used the ARF project as a starting point for working in a new strategic area. As a result, they could apply for a follow-up project, supported by the Dutch government. Thus, the two actors stated that they benefitted individually from the project and were planning to continue their collaboration in a follow-up project.

Despite its advantages, some **challenges of co-creation** were already identified in the interim progress evaluation and expanded on in the final evaluation survey. In the interim progress evaluation, it was highlighted that consortium members have different priorities for their project work, deriving from different professional standards and backgrounds. For instance, it was perceived as a challenge to bridge interests of consortium members for whom research is more important, and those for whom action and application is more relevant. These challenges were reflected in the final evaluation, where the dimensions of responsible behaviour and tolerance were perceived as the most challenging dimensions of co-creation. In the dimension of responsible behaviour, 13% of respondents somewhat agree or more with the statement that their partners in the consortium have followed each others’ directives \( n=38 \). In the dimension of tolerance, 18% were not willing to put up with a partner not completing a task as expected \( n=39 \). Therefore, even though these statements only resonate with less than a fifth of the survey respondents, it becomes clear that the consortium members faced some challenges when directly collaborating with each other. Thus, even though the collaboration between various partners can lead to synergies, the assumption that the interests and world views of partners will align through collaboration was not observed across the projects.
Case Study Insight: Benefits and Challenges of Co-Creation

The case studies of the interim and final evaluations showed the following benefits of co-creation:

- Increased relevance of research results through closer connection to the target group
- Reduced bureaucracy when cooperating with government organisations
- Increased market access through the cooperation with private sector partners
- Regular feedback from beneficiaries through organisations directly working with them
- Access to the target group through trusted consortia members, especially the private sector consortium leads
- Access to past experiences and networks of consortium members, for example to influence policy change

 Nonetheless, the following challenges and risks were also observed:

- Difference in standards and expectations regarding the quality and practices around data documentation between different consortium members
- Dependence on personal collaboration between the consortium members, putting the collaboration at risk in case of a personnel change
- Different priorities of consortium members, for example regarding the weighing of research versus practice

Next to engaging in co-creation activities within the consortium, the ARF programme emphasises the importance of interaction with project stakeholders, the intermediate target group and the ultimate target group. The project stakeholders include any actors outside the project consortium that are involved in the research uptake process, the intermediate target group are those individuals that will be directly affected by the outcomes of the instrument, whereas the ultimate target group are those that will ultimately benefit from the research instruments (see section 0).

In general, the results show that the stakeholders and target groups identified by the projects are in line with the programme logic. According to the results of the online survey, the most frequent project stakeholders outside of the consortium include research institutions in the countries of the projects (61%, n=18 projects) and in the Netherlands (56%), as well as private sector in the countries of the projects (44%) (see Figure 5). Furthermore, more than one third of the projects (39%) identified Dutch governments, including embassies, as stakeholders. As their intermediate target group, most projects (71%, n=18 projects) name the private sector in the countries of the research projects. In line with the ARF impact pathway, the projects engage the private sector to adopt and promote new methods and techniques to increase food security in the project regions. In addition, almost half of the projects (47%) identify local or district non-profit organisation representatives or local or district government representatives (41%) in the project countries as intermediate target groups. In the case study countries, especially agricultural extension officers were addressed as multipliers of the research results. Moreover, 41% of projects address the national government representatives in the developing countries of the research projects as their intermediate target group. This picture was confirmed in the three country case studies.
Next, regarding the ultimate target groups, the projects clearly identify three top priority groups that are in line with the programme logic. The three groups of local farmers and/or smallholders, local communities, as well as local vulnerable groups are addressed by around 70% each (79%, 68%, 68% respectively). In terms of involving the target group, more than half of the projects (55%, n=22) involved their target groups four times or more during the project implementation, whereas one quarter (23%) involved them one to three times per year. More than one third (36%) involved the target group in the proposal development phase and slightly less than one third involved them in the end of the project (27%). In the case studies, the ultimate target groups were mostly involved through training, especially farmer-to-farmer training and demonstration on experimentation fields.

To ensure the uptake and application of research results, ARF projects are encouraged to develop research uptake strategies. In the online survey, 98% of the respondents indicated that they had a research uptake strategy, for example entailing a strategy for stakeholder engagement or communication (n=41) (see Figure 6 for details on the research uptake strategy). However, more than half of the respondents implemented fewer activities for research uptake than they initially planned. One reason for this is that they did not feel like they had enough time to organise the research uptake (33%, n=44). Another reason was that they encountered unanticipated challenges in the research uptake process (77%, n=39). Nonetheless, having a research uptake strategy strongly relates to the achievement of programme-level outcomes (r=0.63, p<0.01). Therefore, projects with more elaborate research uptake strategies tend to be more successful in contributing to the programme-level outcomes on average. As the figure below shows, the most relevant aspects considered within the research uptake strategies include building relationships with stakeholders and target groups, a plan to enhance the availability, relevance and accessibility of research results and an assessment of research uptake capabilities of consortium members.
To facilitate knowledge sharing and exchange on food security, ARF projects can make use of the **Food and Business Knowledge Platform (F&BKP)** that has been commissioned by the Directorate General for International Cooperation of the Ministry of Foreign Affairs. Since the interim progress evaluation, the assessment and use of the F&BKP by consortium members has improved and intensified. In the interim progress evaluation, consortium members mostly assigned a passive role to the platform as a stakeholder that is informed about but not involved in the implementation process of the projects. Nonetheless, in the mid-term survey, 87% of respondents at least agreed that the F&BKP has been helpful to communicate the research knowledge created in the project. This figure however increased to 95% by the end of the projects (see Figure 7). Similarly, the proportion of respondents who did not find the platform useful to create new links to other organisations interested in applying ARF results dropped from one third (34%) to a quarter (25%).
Regarding the different aspects and functions of the F&BKP, particularly the country workshops, which were initiated by WOTRO, but in shared responsibility of WOTRO and F&BKP, were valued by the consortium members. At the time of the interim progress evaluation, the case study projects had not made use of the F&BKP to improve their effectiveness or share key research outcomes and lessons learned. By the time of the final evaluation, the experience of some consortium members in the case studies, particularly in Ghana and Uganda, was reported as positive. They used the ARF country workshops for the exchange of ideas and as an opportunity to meet their own consortium partners as well as members of other projects. Further, the projects shared their results, and some projects used it as an opportunity to expand their networks and explore further cooperation, such as starting similar projects in other countries.

Another aspect of the programme design that is relevant for understanding the achievement of outcomes is the project duration. According to the calls for proposals, projects can apply for funding in a time frame between half a year and three years. Within the sample projects of the first and second call, the projects were designed to last between 18 months and three years with an average duration of 33.8 months. However, 13 out of 20 projects in the sample got an extension between three and twelve months. As a result, the projects lasted between 21 months and four years with a mean project duration of three years (36.5 months). Overall, the reasons for the extensions varied, including extensions for finishing project activities or finalising the reporting. Nonetheless, the case studies showed that some of the project extensions were connected to the duration in which outcomes could be observable. For instance, projects that worked with crops with long growth cycles such as pineapples or cashews) were not able to achieve the research outcomes in the impact pathway within the project time frame. As a result, these projects requested extensions or were not able to achieve the outputs and outcomes that they had originally planned.

Regarding the efforts that consortium members spend on the interaction with stakeholders, these efforts pay off in that they are related to a higher achievement of project-level outcome. This is corroborated by the analysis of the survey results. The success of reaching programme-level outcomes is positively related to the frequency of interaction with stakeholders ($p=0.52$, $p<0.01$) in the projects.
This means that projects that invested in more frequent interaction with their stakeholders tend to achieve the programme-level outcomes with higher success rates on average.

One third of the respondents of the online survey (32%, n=47), interact with relevant stakeholders five times or more per year (see Figure 8). Nonetheless, over half of the respondents, including those that already interacted at a high frequency, would involve stakeholders more intensely if they were to do the project again (53%, n=47). Only a small fraction (5%) of respondents would involve stakeholders less intensely. Therefore, interaction frequency with stakeholders is already high and could still be increased according to consortium members. The interaction with stakeholders occurred with many different purposes. The main objectives of stakeholder interactions were to build informal and formal relationships and to engage in knowledge exchange (each applicable to 63% of the projects, n=26). Furthermore, stakeholder interaction served the communication of research progress and research results (58% and 46% respectively). In line with these purposes, stakeholders were most effectively involved in enhancing the projects’ research uptake and impact. For example, most survey respondents agree with the statement that the involvement of (non-) scientific stakeholders greatly contributed to the projects’ impacts (95%, n=42). Furthermore, 88% agreed that involving stakeholders greatly contributed to building relevant relationships within the research uptake process (n=43).

The effects of stakeholder interaction vary by the type of stakeholder that projects interacted with. This is in line with the ARF programme logic, as its primary focus is to initiate changes in the project regions and countries. Accordingly, actors from developing countries were most likely to change their behaviour, projects or programmes as a result of the interaction. For example, most of the local or district representatives that projects interacted with showed a change in behaviour or policy as a result of the interaction (92%, n=13). According to the online survey, such changes in behaviour included conducting a post-harvest loss assessment or adopting the use of the mobile application that was developed as part of the project. In contrast, fewer changes could be observed among Dutch stakeholders, where 22% of Dutch universities (n=9) showed a change in behaviour and no representatives of Dutch development organisations (n=6) or Dutch non-profit organisations (n=8) changed their policies or programmes. Among international and multilateral stakeholders, consortium members observed some changes could be observed by consortium members. For example, in the online survey, it was reported that 38% of international and multilateral stakeholders (n=8) and 18% of representatives of multilateral organisations or donors (n=11) changed their behaviour, policies or programmes.
In addition to their interaction with stakeholders, projects spent resources on result dissemination activities differently. Such activities include conducting workshops or trainings with the target group, promoting the research results via the media or increasing the access to results by translating them to local languages. While one quarter of the projects engaged in 8 to 10 different types of result dissemination activities (n=24), 38% of the projects engaged in four types of activities or fewer. Among the different types of activities, most projects disseminated their results in formal (83%) and informal meetings (75%). In addition. Most projects made the results publicly accessible (71%) and summarised the research results for non-scientific stakeholders (71%). Furthermore, many projects conducted trainings to disseminate the results, including trainings between stakeholders on the application of the innovations, methods or tools (63%), and trainings for the enhanced understanding of the results, innovations or new insights (54%). In contrast, less than one third of the projects translated the results into local languages (30%) or actively promoted the results in public domains such as social media or traditional media (30%).

Regarding this issue, the ARF programme builds on the assumption that a contribution to food security and private sector development is achieved through the implementation of various modes of knowledge and innovation diffusion. In this respect, the survey shows, that neither a certain dissemination activity nor the number of implemented dissemination activities are correlated with the mean level of achievement of the projects. Thus, the results show that increasing the number of different activities does not relate to increasing the achievement of programme-level outcomes by the projects.

In addition, NWO-WOTRO also engaged in several activities to run the ARF programme and support the individual projects. In the implementation process of the ARF programme, NWO-WOTRO is involved in drafting the calls for proposals and finalising the calls for proposal, publishing the calls and conducting and eligibility assessment, a quality assessment and a quality ranking and in making the final funding decision (together with the Ministries for Economic Affairs and for Foreign Affairs). Once the projects have started, NWO-WOTRO is responsible for supporting the project implementation and for programme monitoring. NWO-WOTRO’s role in the project implementation is to support the projects with trainings on, workshops and meeting between projects, public events for exchange of findings and knowledge, and the communication of findings. Specifically, NWO-WOTRO supports the consortium members with several instruments, including stakeholder maps, communication plans, and impact pathway, and an M&E plan. Overall, the NWO support for project implementation led to high satisfaction among consortium members at the time of the interim progress evaluation. This satisfaction grew even stronger until the end of the projects. By the end of the projects, 42% of survey respondents stated that they were very satisfied and 54% stated that they were satisfied. These figures increased from 31% and 51% respectively in the interim progress evaluation.5

Although statistically, the general satisfaction with the support and the support instruments are not clearly related and the achievement of programme-level outcomes, the case studies showed that ARF projects link the NWO-WOTRO support to their success, especially mentioning the feedback and reflection opportunities (through e.g. the feedback received in the reporting phases, the reflections made during country workshops).

3.2 Impact

Overall, the ARF programme seeks to contribute to increasing food security within the countries in which it is implemented. This chapter assesses to what extent contributions to long-term impacts could be observed. For that, the analysis first shows the extent to which ARF projects aspired to contribute to individual programme impacts and the extent to which they self-assess to have been able to contribute to these impacts by for example – enabling the target groups to apply new knowledge and innovation. It is relevant to underline that ARF projects are not expected to contribute to all programme impacts.

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5 Nonetheless, when interpreting these figures, it has to be kept in mind that there is a possible self-selection effect of individuals who responded to the online survey. The final survey had a lower response rate (44 individuals) than the mid-term survey (77). Thus, it might be possible that individuals who were more satisfied with the support were more likely to respond to the survey.
However, to better understand the capacity of ARF for contributing to long-term impacts, it is important to allocated projects (and therefore resources) within the different programme impacts.

As Figure 9 shows, the ARF impacts have been addressed by a differing number of ARF projects in nine different ARF countries (Bangladesh, Benin, Burundi, Ethiopia, Ghana, Indonesia, Kenya, Mozambique, Uganda). While 20 projects acknowledged to have contributed to an increased sustainable production of quality food at the local level and even 21 to an increased income of farmers, 11 projects did so regarding their contributions to decrease food losses along local or national food chains (see Figure 9). Asked about their self-perceived level of contribution to long-term impacts, the ARF projects confirm to have been (partly) successful in their contribution (average success rate lies between 62% and 75%). Overall, ARF projects report to have reached over 40 thousand farmers (63% of which are women) and that these are now applying new knowledge for enhanced production of quality food. To promote this change, over 400 extension agencies now promote demand-driven production and over 50 value change organisations integrated new knowledge on food safety in their practice. Focussing on the case study projects, 8,330 target group members were reached in six projects, working towards increasing sustainable food production (Pillar 1).

Figure 9 - Project Contribution to Objectives

<table>
<thead>
<tr>
<th>Objective</th>
<th>Percentage</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased sustainable production of quality food at the local level (Impact 1)</td>
<td>69%</td>
<td>N=20</td>
</tr>
<tr>
<td>Decreased food losses along local or national food chains from production to consumption (Impact 2)</td>
<td>75%</td>
<td>N=11</td>
</tr>
<tr>
<td>Increased food safety and nutritional value in response to local dietary needs at the local level (Impact 3)</td>
<td>69%</td>
<td>N=15</td>
</tr>
<tr>
<td>Increased income of farmers at the local level (Impact 4)</td>
<td>68%</td>
<td>N=21</td>
</tr>
<tr>
<td>Improved integration of local small-scale farmers and entrepreneurs in local markets that supply quality food (Impact 5)</td>
<td>71%</td>
<td>N=19</td>
</tr>
<tr>
<td>Improved integration of local small-scale farmers and entrepreneurs in national markets that supply quality food (Impact 5)</td>
<td>68%</td>
<td>N=17</td>
</tr>
<tr>
<td>Local institutionalisation of learning and research infrastructures to local market integration of small-scale farmers or other producers at local levels (Impact 5)</td>
<td>67%</td>
<td>N=16</td>
</tr>
<tr>
<td>Local institutionalisation of learning and research infrastructures to enhance inclusive access to quality food in line with dietary needs at the local level (Impact 6)</td>
<td>62%</td>
<td>N=15</td>
</tr>
<tr>
<td>Local institutionalisation of learning and research infrastructure to sustainable production of quality food at the local level (Impact 6)</td>
<td>70%</td>
<td>N=19</td>
</tr>
</tbody>
</table>

In this analysis, three projects are excluded. Two projects (fisheries in Benin and mango drying in Ghana) did not directly engage with their ultimate target group and one project (cashew in Uganda) failed to deliver improvements regarding food security for the ultimate target group and was therefore also left out of the analysis.
While the figure above shows the data across all nine ARF countries, a more detailed analysis was conducted in the three case study countries Ghana, Benin and Uganda. According to the self-assessment of the project members in Ghana, the thematic focus of the projects was mainly on increasing sustainable agriculture (100%; N=9). Most also agreed that their projects were trying to contribute to improving inclusive access to markets (67%; N=9). Only some saw contributions on ensuring equitable access to better nutrition (22%; N=9) and to enabling better business climate (38%; N=8). Therefore, ARF projects in Ghana worked towards contributing to four out of six ARF long-term impacts. These numbers need to be reflected against the backdrop of the general food security developments in Ghana, where a general upward trend in terms of food production and energy supply on a national level exists. For instance, on national food security indicators, the total value of annual food production has increased from 272 US$ in 2014 (before the ARF projects) to 278 US$ in 2018 (towards the end of the projects) (FAO, 2014/2018). Thus, more valuable food is produced per head. At the same time, volatility in agricultural production has decreased with a drop in the standard deviation of the annual production over the most recent 20 years from 0.05 to 0.01 (EIU GFSI 2014/2018). There is also a general upward trend in terms of enhancing access to quality food. The depth of the food deficit decreased from 24 to 19 kcal per head per day between 2014 and 2018 (FAO, 2014 and World Bank, 2018). Therefore, the calories per person needed to lift the undernourished from their status decreased in the time the ARF projects where implemented. The national figures furthermore indicate that the business climate for farmers and agriculture remained largely constant between 2014 and 2018. At a national level, the access to financing for farmers remained largely constant (EIU GFSI, 2018). Further, public expenditure on agricultural R&D stayed constant at a level between 0.51% and 1% of GDP and there are still no adequate crop storage facilities (EIU GFSI, 2018). Thus overall, ARF project contributions in Ghana were implemented within an improving food security context in the country.

These contributions to long-term impacts are reflected in the number of target group members that have been reached according to the online survey and the three case study along the impact categories. The following overview illustrates the extent to which contributions to long-term effects have been made by ARF at target group level in Ghana (Figure 10). The figure includes data from four ARF projects in Ghana that participated in the survey.

![Figure 10 - Number of reached target group members in Ghana (4 projects)](source: Syspons Online Survey 2019)

The numbers reported in Ghana show that by far the main beneficiaries were (small-scale) farmers. Also, the data shows that in many cases, data on gender differentiation was not available or not applicable. However, regarding the aspects of knowledge application and local market integration, female beneficiaries accounted for 54% and 40% respectively. It is also important to notice that the numbers reported cannot be added up due to possible double counting. As such, many of the farmers applying new knowledge may also have been supported to be integrated in local markets.
In contrast to the development of quality food production in Ghana, Benin has seen a slight decrease in quality food production in the programme time frame. The average value of food production has decreased slightly from 221 US$ per person between 2012 and 2014 to 214 US$ per person between 2014 and 2016 (FAO Food Security Indicators 2018). At the same time, household food insecurity has increased in many areas. Moreover, access to good quality food has not seen improvements in the last years. On a national level, the depth of the food deficit has increased from 52kcal per head per day in 2014 to 67 kcal per head per day in 2018 (EIU GFSI, 2018). At a regional level, the proportion of households with low dietary diversity has increased. Furthermore, in the project region of Atlantique, the proportion of households that are marginally food insecure has increase from 35% to 43.9% between 2013 and 2017 (AGVSA, 2017). Even though the prevalence of food insecurity is generally lower in Littoral (a second project region) than in Atlantique, it has also increased between 2013 and 2017 (from 9% to 19.1%) (AGVSA, 2017). Similar to the developments in Ghana, the national Beninese figures on business climate for farmers remained largely the same. This impact is not addressed by the projects in the case study. Nonetheless, official data shows that the percentage share of expenditure on food decreased from 68% in 2013 to 52% in 2017 in some regions (AGVSA, 2017). Thus overall, ARF project contributions in Benin were implemented within a challenging food security context in the country.

According to the self-assessment of the project members, the thematic focus of the projects was mainly on increasing sustainable agriculture (94%; N=16) and on ensuring equitable access to better nutrition (94%; N=16) Most also agreed that their projects were trying to contribute to improving inclusive access to markets (71%; N=14). Only some saw contributions to enabling better business climate (38%; N=13). Therefore, similar to Ghana, the ARF projects in Benin were working towards contributing to four out of six ARF long-term impacts. These contributions are reflected in the numbers shown in Figure 11, especially in the number of farmers who now apply new knowledge and innovation for high yielding, nutritious and resistant varieties (over 2.300 farmers). The data also highlights a strong involvement of female farmers that made out the majority of target group members reached.

Finally, in Uganda FAO data show a strong increase of food insecurity in the last years. The average value of food production per person decreased from 130 US$ (2011-2013) to 120 US$ in (2014-2016). The number of undernourished people rose from 12.6 million (2011-2012) to 17.2 million (2015-2017). Parallel to these numbers, prevalence of undernourishment increased from 35,5% (2013-2015) to 41,4% (2015-2017) (FAO Uganda 2018). Average food supply also slightly decreased, while public expenditure on agricultural R&D stayed unchanged on a low level (GFSI EIG 2018). Thus overall, ARF project contributions in Uganda were implemented within a very challenging food security context in the country.

The survey of the project members moreover made clear, that the thematic focus of the projects was mainly on four ARF impacts, mainly in increasing sustainable agriculture (100%; N=16) and on
improving inclusive access to markets (88%; N=16). Most also agreed that their projects were trying to contribute to enabling better business climate (75%; N=16) and to ensuring equitable access to better nutrition (63%; N=16). The contributions made in Uganda in terms of reached target group members is the highest reported in the three case study countries. Here the main driver behind these numbers is the successful implementation of the sesame project that was able to account for over four thousand farmers organised in cooperatives and farmers groups and exposed them to the new sesame varieties and the innovative use of agrochemicals to enhance production of quality food. As in Ghana and Benin, also in Uganda the participation of female farmers was extensive.

Figure 12 - Number of reached target group members in Uganda (6 projects)

<table>
<thead>
<tr>
<th>Number of...</th>
<th>Total</th>
<th>Women (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>...farmers who now apply new knowledge and innovations for high yielding, nutritious and resistant varieties</td>
<td>2719</td>
<td>61</td>
</tr>
<tr>
<td>...farmers who apply new knowledge for enhanced production of quality food</td>
<td>6542</td>
<td>67</td>
</tr>
<tr>
<td>...farmers who are organised in new business models that are inclusive of small-scale producers</td>
<td>5969</td>
<td>50</td>
</tr>
<tr>
<td>...consumer who now show awareness of food waste</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>...farmers who apply new knowledge for enhanced production of quality food</td>
<td>6542</td>
<td>67</td>
</tr>
<tr>
<td>...small-scale producers that have been included in fair credit schemes by credit providers</td>
<td>300</td>
<td>55</td>
</tr>
<tr>
<td>...practitioner's organizations who integrated new knowledge and innovations</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>...local or national institutions who integrated new knowledge and innovations</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>...value chain organisations who integrated new knowledge for preventing food waste into their practice</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>...value chain organisations who integrated new knowledge into their practice</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>...extension agencies who now promote demand-driven production (for example responsive to age structure, class structure)</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Source: Syspons Online Survey 2019

The general food security developments described for the three ARF countries show that ARF projects were implemented within different contexts. Although Figures 9, 10 and 11 illustrate the extent to which contributions to food security within these differing developments were achieved, the case studies abroad also showed three limitations. First, a closer look at how ARF was linked to national and regional developments shows, that ARF projects were not necessarily located in the country regions that are – according to the general data – most affected by food insecurity. For example, the regional data shows that in 2009 and 2012, most food insecurity in Ghana occurred in the northern regions (Upper West, Upper East, Northern). The projects, however, worked in the southern and central regions, where the population is less prone to food insecurity. In Uganda the most food insecure regions are Acholi, Karamoja, Teso and West Nile, which were only partly at the centre of the three sampled ARF projects that were mostly implemented in Lango region (IPC 2017). Thus overall, ARF project contributions in Uganda were implemented within a challenging food security context in the country. In contrast, in Benin, many areas are affected by high food insecurity, so that the ARF projects were also situated in areas with relatively high food insecurity.

Lessons Learned from Uganda

The cashew nut project failed to produce benefits for its ultimate target group due to three main aspects. First, at the time the project started, cashew nut trees were not a common source of food or a cash crop among the local farmer communities. Therefore, the project had to invest in sensitization of farmers. This was, second, a challenge, because the cashew nut tree needs at least three years to deliver first small yields and up to 8-10 years to achieve its full yielding potential. Therefore, farmers needed to be patient and invest in maintaining the trees healthy for a long time before they could benefit from them. This was thirdly a problem, as the farmers did not receive proper training and were not sufficiently accompanied by the project, which lead to high tree losses among farmers. Besides insufficient quality management skills, many farmers were also not well connected to the markets and had no proper storage facilities, which lead to high post-harvest losses. The lessons learned here is that too many challenges existed in the way this project was designed that made the uptake of innovation for farmers too difficult.
Second, the selection processes of the ultimate target group members were not based on detailed data on the quantity or quality of food insecurity. For example, in Uganda, the project on Conservation Agriculture needed early adopters that are literate and experienced in farming practices. In general, these early adopters are not among those suffering high levels of food insecurity. Moreover, the practitioner organisation in the lead made use of the network of farmers that they have been working with in other projects. The quantity of quality of their food insecurity was not analysed or used as a selection criterion. This also holds true for the early adopters that were involved in the cashew nut project in Uganda. The project involved those farmers and farmer groups interested in introducing cashew nut trees as a source of additional income without taking into consideration their food security situation. Even though this approach of trying to indirectly reach food insecure farmers in the long-term through e.g. model farmers and early adopters is plausible, interviewees also acknowledged that it increases the challenges for the projects to ensure its realisation. The difficulties are that it involves additional steps and increases the number of interfering variables that can negatively affect this long term goal.

Third, some of the projects based their work on Food Security Policy assumption, that an increase in income would lead to an improved food security situation. The premise here was that members of the ultimate target group would use the additional money to buy more (quality) food. For example, in Uganda all projects aimed at increasing food security through an increased income of farmers. However, as the case studies abroad showed, the farmers did not see themselves as being food insecure and thus spend the additional money on transportation or education for their children. Moreover, they did not see the need to save part of the additional money to be able to face future food shortages. In Benin, the case study also showed that even though some farmers spent the additional income on food, there was little awareness of the nutritional value of different food types.

Notwithstanding these limitation, also positive examples were identified. For example, in Uganda the farmers that benefited from the increased sesame production used it to increase their income and to enhance their own supply with sesame. In Benin, the rice project seeks to address increasing access to quality food by increasing rice production of smallholder farmers. Through this method, some farmers eat the additional rice or sell it. Thus, besides an increase in income, also the energy supply was enhanced.

**Story of Change from Uganda**

The sesame project was successful in transferring knowledge and innovation about climate smart sesame production to the target group members. This was implemented through trainings and exposure to knowledge about the results of the research conducted to test different sesame varieties, which eventually led to the adoption and application of new crop varieties by the target group members (farmers and further value chain stakeholders). Farmers reported that as a result of the innovation, they were able to double the yields per acre. While in their experience traditional seed varieties yield 1,5 bags (each 90 kg) per acre, the farmers have been able to yield and sell three such bags per acre by using the newly introduced varieties. Although farmers have been producing seeds to sell and increase their income, they have also used the sesame for own consumption. This was facilitated by the fact, that sesame has traditionally been a source of food in Northern Uganda.

### 3.4 Sustainability

To ensure that outcomes stay available and beneficial after the projects end, achieving sustainable results is essential. In this section, Syspons analysed measures that projects have implemented to ensure the sustainability of their results. At the time of the final evaluation, the projects had just been completed. Therefore, the analysis of the sustainability focusses on the sustainability measures that were implemented and on the probability of their success. In this section, we analyse the dimensions of sustainability as defined for the context of ARF: financial sustainability, institutional sustainability, ecological sustainability, social sustainability, and technological sustainability.
3.4.1 Financial Sustainability

Looking more closely at the different dimensions of sustainability, **financial sustainability is defined** as the ability of the projects in the programme to acquire additional funding during the project and to carry on its activities without further funding from NWO-WOTRO after the project has ended. Overall, the results show that financial resources are a continuous challenge for the projects in the ARF programme. Nonetheless, across the programme, some successful avenues for securing financial resources could be identified, namely the investment of private project partners, additional public funding, and showing viable business models for the target groups.

The interim progress evaluation identified financial resources as a potential **major challenge for sustaining results** and this challenge persisted when the projects ended. At the time of the interim progress evaluation, many ARF consortia members saw a challenge in securing financial resources to continue funding research activities and research uptake. This was reflected in the mid-term online survey, where 17% of the projects stated that they did not have any measures planned or in place to ensure the sustainability of the results. This figure increased until the end of the projects, when in 46% of the projects, all respondents stated that they did not implement measures to ensure that financial resources are available to sustain the project results after the project ended (n=24). Accordingly, in 39% of the projects, respondents disagreed or more with the statement that by the end of the project, there would be sufficient financial resources to the target group(s) to sustain the research results (see Figure 13). Nonetheless, the survey and the case studies show that some projects have been successful in securing financial resources. For this, the data points to three main ways in which projects have secured financial resources.

First, many ARF projects managed to secure continued funding from the **private project partners**. As part of the programme design, the private project partners have to contributed 20% of the budget during the projects. The survey showed that continued funding by the private partners was the most frequent source of funding. Most respondents (74%) stated that their private partner decided to invest in the research results. In the case studies, projects that develop technologies which can be turned into business ideas were particularly prone to the continued investment of the private partner. For example, in the mango drying project in Ghana, one of the project goals was to develop a financially viable method of drying mangoes. When the financial profitability was shown in the project, the consortium partners decided to form a business around their solar dryer at the end of the project funding to sustain the research results.

![Figure 13 - Financial Sustainability](#)

Source: Syspons Online Survey 2019

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7 In the online survey, individual consortium members were questioned. The responses were then aggregated to a project level, highlighting instances where individual project members gave contradicting answers. In this section, we report on the number of projects, in which all consortium members replied in the same way to the respective questions.

8 The responses are reported on an individual level. Therefore, ‘N’ refers to the number of respondents rather than the number of projects.
A second source of funding that was used by projects across the ARF programme was further public investment. In the survey, 30% of the respondents state that they are in the process of or already have achieved funding of practical donor instruments for food security business development (n=34). The survey data shows a positive relationship between securing from private partners and funding from external donors ($r=0.43$, $p<0.05$). This connection was illustrated in the case studies by the weather monitoring project in Ghana. In this project, consortium members combined multiple sources of funding to sustain and further develop their results. While the private partner integrated the developed technology into their products, to continue offering them to farmers, other consortium members continued their collaboration in a larger research project funded by the EU Horizon 2020.

A third avenue to ensure the financial sustainability of the projects was to demonstrate a successful business case for farmers or other members of the target group. The sesame project in Uganda serves as an example of a project that was able to introduce new knowledge that is seen as financially viable and profitable. Through the adoption of a new sesame variety, farmers have increased production and their income through the sales. Therefore, the farmers continue to use the new sesame variety. Nonetheless, the case studies also indicated that this model of ensuring financial sustainability may require high continuous support from the consortium members as illustrated by the organic composting project in Ghana. In this project, the consortium members showed high commitment to support the business of the youth who were producing organic composting, for example by establishing business relations and identifying potential clients. Furthermore, one potential caveat regarding the sustainability of the introduction of new farming techniques was identified: projects showed a potential trade-off between benefits from new techniques and the required financial and labour investments. For instance, the rice and pineapple projects in Benin showed that while the newly introduced agricultural techniques have led to higher yields, they also require higher investments, such as buying fertilisers and labour. Calculating this trade-off between higher investments for higher farming outputs was not part of the initial research designs and has only been addressed by the researchers in the projects towards the end of the projects.

### 3.4.2 Institutional Sustainability

Regarding the second dimension of sustainability, institutional sustainability was defined as the degree to which human resources, processes and procedures of the project have been incorporated into the structures of the consortium members during and after the project. Generally, projects in the ARF programme managed to put their measures for institutional sustainability into practice. For this, collaboration between project stakeholders, their connections to the research topic and a focus on qualifying personnel were identified as important contributing factors.

The interim progress evaluation showed that most projects in the programme had plans to ensure their institutional sustainability. These plans were implemented by the end of the projects and showed potential for success. In the mid-term survey, 84% of the respondents stated that they planned to implement a Capacity-Building Approach. Similarly, 84% of the respondents planned to implement measures for qualifying personnel. These figures remain largely stable until the end of the projects, indicating that plans for sustainability measures were put into practice. Accordingly, in 80% of the projects, all project respondents stated that they implemented a Capacity-Building Approach to support the consortium members sustain the institutional capacities (n=24). Moreover, in 71% of the projects, all respondents stated that measures to ensure that qualified personnel were available to the target group to take up the project results after the project ended. In their assessment, these measures showed potential for success, as 73% of respondents stated that they somewhat agreed or more with the statement that by the end of the project, there was sufficient qualified personnel available in their organisation to further support the target groups to take up the research results (see Figure 14). To explain this institutional sustainability, three contributing factors could be identified in the analysis of the quantitative and qualitative data.
First, a close collaboration between the consortium members during the project time is connected to higher chances of continued collaboration once the projects have ended. The analysis of the quantitative data points to a positive relationship between co-creation and institutional sustainability. There is a positive correlation between the probability of consortium members continuing to sustain the institutional capacities and overall co-creation within the project ($r=0.32$, $p<0.1$), co-creation with regard to helping each other within the consortium ($r=0.32$, $p<0.05$), as well as co-creation with regard to tolerance between consortium members ($r=0.37$, $p<0.05$). This relationship was supported by the case studies. For example, the solar drying project in Ghana demonstrated high collaboration between project stakeholders while the project was running. In the project, each stakeholder fulfilled their own role, ranging from developing the oven, testing the dried mangoes and establishing a business plan. Based on this close collaboration, the project stakeholders decided to found a business to continue the project together.

A second contributing factor to institutional sustainability is a strong connection of consortium members to the research topic. This connection and high interest in the topics motivated consortium members to carry the results forward even after the projects officially ended. In the case studies, this manifested in different ways. On the one hand, the ARF projects could be used to expand stakeholders influence within their fields. For instance, in the sesame project in Uganda, most consortium members were already in the sesame business before their participation in the ARF project and they continue these activities after the project ended. As a result of the project, the stakeholders took up the new sesame varieties and continued to actively promote them among farmers and other buyers. On the other hand, the ARF projects could be used as an entry point to a new field, thereby increasing stakeholders’ roles in different fields of food security. For instance, for the Beninese NGO in the lead of the fisheries project, the ARF project was the first larger project that they implemented. It helped them gain capacities and credibility, helping them to acquire funding for follow-up projects in connected areas.

**Figure 14 - Institutional Sustainability**

There was sufficient qualified personnel available in our organisation to further support our target group(s) to take up our research results. 13% 11% 13% 26% 34% N=38

The consortium members were able to sustain the institutional capacities built up by the research project for the next three years. 8% 18% 39% 29% N=38

Source: Syspons Online Survey 2019
Third, including the qualification of personnel as an explicit project goal can contribute to ensuring the institutional sustainability of the ARF projects. For instance, training youth to collect and process organic waste was an integral part of the organic composting project in Ghana. The follow-up project is planning to recruit these trained youths for the waste collection from markets, thereby tapping into the human resources that were fostered during the ARF project. In contrast, the cashew nuts project in Uganda serves as an example for a case where training the target group was not sufficiently incorporated in the project design. As farmer associations did not receive proper trainings, quality management could not be institutionalised to deal with pests and ensure the survival of the newly introduced cashew trees.

3.4.3 Technological Sustainability

Next to financial and institutional sustainability, technological sustainability was defined as the degree to which newly developed methods and technologies can be used by the target groups without external assistance and maintenance support during and after the projects. Overall, the high commitment to technological sustainability across the ARF programme that was found in the interim progress evaluation decreased slightly. Nonetheless, the ARF projects could foster their technological sustainability through integrating their research into existing value chains and through links to institutional sustainability.

In the interim progress evaluation, high commitment to technological sustainability was identified, but this decreased until the projects ended. In the mid-term survey, most respondents (97%, n=75) indicated that they were planning to implement measures to ensure that the target group has access to the technology necessary to take up and use the research results. By the end of the projects, however, in 57% of the projects, such measures were put in place. Nonetheless, 90% of the respondents indicated that the target group had access to the technology necessary to take up and use the research results (n=38) (see Figure 15). Therefore, even though no explicit measures are being implemented, there are signs of institutional sustainability across many projects. These are fostered by an integration of the projects into existing value chains as well as by high institutional commitment from project stakeholders.

![Figure 15 - Technological Sustainability](image)

Specifically, the case studies illustrated the importance of integrating the projects and newly developed technologies into the local supply chains. For example, the solar drying project in Ghana already aimed at developing a dryer that could be produced and maintained with local products at the design stage. In this way, the project could ensure that the dryer could be maintained and potentially rebuilt using local materials. The Conservation Agriculture project in Uganda illustrates a less successful example regarding the integration into existing value chains. In this project, the continued availability of agrochemicals as well as gear and spray pumps need to be maintained in order to ensure the technological sustainability of the project. While lead farmers receive spray pumps for the application of agrochemicals, these are not sufficient in numbers to ensure the continued use of the insights developed by the project by all involved farmers. This is because mostly, other farmers visit the lead farmers to observe how they use the spray pumps and the protective gear. Therefore, multiplication here means that new farmers copy the behaviour of the lead farmers.
Furthermore, the qualitative and quantitative data points to a strong connection between the training of qualified personnel, the commitment of consortium members and the continued use of technology. The analysis of the survey data shows that projects that expect to be successful in implementing measures for institutional sustainability also expect to be successful in ensuring their technological sustainability. For example, projects ensure the availability of qualified personnel to support the target group also ensure the ability of the target group to use the technology \((r=0.69, \ p<0.01)\). In addition, there is a strong connection between the ability of the target group to use the technology and the ability of consortium members to sustain the institutional capacities \((r=0.64, \ p<0.01)\). This connection between the continued use of technologies and the support and training from the consortium members could be confirmed in the case studies (also see Story of Change below). For instance, in the sesame project in Uganda, one of the consortium members actively supported the farmers in getting agrochemicals and sold sesame seeds to them at the same time. As a result, the consortium members and the target group members confirmed that the newly introduced sesame varieties and necessary agrochemicals continued to be available and used by the target group after the project ended.

**Story of Change from Ghana**

The Weather and Water Monitoring Project in Ghana included the technological sustainability as an integral part of its design. The project was motivated by the fact that weather stations that had previously been installed in Ghana were not being maintained well. To address this issue in the ARF project, the project team deliberately installed the weather stations at schools throughout the country. This was advantageous as they could be maintained by teachers who felt responsible for the maintenance and functioning of the station. When visiting some of the schools in the case study, the weather stations were well-maintained and teachers as well as project members reported that they had good communication channels in case questions regarding the maintenance arose. In addition to the advantage of ensuring technological sustainability, installing the weather stations in schools also had an educational effect on the students. Teachers could use “their data” in classes to discuss weather patterns and the changes of weather patterns due to climate change.

3.4.4 Ecological and Social Sustainability

Finally, ecological sustainability was defined as the ability of projects within the ARF programme to increase the ecological benefits or decrease ecological harm (e.g., in terms of increased biodiversity or reduced pollution) during and after the project. Moreover, social sustainability was defined as the ability of projects to increase social benefits or decrease social harm (e.g., in terms of improved labour conditions or the social inclusion of disadvantaged groups) during and after the project. Thereby, the concepts address two important aspects: the reduction of harm and the promotion of benefits. Overall, the first results from the interim progress evaluation were solidified as social and ecological sustainability were not always specifically addressed or monitored but were the explicit focus of some ARF projects.

In the mid-term survey, most respondents were planning to implement measures to reduce environmental and social harm, but these figures decreased significantly to the final evaluation. In the interim progress evaluation, 84% of respondents stated that they planned to implement measures to prevent environmental harm \((n=67)\). However, by the end of the projects, in 50% of the projects \((n=24)\), all respondents stated that they implemented measures to ensure that the project results do not harm the environment in case it is used extensively \((63\% \ of \ all \ individual \ respondents, \ n=40)\). Therefore, not all planned measures were implemented at the end of the projects. A similar trend could be observed regarding the measures to prevent negative social consequences. In the interim progress evaluation, 78% of the respondents stated that they planned to implement measures to ensure that the uptake and use of the project results by the target groups do not cause negative social effects on other social groups. By the end of the projects, in 46% of the projects, all respondents stated that they implemented such measures.
The data analysis shows that not all projects recognise potential harms that they are causing. This, however, is a necessary condition for the prevention of social and ecological harm. The survey showed that all respondents agreed with the statement that by the end of the research project, the uptake and use of the research results would not cause negative social or environmental effects (see Figure 16). Nonetheless, in the case studies, some instances were identified where negative social and environmental effects were caused but not recognised by the consortium members. In the case of the CA project in Uganda, agrochemicals were used without proper training and precautions. Although lead farmers were trained in the use and safety measures of agrochemicals, the interviews showed that the use of agrochemicals had changed since the projects’ training measures. For example, farmers reported that they were using agrochemicals and training other farmers without the proper protective gear. This led to the adoption of CA methods by other farmers as well as the multiplication of errors in the usage demonstrated by the leader farmers. In contrast, the potential ecological harm of the waste created by the solar drying project in Ghana was recognised and addressed. Through the solar drying of mangos, much organic waste in the form of peels and pits is created. In the interviews, the project stakeholders named different ways of addressing this issue once the factory starts running, such as giving the waste to a piggery as feed.

Regarding the second aspect of ecological and social sustainability, the case studies have demonstrated that the promotion of benefits is fostered by the project goals and the extent to which projects can reach them. For example, in the fisheries project in Benin, part of the research addressed environmental aspects related to the physical-chemical quality of resources, including biodiversity of fish species and the effects of different types of fishing engines on fish production. The project contributes to ecological sustainability by sensitizing authorities and fishing communities on these aspects. Additionally, the organic waste project in Ghana aims to reduce soil degradation by promoting the use of organic compost instead of inorganic fertilisers. The project is however only partially successful in this regard, as the uptake and use of organic compost by farmers proves difficult.
4. Conclusion and Recommendations

4.1 Assessment and Conclusion by the Evaluation Team

The evaluation team finds that stakeholders and target groups are being involved by the projects as foreseen and planned by the programme. This is an important step to enable the achievement of programme-level outcomes and impacts. In this area, the revised impact pathway was useful to accurately assess the outcomes across the programme. As a result of revising the impact pathway, the local level could be analysed more closely in the evaluation. Moreover, as an intermediate level was included in the revised impact pathway, the path from outputs to outcomes could be assessed more rigorously. Thus, the evaluation team concludes that the programme is largely effective, as most outcomes are reached across the programme. In addition, the evaluation concludes that farmers and other producers adopt and apply new knowledge and innovation. This outcome was observed in the three case study countries Benin, Ghana and Uganda. Furthermore, the evaluation finds that the programme is successful in raising awareness for the food security issues that are being researched. Further, the evaluation shows that using agricultural extension officers and other existing national or local institutions can lead to more effective projects. Nonetheless, it can also make project success dependent on the institutional capacities of the government as well as potential governmental or political changes. Further, the evaluation finds that research uptake strategies are important for achieving the project outcomes, even though they cannot always be implemented as planned. Therefore, encouraging projects to develop and devise research uptake strategies – in relation to the Impact Pathway – is important for the success of the programme. In this regard, the support activities by NWO pay off in that they are appreciated by the projects and support is seen by project members as helpful to their project implementation. Regarding the spending of resources on programme and project activities, the evaluation finds that engaging in frequent stakeholder interaction activities and establishing a research uptake strategy are connected to higher achievement rates. The quantity of results dissemination activities, however, is not related to the effectiveness of projects. In general, the evaluation finds that the ARF programme has been successful in fostering collaboration between Northern and Southern researchers. For this success, the programme design, requiring teamwork and co-creation between Northern and Southern consortium members was instrumental. Moreover, the evaluation team concludes that co-creation is a useful feature of the programme design to achieve programme-level outcomes. Nonetheless, realising co-creation within consortia also yields challenges, such as different expectations of the involved actors. In order to be successful, these challenges need to be overcome by project actors with the support of NWO-WOTRO.

A challenging aspect regarding the achievement of outcomes across the programme is the project time frames. The evaluation sometimes found a disconnect between the growth cycles of crops that are used in the projects and the time in which projects are supposed to achieve outcomes. When the ARF projects use crops with long growth cycles, the expectation that research outcomes of the impact pathway can be observed within the project time frames is unrealistic. Another challenge that remains is creating access to credit for small-scale farmers and producers. This outcome was not successfully addressed and achieved across the programme and identified as a main challenge by multiple projects. Regarding the impact of the programme, the final evaluation identifies successful examples of projects contributing to changing food security at local or regional levels. Nevertheless, the evaluation identifies relevant challenges to the successful achievement of impacts across the programme. First, many of the projects in the case studies were not located in the most food insecure regions of the country. As a result, the ARF programme was not able to reach the most food insecure populations and was therefore not able to make large contributions among those that are most food insecure. Second, some ARF projects did not select food insecure individuals as their target group. As a result, even though the target group adopted new farming methods, these did not change their overall food security. In this regard, the evaluation identified a trade-off between the programme objectives of supporting food insecure target groups and the objective of fostering private sector development. Third, the evaluation team did not find that the target group spent additional income on food. Therefore, the ARF programme
has contributed to a better understanding that an increase in income does not necessarily lead to an increase in food security, thereby rejecting one of the underlying assumptions of the Food Security Policy.

Moreover, the evaluation team finds that projects across the ARF programme have implemented measures for ensuring their sustainability. The programme shows promising measures to ensure technological and institutional sustainability. In this sense, human resources, processes and procedures of the project have been incorporated into the structures of the consortium members (institutional sustainability), and newly developed methods and technologies can be used by the target groups without external assistance and maintenance support after the project (technological sustainability). Regarding the institutional sustainability, namely the extent to which human resources, processes and procedures are embedded once the projects have ended, a close collaboration and co-creation between consortium members has shown to be beneficial. Therefore, the emphasis on co-creation of the ARF programme is a useful feature to ensure the institutional sustainability of the results. Therefore, the Capacity Building approach that is pursued in the ARF programme is a success factor for ensuring institutional sustainability. Moreover, for ensuring the technological sustainability of the projects, the ARF projects integrated their research into existing value chains and managed to integrate efforts for technological and institutional sustainability. Furthermore, projects that develop technologies which can be turned into business ideas were particularly prone to secure the continued investment of the private partner. In contrast, the financial sustainability of projects is not consistently assured across the ARF programme, as it is often the case with similar programmes. Nonetheless, the evaluation team finds that funding from the private sector consortium members is a frequent source of funding. Thus, including a requirement for private sector involvement is a successful strategy for increasing the financial sustainability of the projects. In addition, the evaluation team concludes that some projects across the programme could improve regarding the recognition of potential social or environmental harms. The evaluation found that in some project, these potentials for harm were not sufficiently recognised, so that no active measures were taken to prevent them.

4.2 Recommendations

Based on the findings of the final evaluation the following seven recommendations for the future implementation of ARF or similar instruments are put forward. They are grouped into recommendations on the strategic and operational level. These recommendations complement those submitted in the mid-term evaluation.

4.2.1 Strategic-Level Recommendations

1. Key programme design features, like co-creation, using research uptake strategies, encouraging the regular interaction with stakeholders and the involvement of private sector stakeholders should be considered for further implementation of programmes by NWO-WOTRO and the Ministry of Foreign Affairs.

The evaluation team concludes that the key programme design features of the Food and Business Applied Research Fund are a main source of success of the programme. They contribute to the effective and efficient implementation of projects throughout the programme. Specifically, the programmes should further pursue research in consortia, as it leads to co-creation, which is important for the achievement of programme-level outcomes. Furthermore, the evaluation team has concluded that by funding multi-actor consortia, access to different stakeholders, including policy makers, researchers as well as members of the target group can be ensured. Moreover, the evaluation has shown that including private sector actors in the consortium is a useful strategy for ensuring the financial sustainability of some projects, as the private sector partners are a frequent source of funding for the continuation of the project. In addition, the capacity building approach should be continued and encouraged by NWO, as this can contribute to ensuring the institutional sustainability of the programme. Finally, the
programme should continue fostering frequent stakeholder interaction and explicit research uptake strategies as these are important for the successful uptake of research results by the target groups.

2. The Dutch Foreign Ministry and NWO-WOTRO should review the assumptions underlying the new impact pathway, especially concerning the connection between income and food security, ensuring that they reflect the realities of the contexts in which projects operate.

In the evaluation, some of the basic assumptions of the Food Security Policy that underly the ARF's revised impact pathway were not validated. Instead, the evaluation found evidence that contribute to learning for the Dutch Food Security Policy. Therefore, the evaluation team recommends revising the underlying assumptions of the impact pathway, so that they reflect the reality within which the funded projects operate. Specifically, the case studies have revealed that an increase in income among the ultimate target group does not necessarily lead to a higher spending on food. This is not the case, because some members of the target group do not perceive themselves as being food insecure and because they have other spending priorities, such as schooling or transportation. Therefore, the assumptions, which the ARF impact pathway is based on, that increased income leads to increased food and nutrition security, as well as the assumption that nutrition is on the minds of the engaged actors should be reviewed by the Dutch Foreign Ministry and NWO-WOTRO. In this way, the programme can ensure that it is possible to reach its impacts with the projects that it is funding.

3. The Dutch Foreign Ministry and NWO-WOTRO should make a clear decision about the focus of the ARF instrument or acknowledge the existence of a trade-off effect between the objective of involving vulnerable groups and enhance private sector development. In this regard, the programme can either (a) focus more clearly on vulnerable groups suffering from food insecurity (b) focus more clearly on the development of inclusive private businesses and value chains or (c) accept that there is often a trade-off between the two objectives.

The evaluation has found that there is a trade-off between the two ARF programme objectives of fostering private sector development and supporting food insecure target groups. The ultimate target groups of the projects are not always selected due to the extent and quality of their food insecurity. Instead, projects that aim to develop business models often select target groups with sufficient income and education, so that they can contribute to the business effort. For instance, these are farmers that can deliver a certain food or seed to be processed further and who are normally not part of the most vulnerable groups. Although this can be designed as an indirect approach for reaching the most food insecure farmers, its success is more difficult to achieve due to a longer impact pathway and more intervening variables. Therefore, the evaluation team suggests that the Dutch Foreign Ministry and NWO-WOTRO make a clear decision about how to address this trade-off.

1st Scenario: The programme could clearly focus on vulnerable groups suffering from food insecurity. As a result, the programme’s contribution to food security could be enhanced at the cost of the programme’s contribution to fostering private sector development.

2nd Scenario: The programme could clearly focus on the development of inclusive private business and value chains. This would involve working with non-vulnerable target groups who are equipped to run and sustain their businesses. As a result, the programme’s contribution to private sector development could be strengthened at the cost of the contribution to food security.

3rd Scenario: The Dutch Foreign Ministry and NWO-WOTRO acknowledge that there is a trade-off between the two objectives. As a result, the resources spent in the programme will need to be divided to achieve results concerning the two objectives.

4.2.2 Operational-Level Recommendations

1. NWO-WOTRO should make the reduction of harm to ensure social and ecological sustainability a more explicit focus in the project planning stage and in the reporting phase.

For some of the projects of the first and second call in the ARF programme, social and ecological sustainability were not an explicit focus, although some of them explicitly incentivised the use of agrochemicals. As a result, the evaluation has found that some projects underestimate potential harms
that might result from their project activities. Therefore, the evaluation team recommends that NWO-WOTRO increases its emphasis on the reduction potential social and ecological harms to confirm with the "do no harm" principle, especially if the use of agrochemicals is promoted. This could be achieved by including social and ecological harms and an avoidance strategy in the project proposal and project reporting, so that consortium members are encouraged to reflect upon these issues.

**2. To ensure the financial sustainability of the projects, NWO-WOTRO should increase its scrutiny of sustainability strategies and their implementation during the projects’ lifespan.**

In addition to challenges regarding the social and ecological sustainability of the programme, the evaluation has found challenges regarding the financial sustainability of the projects in the ARF programme. While some projects have managed to ensure their financial sustainability, others have been less successful in doing so. The evaluation has found that successful avenues for making the projects financially sustainable are investments by private project partners, additional public funding, and showing viable business models for the target groups. Other projects, however, did not succeed in implementing their sustainability strategies. Thus, NWO-WOTRO should increase its scrutiny of the projects’ sustainability strategies and their implementation during the projects’ lifespan and promote the identified funding avenues in project implementation and design.

**3. The time frame of projects and the time in which outcomes can be achieved and observed should be aligned, so that the ARF impact pathway can be accomplished within the allocated project time frames.**

The evaluation has revealed that a potential disconnect between the project time frames and the outcomes that they aim to achieve can exist. This disconnect occurs in projects that work with crops with long growth cycles. As a consequence of these long growth cycle, experimentation, as well as observing results and adopting new techniques by farmers take a long time. These are however success factors identified during this evaluation. Moreover, the growth cycle does not always go in accordance with the time frame in which the projects are supposed to be implemented and outcomes are supposed to be achieved. Thus, the evaluation team suggests two potential scenarios which could be discussed by NWO-WOTRO:

*1st Scenario:* The ARF extends the time frame of projects, especially of those that work with crops with long growth cycles. In this way, it would be possible for projects to achieve their intended outcomes within the project time frames and show the success and viability of their project hypotheses. This however could result in longer time frames and therefore also longer funding periods, leading to higher costs for the programme.

*2nd Scenario:* The ARF focusses on projects and crops that can be completed realistically within the envisioned time frame of half a year to three years. This would mean that NWO-WOTRO would scrutinise project proposals that plan to work with crops with long growth cycles that surpass the project lifetime. As a result, the breadth of research topics funded within the ARF programme however could potentially be reduced, as possible relevant crops are excluded from the research.

**4. NWO-WOTRO should consider using a standardised monitoring tool that supports and structures the collection of information from projects to ensure the compliance with quality standards for reporting.**

In the document analysis, the evaluation team has found that the quality of the reporting coming from the projects varies considerably across the programme. This makes it very difficult for NWO-WOTRO to assure the quality of the projects and support them adequately in their implementation. Moreover, the lack of high-quality reporting on project goals and their achievement makes strategic steering for NWO-WOTRO to ensure the achievement of programme-level impacts and outcomes more difficult. To improve the quality and consistency of reporting, NWO-WOTRO should consider using a standardised online monitoring tool. In this way, the collection of information from projects can be structured and standardised, so that NWO-WOTRO can analyse and work with the data and the projects more easily. Such monitoring tool also have the benefit that project members are not able to simply change reporting standards, as was sometimes the case in the project reports.
5. Annex

5.1 Reference List


Food and Agriculture Organization of the United Nations (2003). Trade Reforms and Food Security - Conceptualizing the Linkages. Commodity Policy and Projections Service Commodities and Trade Division: Rome


NWO-WOTRO (2014b). Collaboration between WOTRO and the Knowledge Platforms


The Economist Intelligence Unit (2014). Global Food Security Index 2014 – An Annual Measure of the State of Global Food Security


5.2 Project Fact Sheets

### Basic Project Data

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<td>Members of consortia</td>
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</tr>
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### Impact Pathway

| Focus Areas (pillars) | Increased sustainable agricultural production |

**Output:**

In order to achieve the previewed targets, the project should create outputs in three steps:

First, the project plans to identify relevant Conservation Agriculture (CA) initiatives in Northern Uganda by mapping and categorizing existing approaches and conducting comparative analyses of nutrient and water balances between local initiatives and standard practices.

The second output comprises the evaluation of existing initiatives and the identification of possible improvements in terms of productivity, sustainability and resilience to climate change. Once best practices have been identified, technical trainings and on-farm coaching of pilot farmers should be conducted by the project.

The third output includes the development of knowledge transfer approaches based on Farmer-to-Farmer trainings and their dissemination to the LG extension staff via workshops.

**Outcome:**

On the outcome level, the categorizing and mapping of existing approaches on CA in northern Uganda should lead to a better understanding of the current extension of initiatives in the region and therefore to an identification of underrepresented areas. The evaluation of existing approaches should result in knowledge about the effects of existing CA initiatives on productivity, sustainability and resilience to climate change of the local food production. Based on this knowledge, improved instruments should be developed and transferred to the pilot farmers. As a result of workshops and trainings with them, these farming communities should apply the new instruments and be motivated to experiment and invest in further improvements. The workshops on F-to-F trainings for the LG extension staff should motivate and enable the extension staff to use the developed training methods for further dissemination to non-pilot communities.

**Impact:**

Once the pilot farmers apply improved methods and start to invest and experiment, the existing CA initiatives should further increase their capacity for productive, sustainable and resilient food production. In addition, the F-to-F trainings promoted by the extension staff in areas where CA is not applied yet should lead to an increased number of farmers who use improved CA methods. The increased capacity of existing initiatives combined with the increased number of trained farmers should lead to the overall impact, that food production in Acholi and West Nile sub region should be intensified as well as more sustainable and more resilient to climate change. This should increase the general food security in northern Uganda.

### Evaluability

**Objective 1**

The local farming communities in the Acholi and West Nile sub-region have adopted improved CA crop production technologies.

**Indicator 1.1**

290 farmers have adopted improved CA crop production technologies in Pader, Nebbi and Nwoya District

**Baseline 1.1.1**

0 farmers apply improved CA crop production technologies in Pader, Nebbi and Nwoya District

According to the project, 101 model farmers in Nebbi (36), Nwoya (25) and Pader (40) respectively were trained in CA principles and the use of related technologies (e.g. visual soil fertility classification tools, agrochemicals). These model farmers disseminated knowledge on CA to more than 1000 farmers. The evaluation team is reasonably certain, that the target was achieved. However, the quality of adoption varies due to knowledge not being passed on entirely and technology availability not being secured.
| Indicator 1.2 | Improved CA practices adopted in 3 targeted communities of Pader, Nebbi and Nwoya District | ✔ | The evaluation team is reasonably certain that CA practices (e.g. reduced/no tillage and permanent soil cover) have been adopted by farmers in all 3 intervention districts. However, adoption quality varies between farmers leading to differences in application (e.g. regarding the use of agro-chemicals).

| Baseline 1.2 | In none of the targeted communities of Pader, Nebbi and Nwoya District CA practices are used. |

| Objective 2 | Farmer to Farmer training model and improved CA practices are promoted through LG extension system | ✔ |

| Indicator 2.1 | 3 sub-county LG extension teams of Pader, Nebbi and Nwoya District developed skills and material to promote improved CA crop production technologies among farmers in their regions. | ✔ | The project trained 16 extension officers in Pader (5), Nwoya (5) and Nebbi (6) in CA skills and produced learning materials. The evaluation team is highly confident that these trainings took place and that promotion material was developed.

| Baseline 2.1.1 | LG extension staff in Pader, Nebbi and Nwoya District does not have the skills nor material to address crop production decline in the target region in the 3 districts. |

| Indicator 2.2 | 500 farmers have been trained by LG extension teams in Pader, Nebbi and Nwoya District in improved CA crop production technologies. | ! | The evaluation team is more confident than not confident that this indicator was only partially achieved. Although extension officers in the three districts were encouraged to impart the skills to farmers and do conduct follow-up visits, target group members assessed the role of the LG negatively. Most target group members agree on LG having exercised little to no influence in passing on CA knowledge.

| Baseline 2.2.1 | No farmers trained in improved CA practices in the 3 Districts |
**Basic Project Data - Uganda 1**

<table>
<thead>
<tr>
<th>Programme name</th>
<th>ARF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project name</td>
<td>Cashew nuts for farmers' income Uganda</td>
</tr>
<tr>
<td>Project number</td>
<td>W 08.270.2013.111</td>
</tr>
<tr>
<td>Project duration</td>
<td>36 months</td>
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<tr>
<td>Financial budget</td>
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<td>ARF funding</td>
<td>228,37 EURO</td>
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<td>Co-funding</td>
<td>57,663 EURO</td>
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<tr>
<td>Total</td>
<td>286,033 EURO</td>
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<tr>
<td>Country of implementation</td>
<td>Uganda</td>
</tr>
</tbody>
</table>

**Members of consortia**
- Ms Hellen Katty Acham Elungat, North East Chilli Producers Association LTD (Uganda)
- Deni Byabashaija Mujuni, National Forestry Resource Research Institute (Uganda)
- Willem Jacob Simkarale, Away4Africa B.V. (NL)
- Patrick Ogwang, Agency for Sustainable Rural Transformation (Uganda)

**Impact Pathway**

**Focus Areas (pillars)**
- Increased sustainable agricultural production
- More efficient markets

**Output**

The project should achieve **outputs** in three main thematic areas:

In the field of **cashew nut production**, outputs include the identification of adequate cashew nut tree types with more efficient traits, insights into agro-ecological and production factors and into post-harvest handling practices. Further activities comprise the establishment of cashew nurseries in order to produce high yielding seedling varieties, the building of demonstration plots and the development of a common quality control system. In addition, the project plans to offer trainings for farmers, as well as technology transfer in order to spread the gained knowledge.

Within area of **market research**, the project plans to reveal detailed knowledge about the Ugandan and the international cashew nut market. It should deliver a SWOT-analysis along the value chain and present research results about farmer organization models and integrated chain approaches.

In the field of **capacity development**, outputs include extensive services such as trainings, workshops and seminars, as well as data archiving systems accessible for third parties, like Civil Society Organizations (CSOs) or the extension services of local governments.

**Outcome**

Within the first area of **cashew nut production**, the more efficient cashew nut tree types identified should be multiplied and established on farmers' ground, taking into account agro-ecological factors. This should lead to raised yields of nuts and apples. The seedlings produced by the nurseries should be planted by the farmers and should lead to an increased quantity of trees. In addition, farmers should apply their knowledge on post-harvest handling, which should reduce losses consequently. Early adapters should use common quality control systems and therefore increase the quality of nuts. An increased number of trees with raised yields, less post-harvest losses and a better quality of nuts should lead to a rise in farm level production of cashew nuts as the first outcome of the project.

Second, in the field of **market research**, farmers should apply the gained knowledge about the cashew nut market, farmer organization models, and integrated chain approaches. As a consequence, farmers should organize in groups to access markets with a marketable product together, being more aware of their role and position in the value chain.

Within the third area of **capacity development**, the conducted trainings, workshops and seminars for third parties, as well as their access to archived data, should result in an increased expertise on cashew production and supply chains among CSOs and extension services. Their new awareness about the subject should lead to the integration of this knowledge in their services and plans.

**Impact**

On **impact** level, the increased farm level production of cashew nuts and the dissemination of the gained knowledge by CSOs and extension services should generally lead to an increased food production in Northern and Eastern Uganda. At the same time, the integration of the farmers in the cashew nut market and their raised awareness of economic factors should result in a higher income of these farmers and more income security within five years after finishing the project.

**Evalubility**

**Objective 1**
Farm level cashew nut production increased in the target region.

**Indicator 1.1**
Target plantations take into account new agro ecological factors.

The evaluation team concludes that the agro-ecological conditions for cashew growing were - in general - identified. However, the evaluation team is reasonably certain that the plantation of the target farmers have not benefitted from this knowledge. All target group members interviewed were not aware of relevant agro-ecological factors that need to be taken into account for their cashew nut plantations.
Baseline 1.1.1
Target plantations do not take into account new agro-ecological factors.

Indicator 1.2
Target plantations reach a potential yield of 2-3 kgs/tree or 140 kg/ha
Due to the project length versus the time needed for the cashew nut trees to reach productivity levels, the project did not monitor the production level of farmers. This hold also true for 2017 and 2018. Based on the results from the case study however, the evaluation team is reasonably certain, that this objective has not been reached, due to the overall low survival rate of the trees.

Baseline 1.2.1
Target plantations are mostly (more then 90%) composed of new trees

Indicator 1.3
Additional 210,000 new cashew seedlings are planted by farmers in the target region (3,000ha)
The projects reported 106,613 cashew trees planted - with a survival rate of 65% one year after planting on 1,066 ha (2,665 acres). The evaluation team is neither confident nor not confident that the reported amount of cashew trees have been planted, as interview partners in Uganda vary in their assessment. However, the range of the survival rate has been mostly between 50% and 65% two years after planting.

Baseline 1.3.1
0 new cashew nut seedlings planted

Indicator 1.4
Post harvest losses on cashew nuts procured by the buyer have been reduced by 85%
But no monitoring was done on this aspect by the project. The evaluation team however is highly confident that this objective was not reached. According to the local processor (buyer) no cashew nuts were bought from the farmers of the target region. Moreover, the target group members did not have knowledge on techniques to decrease post harvest losses.

Baseline 1.4.1
Post harvest losses are around 3% on the cashew nut procured by the buyer

Objective 2
Knowledge on quality and cashew nut production is transferred to farmers.

Indicator 2.1
25 demonstration centres have been established in the target region
According to the project, a total of 25 demonstration centres established. The evaluation team was able to confirm and visit some of these demonstration plots and thus is more confident than not that the indicator was met.

Baseline 2.1.1
1 demonstration centre available (one at Omodoi - Soroti developed by NaFFORI)

Indicator 2.2
A common quality control system is adopted among the early adopters in the target region.
The evaluation team is reasonably certain that the indicator was not achieved. Although project activities regarding the quality control system were implemented, knowledge of this system was none existent among target farmers. In addition, the local processor denied having conducted capacity building activities on quality control in the context of this project.

Baseline 2.2.1
There is no quality control system known among cashew producers

Objective 3
Farmers are organised to access markets with a marketable product.

Indicator 2.1
5,000 farmers formed into farmer groups market their cashew nuts.
According to the project, a total number of 3,200 farmers with existing or new trees were mobilized. Only 10% of the farmers with existing old trees do make part of existing farmer groups and 48 farmer groups have adopted cashew as a new cash crop. The evaluation team is neither confident nor not confident that this is true as the numbers were neither corroborated nor dismissed by interviewees in Uganda.

Baseline 2.1.1
0 farmer groups exist
### Indicator 2.2
5,000 farmers are aware of their position and role in the value chain through their participation in farmer groups.

The evaluation team is reasonably confident that this indicator has not been reached. The case study results indicate that farmers do not understand their role and potential in the value chain, which has led to overpricing and post harvest losses due to failure to meet interested buyers.

### Baseline 2.2.1
0 farmers aware of position and role in the cashew nut value chain

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### Objective 4
Farmers in target region increase their income on average by 90 Euro/ha/year through cashew nut production

### Indicator 4.1
An increase in income of 90 Euro/ha/year on average of farmers organized in farmer groups is reached

The project expected (for the new trees) an additional income per farmer of 200 Eur/ha/year (5 years after the project). The evaluation team is reasonably confident that this target has and will not be reached. The main reason for this is, that farmers are experiencing low levels of cashew tree survival rates and difficulties in selling and handling quality and post harvest storage.

### Baseline 4.1.1
The level of income from cashew production is 0, as production was negligible and there was no market to sell the cashews.

---

### Objective 5
Knowledge on cashew production and supply chain is strengthened and sustained among farmers in the target region.

### Indicator 5.1
Extension services (5 CSO, and 16 District local governments) in the target region have integrated knowledge on cashew nut production and supply chain in their services.

According to the project, 5 CSOs and 11 Local Governments have been involved. The evaluation team was able to corroborate the involvement of local governments and other CSOs through invitations to project activities to a reasonable extent. At Lira district, cashew nut was included as a priority crop to be promoted among the region’s farmers. However, the local government also underlined, that training and knowledge among their extension service agents regarding cashew nuts was mostly missing.

### Baseline 5.1.1
Cashew nut production and supply chain are not covered by extension services.

---

### Indicator 5.2
7 third party organizations can access and apply knowledge and experience on cashews.

According to the project, 5 parties can access knowledge and experiences on cashew. The evaluation team is more confident than not, that the target was almost reached. These “third party organizations” include however organisations from he project consortium and people directly affiliated with them (e.g. representative of Away4Africa in Uganda that has its own business).

### Baseline 5.2.1
Third parties do not have access to knowledge on cashew nuts
Table 5.3

<table>
<thead>
<tr>
<th>Indicator 5.3</th>
<th>According to the project, at least 4 CSO integrated cashew in their plans. Again this also includes organisation within the consortium such as NECPA, due to which the evaluation team is reasonably confident that the indicator was almost achieved.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 5.3.1</td>
<td>There are no CSOs in the intervention zone that include cashew nut value chain in their plans.</td>
</tr>
</tbody>
</table>
### Basic Project Data - Uganda 3

<table>
<thead>
<tr>
<th>Programme name</th>
<th>ARF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project name</td>
<td>Stabilizing sesame yields and production in the Lango region, northern Uganda</td>
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<tr>
<td>Project number</td>
<td>W 08.270.2014.355</td>
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<td>Project duration</td>
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<td>Financial budget</td>
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<td>ARF-funding</td>
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<tr>
<td>Co-funding</td>
<td>78,513 EURO</td>
</tr>
<tr>
<td>Total</td>
<td>378,513 EURO</td>
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<tr>
<td>Country of implementation</td>
<td>Uganda</td>
</tr>
</tbody>
</table>
| Members of consortia | Francis Ouuma Alacho (African Innovations Institute)  
Walter Okello Anyanga (National Semi Arid Agricultural Research Institute NaSARRI)  
Ray Bruno Agong (Uganda Oilseeds Processors Association UOPSA)  
Narcis Tumushabe (FICA Seeds Ltd.) |

### Impact Pathway

**Focus Areas (pillars)**

- Increased sustainable agricultural production
- Improved access to better nutrition

**Output**

In order to achieve the previewed targets, the project should create outputs in three steps:

First, the project plans to identify and understand the main challenges and constraints caused by the impact of climate change on sesame value chain performance in the Lango region in Northern Uganda. The project conducts an analysis of historical and predicted climate trends in the region and uses models of crop yields, production trends and weather relationships in order to prioritize opportunities and interventions to address the impact of climate change on sesame production.

The second output comprises the development and promotion of suitable climate smart sesame innovations. These innovations will increase yields and stabilize production in Lango Sub region by evaluating and releasing potential drought tolerant new sesame varieties as well as developing and introducing appropriate climate smart sesame innovations and practices.

The third output includes the managing and sharing of knowledge on climate smart sesame innovations with wider stakeholders by producing manuals, extension bulletins and policy briefs, holding dissemination workshops and developing a project website with databases on sesame innovations available to stakeholders.

**Outcome**

On the **outcome level**, the identification of main challenges and opportunities caused by climate change impacts on sesame value chain should lead to an increased awareness and better planning in order to reduce sesame production losses due to climate change impacts.

Due to the adoption and use of suitable climate smart sesame innovations the yields of good quality sesame should increase and stabilize.

As a result of the dissemination workshops and the access of stakeholders to databases, manual extension bulletins and policy briefs stakeholders are better informed and should be able to improve the resilience of the risks of climate change on sesame production.

**Impact**

On the **impact level**, the raised awareness of climate change impacts and better planning possibilities as well as the dissemination of the gained knowledge by the stakeholders should result in an increased resilience of sesame farmers to the impact of climate change on sesame production. Furthermore, the increase and stabilization of good quality sesame production should lead to a higher income of the farmers and other stakeholders in the Lango region, Northern Uganda and it should at the same time increase food security.

### Evaluability

**Objective 1**  
Higher and more stable yields and production of good quality sesame as a result of adoption and use of climate smart innovations.
### Indicator 1.1
At least 20% of the communities in each of the three districts accessing and utilising climate smart innovations for sesame production.

The project conducted activities in all three districts (Otuke, Lira and Amolatar). Seed varieties of sesame (2 and 3) with desirable market attributes was accessed within participating farmer groups while some communities bought seeds from FICA and UOSPA. The evaluation team is highly confident, that farmer communities in all three district accessed and used the new seed varieties.

### Baseline 1.1.1
Traditional sesame varieties used in the three district by target farmer groups.

### Indicator 1.2
At least 30% of project beneficiaries have reported 30% yield increase and stable sesame production.

A survey conducted by the project indicated that sesame yields increased on average 44% (approx. 190 kg per acre). The increase in production was validated by the case study results. and mostly contributed to the usage of new sesame varieties and agro-chemicals. The evaluation team is therefore highly confident that most farmers were able to increase their yield. In some cases, farmers also received higher prices for their sesame, as they were able to sell Certified Sesame Seed (CSS) and Quality Declared Seed (QDS).

### Baseline 1.2.1
No average baseline was available for the three districts. Estimates are that traditional varieties yield 135 kg per acre.

### Objective 2
Increased awareness and better planning to reduce sesame production losses due to climate change impacts

### Indicator 2.1
Farmers adapt coping mechanisms to strengthen sesame production resilience to climate change effects

The evaluation team is reasonably confident that many target farmers have switched most sesame production to the second season with more rain days and higher precipitation and temperatures to adapt to changing climate conditions.

### Baseline 2.1.1

### Indicator 2.2
Community actions to minimize adverse effects of climate change on sesame value chain

Although Lira district government officials validated that they have strengthened enforcement to reduce encroachment of wetlands that have adverse effects on the climate, they also acknowledged that this was unrelated to the ARF project.

### Baseline 2.2.1
No community actions to mitigate negative climate change effects specific to sesame in the three target districts identified.
<table>
<thead>
<tr>
<th>Objective 3</th>
<th>Better informed stakeholders able to innovate to reduce risks of climate change on sesame production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator 4.1</td>
<td>Stakeholders develop strategies to mitigate climate change effects on sesame value chain development.</td>
</tr>
<tr>
<td>Baseline 4.1.1</td>
<td>Stakeholders in the value chain don't take climate change into account in their business models.</td>
</tr>
</tbody>
</table>

The district and sub-county local government have prioritized sesame as a commodity in their development plans to support to food security and income generation as sesame is seen as a food and a cash crop. Moreover, they validated their support to disseminate the researched varieties 2 and 3, due to more farmers wanting to get access and re-buy them. Certification of seeds is seen as a way to get higher prices from value chain buyers. The evaluation team is therefore confident that value chain stakeholders (farmers, cooperatives, seed company) are using the new varieties as a mean to cope with climate change effects.
include knowledge on effective and sustainable soil management and conservation practices. Once and the widespread adaption of waste collection and separation should lead to an 

With the implementation of waste separation and collection, the project plans to deliver an economic assessment on market opportunities and threats of composting, which should result in business support, training manuals and meetings for unemployed young Ghanaians in this field. In addition, knowledge about waste separation, waste collection and processing should be gained and used for the implementation of these practices in selected markets and farms.

Third, the project plans to raise awareness for and consent to organic food in the communities by distributing policy and advocacy materials, media programs and workshops or trainings. This should lead to an increased production of and demand for organic food in Ghana as an output.

No farmers seem to be selling compost products. Instead, the farmers say that they are not producing enough compost for their own production. Based on the information given (by MOFA), around 30 to 40 farmers could be utilizing compost. However, at the case study, we were only able to talk to 4 farmers who are using the organic compost. Therefore, the target of 200 farmers is probably not reached.

As a result of a stimulated market for organic food in Ghana, a greater part of the vulnerable population should gain access to nutritious products and farmland should be maintained in the long-term. Additionally, organic production should be integrated into local and regional markets and farms. This should result in rehabilitation and productive use of degraded lands and improved public health in general.

A widespread adoption of new soil conservation techniques should lead to better soil quality on target farms, a rise in yield and improved product quality. As a further impact, the new techniques should help to build the farmers’ capacity for enhancing long term soil management and therefore boost their income as well as the overall product volume and accessibility to the market.

As a result of a stimulated market for organic food in Ghana, a greater part of the vulnerable population should gain access to nutritious products and farmland should be maintained in the long-term. Additionally, organic production should be integrated into local and regional policy.

### Results

<table>
<thead>
<tr>
<th>Objective 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>465 farmers trained in new soil conservation techniques</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator 1.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 farmers utilizing compost/organic manure to ameliorate soil.</td>
</tr>
</tbody>
</table>

Based on the information given (by MOFA), around 30 to 40 farmers could be utilizing compost. However, at the case study, we were only able to talk to 4 farmers who are using the organic compost. Therefore, the target of 200 farmers is probably not reached.

<table>
<thead>
<tr>
<th>Baseline 1.1.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator 1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 farmers selling compost products to specialized markets</td>
</tr>
</tbody>
</table>

No farmers seem to be selling compost products. Instead, the farmers say that they are not producing enough compost for their own production.

<table>
<thead>
<tr>
<th>Baseline 1.1.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
</tbody>
</table>
### Objective 2
2,952 farmers reached by extension officers with new soil conservation techniques in revised program of work.

#### Indicator 2.1
21 extension officers trained in soil conservation techniques who are training farmers.

This outcome was likely reached.

#### Baseline 2.1.1
0

#### Indicator 2.2
200 farmers trained by extension officers and adopting soil conservation techniques.

According to the evaluators’ assessment, this outcome was only partially achieved. Even though extension officers talk to farmers about composting techniques, adoption rates remain low.

#### Baseline 2.2.1
0

#### Indicator 2.3
The level of soil quality (soil carbon) in study areas, including in target degraded land areas and on farms increased to 1.1%.

No data.

#### Baseline 2.3.1
0,7%

#### Indicator 2.4
The level of crop productivity and yield on participating farms increase by 30-35%.

At the time of the case study, changes in crop productivity had not been achieved. However, according to the researchers at the university, it takes time to observe a change in crop productivity from compost.

#### Baseline 2.4.1
1

### Objective 3
200 unemployed youth in the project area engaged in waste segregation from source and collection after receiving training in compost making and entrepreneurship.

#### Indicator 3.1
200 unemployed youth have been successfully trained in compost making and entrepreneurship.

Outreach activities were conducted, but these were part of other projects by one of the consortium members.

#### Baseline 3.1.1
0

#### Indicator 3.2
A entrepreneurship programme was developed and 35 young people gone through programme.

This outcome was most likely achieved. In the first cohort, 12 were trained, 35 in the second cohort.

#### Baseline 3.2.1
0

### Objective 4
Education and awareness creation on waste separation, compost production and utilization of compost produced crops among traders and farmers.

#### Indicator 4.1
110 traders engaged in separation of waste from source after receiving education.

Outcome was partially achieved, overall estimate is that around 60 traders are engaged in separation of waste. Market vendors at three markets are involved in waste separation at the source. Overall estimates: 20 vendors per market.

#### Baseline 4.1.1
0

#### Indicator 4.2
5 education and awareness tools developed.

The university collaborated with the University of Oregon to develop a pilot for an advertising campaign videos and newsletters are available on the FBKP website.

#### Baseline 4.2.1
0

### Objective 5
70 market vendors trading in organic foods

#### Indicator 5.1
70 Market vendors with signage/promotion of organic produce.

This outcome was not achieved. Farmers combine organic compost with fertilisers, so that no organic produce is produced. Moreover, there is no clear certification or signposting system that would incentivise farmers to grow organic produce.

#### Baseline 5.1.1
0
<table>
<thead>
<tr>
<th>Indicator 5.2</th>
<th>70 market vendors trading in organic foods</th>
<th>X</th>
<th>see above.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 5.2.1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Indicator 5.3</td>
<td>5 Business models based on organic produce have been adopted</td>
<td>X</td>
<td>The evaluators’ assessment shows that no business models were developed as part of the ARF project, as there were difficulties with producing and selling organic produce (see above).</td>
</tr>
<tr>
<td>Baseline 5.3.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objective 6</td>
<td>3 formal markets and 9 farms participating in the project waste separation program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicator 6.1</td>
<td>60 market traders, 50 youth and 50 farmers are engaged in separation and collection of organic waste</td>
<td>I</td>
<td>Outcome was partially achieved. One business with 5 entrepreneurs is collecting waste. During the training, there was around 40 youth engaged in collecting waste and compost production (training has ended). Farmers are not engaged in separation and collection of organic waste (except for their own use). Around 60 market traders are engaged (20 per market)</td>
</tr>
<tr>
<td>Baseline 6.1.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicator 6.2</td>
<td>200 youth and 50 selected farmers engaged in composting of market and farm organic waste</td>
<td>X</td>
<td>Outcome was probably not achieved. Processing of organic waste was done by 5 (rather than 200) youth, and some farmers (max. 40) are engaged in composting.</td>
</tr>
<tr>
<td>Baseline 6.2.1</td>
<td></td>
<td></td>
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</table>
Basic Project Data

<table>
<thead>
<tr>
<th>Programme name</th>
<th>ARF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project name</td>
<td>Development of automated solar powered fruit drying technology for smallholder farmers in Ghana</td>
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<tr>
<td>Project number</td>
<td>W 08.270.2014.309</td>
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<td>Project duration</td>
<td>36 months</td>
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<tr>
<td>Financial budget</td>
<td>ARF funding 298,684 EURO, Co-funding 110,913 EURO, Total 409,597 EURO</td>
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<td>Country of implementation</td>
<td>Ghana &amp; The Netherlands</td>
</tr>
<tr>
<td>Members of consortia</td>
<td>Kwasi Etu-Bonde (Agribusiness &amp; Rural Development Consultant), Sustenance Agro Ventures (Ghana) Daniel Asare-Kyei, Eucharia Farms Ltd (Ghana) Valentijn Venus, Ujuizi Laboratories (NL) Patrick Kumah, Kwame Nkrumah University of Science and Technology (Ghana)</td>
</tr>
</tbody>
</table>

Impact Pathway

Focus Areas (pillars)

- Impact Pathway

Output

Related to the four research questions of the project, outputs should be created within four steps:

First, the project plans to gain insights into the options of spatial distribution of solar dryers for processing mangos by locating existing mango farms and areas with high incidence of solar radiation in Kintapo. At the same time, farmers should be involved in this process and sensitized for the solar drying technology.

Second, new knowledge on efficient technological designs for the solar drying of mangos should be gained, applied and, consequently, shared with local technicians.

As a third step, knowledge about the automation of mango dehydration should be gained, applied and shared by the project.

Fourth, an insight into the economic context, such as export market conditions, quality certifications and challenges should be gained and transferred to the stakeholders.

Outcome

As an outcome of the knowledge about suitable sites for solar dryers, an adequate rate of solar panels and corresponding ovens should be installed on the identified sites. The farmer sensitization should have led to an increased knowledge about the drying practice among the participating farmers (1000 in total).

Due to the application of the developed design for mango dryers in the identified areas, as well as the new knowledge and awareness among farmers, these farmers should have started to dry mangos that would have been left over without the technology, using the new technology. As a result, less smallholder farmers have to sell their spare mangos for giveaway prices. Before the processing takes over to the commercial phase, the produced mangos should be offered to the Government School Feeding Programme. Afterwards, the schools should receive the mangos for a reduced price.

The gained knowledge and application of the developed automation technology should lead to an increased conversion rate of processed mangos as well as reduced labour requirements and operational costs.

Impact

As the first impact, the application of the developed technologies regarding drying design and automation should lead to an increased capacity among practitioner organizations and farmers on these technological innovations.

Second, the increased amount of dried mangos on the market should result in an improved food security in the Kintapo area. In addition, children malnutrition should be reduced due to mango donations in the first phase and reduced prices for dried mangos in the second phase of the project.

Furthermore, the raised value of mangos and lower production costs due to automation should generate more income for 1000 direct beneficiaries and improvements of livelihoods of 5000 dependents.

Finally, the project results should also be applicable in other areas of Ghana.

Evalibility

Objective 1
Solar panels are installed in suitable sites and farmers in these sites have an increased knowledge regarding fruit drying/processing technology

Indicator 1.1
At the end of the first year of the project, 25 suitable sites are identified

Baseline 1.1.1
The current baseline is 0

Indicator is not relevant any more, because the approach was changed, prioritising one central site over multiple small sites.
Baseline 1.2.1
The current baseline is 0

Indicator 1.3
1000 farmers are sensitized and possess adequate knowledge in fruit drying/processing technology (year 1: 200; year 2: 400; year 3: 400)

Outcome was not fully achieved, as due to the change in project approach, not as many farmers were needed in the pilot phase of the project. Some farmers were sensitized as part of the project (around 40-60), but during the ARF project, the drying facility only collaborated with two lead farmers.

Baseline 1.3.1
The current baseline is 0

Objective 2
The participating farmers have an increased knowledge about solar oven technology for mango drying/processing and adopt this technology

Indicator 2.1
At the end of the first year of the project, 5 existing mango drying & other processing technologies are studied

Outcome was partially achieved, as the approach was changed. One central processing plant was installed. 2 prototypes of mobile micro dryers were developed. However, no more mobile micro dryers were produced, because mango drying needs clean conditions to warrant certification. This can only be accomplished at a central drying facility.

Baseline 2.1.1
The current baseline is 0

Indicator 2.2
1000 farmers (male and female) are using improved drying/processing technologies (year 1: 200; year 2: 400; year 3: 400)

Outcome was not achieved in the project phase, but could be achieved in the subsequent business. In the piloting phase (ARF project), 2 lead farmers supplied fruits to processing site. Other farmers were ready to supply fruit to the factory once it starts running (planned for 2019).

Baseline 2.2.1
The current baseline is 0

Objective 3
The food security of the participating farmers is increased

Indicator 3.1
The percentage of post-harvest loss of mangos harvested by participating farmers is reduced to 5% (year 1: 30%; year 2: 20%; year 3: 5%)

The outcome is not likely to be achieved as it is too ambitious in the evaluators' assessment. The case studies showed that around 12,600 tonnes of mango are produced per season. The processor can dry 2 tonnes per drying cycle (3-4 tonnes per day). During the project, they managed to dry 168 tonnes per season, amounting to 1.3% of the produced mangos. Therefore, the post harvest loss is not likely to be reduced from 40% to 5%.

Baseline 3.1.1
The current baseline is 40% of post-harvest loss of mangos.

Indicator 3.2
The uptake of raw mangos processed by the participating farmers is increased by 28,200 tons (year 1: 40 tons; year 2: 8880 tons; year 3: 20880 tons)

The outcome is not likely to be achieved. In the final year of the project, two farmers gave their mangos to the project, one of them 15 tonnes.

Baseline 3.2.1
The current baseline is 0.

Indicator 3.3
The percentage of smallholder farmers selling their fruits at giveaway prices is reduced to 40% (year 1: 70%; year 2: 60%; year 3: 40%)

The project has not started selling dry mangos. Therefore, farmers do not yet receive and income from the drying factory.
Capacity of the dryer: 168 tonnes per season
Average production of interviewed farmers: 50 tonnes
Average loss by interviewed farmers: 60%
Resulting in 30 tonnes per farmer
The factory could take all the otherwise lost mangos from 8 farmers

Baseline 3.3.1
The current baseline is 85%.

Indicator 3.4
The yield (tons/acre) of smallholder mango plantations is increased to 5 tons per acre (year 1: 3; year 2: 4; year 3: 5)

Increasing yields was not the focus of the project.

Baseline 3.3.1
The current baseline is 2 tons per acre.
### Objective 4
The development and dissemination of mango drying & processing technology is enhanced

| Indicator 4.1 | The amount of dried mangoes realised per ton of raw fruits is increased to 130 kg.  
(year 1: 100; year 2: 115; year 3: 130) |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Baseline 4.1.1</td>
<td>The current baseline is 90 kg per ton.</td>
</tr>
</tbody>
</table>

| Indicator 4.2 | The number of dryer operators engaged per dryer unit is reduced to 2  
(year 1: 4; year 2: 3; year 3: 2) |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Baseline 4.2.1</td>
<td>The current baseline is 5 dryer operators per dryer unit.</td>
</tr>
</tbody>
</table>

| Indicator 4.3 | 5 lead processors have adopted an automation technology  
(year 1: 1; year 2: 3; year 3: 5) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 4.3.1</td>
<td>The current baseline is 0.</td>
</tr>
</tbody>
</table>

### Objective 5
There is an increased local and export market demand for solar dried mangoes

| Indicator 5.1 | 740 farmers have adopted international quality standards  
(year 1: 100; year 2: 300; year 3: 340) |
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Baseline 5.1.1</td>
<td>The current baseline is 0.</td>
</tr>
</tbody>
</table>

| Indicator 5.2 | 3310 tons of dried mangos are sold to buyers  
(year 1: 2; year 2: 670; year 3: 2638) |
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 5.2.1</td>
<td>The current baseline is 0.</td>
</tr>
</tbody>
</table>

This objective was no longer the focus of the project, as the efforts concentrated on building one central drying facility.

As the approach was changed, only the central factory had to adopt the quality standards. This was likely to be achieved, as it was in process at the time of the case study and a necessary condition for setting up the mango drying business.

First dried mangos were given out for free, but very well received. They have not started selling them yet. They are optimistic that the dried mangos will be bought in Ghana (not meant for export at the moment.)
Programme name: ARF

Project name: Water and Weather Monitoring Services in Ghana’s Cocoa region: Innovative weather censoring and information services for local farmers

Project number: W 08.270.2014.330

Project duration: 24 months

Financial budget:
- ARF-funding: 200,000 EURO
- Co-funding: 52,000 EURO
- Total: 252,000 EURO

Country of implementation: Ghana

Members of consortia:
- Alloysius Attah (Farmerline)
- Nick van de Giesen (Technische Universiteit Delft)
- Frank Annor (Kwame Nkrumah University of Science and Technology)

Impact Pathway

Focus Areas (pillars)

Output: The outputs of the project aim at addressing the project targets via six combined steps:

1. The first output includes the installation of a dense network of low-cost hydro-meteorological stations throughout the cocoa region of Ghana.
2. The second output comprises the calibration of on-the-ground data as well as using assimilation with remote sensing data while the third output includes the improvement of algorithms and the implementation of automated error detection.
3. The project plans also to improve the knowledge of hydrological cycle, micro weather systems and climate.
4. As a fifth output, data, satellite imagery and models will ensure local relevance of weather data.
5. Furthermore, the projects plans to install 30 robust weather stations at schools and integrate weather stations use and function into school curricula.

Outcome: On the outcome level, the new availability of localized weather data through the installation of a dense network of stations, should provide relevant and reliable data on a local level. This should also lead to a gain of insight into local weather and seasonal climate change.

Impact: On the impact level, as a result of more relevant and reliable data, the gathered information should be used to advise farmers on optimizing growing processes and efficient use of water regarding planting dates, use of fertilizers and harvesting.

Evaluability

Objective 1: Through a new platform, locally relevant weather information is timely available to 10,000 farmers, 2 research institutes, 27 educational institutes, 1 insurance platform (GAIP) and 2 government institutions/NGOs (target group) that are involved in Ghana’s cocoa region.

Indicator 1.1: Through the platform, target group members can access data packages on plot-specific water, temperature, humidity, solar radiation information in different languages.

This outcome has been achieved by the project. The platform has been developed and schools have access to the data and use it in classes. Moreover, other institutes, including Met, GAIP, TAHMO, KNUST used the data.
Baseline 1.1.1
No platform exists yet. Farmers have only access to weather forecasts on the radio and web. These forecasts are based on satellite imagery only. Agricultural insurance providers are registered by GAIP (Ghana Agriculture Insurance Pool). They currently use currently used information sources from GMET and NOAA Satellites are not plot-specific.

Indicator 1.2
The platform offers daily updated weather information to all target group members.

Baseline 1.2.1
No platform exists yet. See also Baseline 1.1.1

Indicator 1.3
Target group members (except farmers) log into the platform at least once a month on average.

Baseline 1.3.1
0 log ins

Indicator 1.4
The outcome is achieved, as the platform contains weather data that is collected at 30-minute intervals.

Objective 2
Farmers have access to products aimed at optimizing their growing processes and use of water regarding planting dates, use of fertilizers and harvesting.

Indicator 2.1
At least 1 farmer-focused weather innovation products are developed (e.g. hydro-meteorological models and weather forecasts).

Baseline 2.1.1
0 farmer-focused weather innovation products are available.

Objective 3
Farmers actively feedback local knowledge to improve meteorological models.

Indicator 3.1
By the end of the project at least 1,000 farmers feedbacked information to the new weather system.

Baseline 3.1.1
0 farmers feedbacked information.

Objective 4
Financially sustainable business models for providing weather information to farmers, researchers, insurance companies & other institutes have been developed and tested. We develop at least one business model for each specific target group (farmers / 2 LBCs / grants / insurance company GAIP/GMet/ Tony Chocolonely/Solidaridad-CORIP/ Vodafone).

Indicator 4.1
8 sustainable business models are developed and tested (to prove whether they are viable to build upon for expanding the product) with stakeholders.

Baseline 4.1.1
0 business models developed and tested with stakeholders.

Outcome has been achieved. The messaging service for farmers has been developed. It provides voice information on weather warnings and rain fall with advice on farming (e.g. fertilizer application) in local languages.

Objective not relevant any more, because messaging service stopped at the end of the project.

Indicator 4.2
By the end of the project at least 1,000 farmers were reached. However, the continuation of the messaging service was difficult, because mobile network pricing is too expensive.

Baseline 4.2.1
0 farmers have received product information.

Outcome has been partially achieved. The outcome is achieved, as the platform contains weather data that is collected at 30-minute intervals.
**Basic Project Data**

<table>
<thead>
<tr>
<th>Programme name</th>
<th>ARF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project name</strong></td>
<td>Improving the resilience of the inland fisher communities and aquatic systems to overfishing and water resource degradation in Benin</td>
</tr>
<tr>
<td><strong>Project number</strong></td>
<td>W 08.270.310</td>
</tr>
<tr>
<td><strong>Project duration</strong></td>
<td>36 months</td>
</tr>
<tr>
<td><strong>Financial budget</strong></td>
<td></td>
</tr>
<tr>
<td>ARF-funding</td>
<td>290,600 EURO</td>
</tr>
<tr>
<td>Co-funding</td>
<td>74,000 EURO</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>364,600 EURO</td>
</tr>
<tr>
<td><strong>Country of implementation</strong></td>
<td>Benin</td>
</tr>
</tbody>
</table>

**Members of consortia**
- Frejus Thoto (Actions pour l’Environnement et le Développement Durable ACED)
- Benjamin Sonneveld (Centre for World Studies of the VU University Amsterdam)
- Adédjobi Philippe Lalaye (Laboratory of Hydrobiology and Aquaculture of the University of Abomey-Calavi)

**Impact Pathway**

**Focus Areas (pillars)**

- Increased sustainable agricultural production
- Improved access to better nutrition

**Output**

The outputs of the project aim at addressing the project targets via four approaches:

1. **First**, the project plans to gain new insights into regulatory rules of shared water resources and to give recommendations on how to strengthen local institutions to cope with the new challenges. This includes the analysis of existing formal and traditional regulations for shared water resources as well as the identification of strategies to improve these regulations so they can be used as coping mechanisms to the declining resource availability.

2. **Second**, the project aims at obtaining, applying and sharing knowledge about potential solutions for inland fisher communities to improve their resilience and to strengthen their food security. This includes the assessment of modern practices of fishing to improve fish productivity and fishing communities’ incomes.

3. **Third**, the project aims at obtaining, applying and sharing knowledge about potential solutions for inland fisher communities to improve their resilience and to strengthen their food security. This includes the assessment of modern practices of fishing to improve fish productivity and fishing communities’ incomes.

4. **Fourth**, the project aims at obtaining, applying and sharing knowledge about potential solutions for inland fisher communities to improve their resilience and to strengthen their food security. This includes the assessment of modern practices of fishing to improve fish productivity and fishing communities’ incomes.

**Outcome**

On the outcome level, the more detailed insights about existing formal and traditional regulations should lead to an application of better evidence based regulatory rules of shared water resources.

Furthermore, the better knowledge of inland fisher communities’ vulnerability to climate change and other major constraints should result in a better understanding of inland fishing vulnerability in general.

The development of solutions to improve the fisher communities’ resilience should lead to an uptake of improved or new fishing techniques and technologies by Benin inland fishers in terms of fish capture, aquaculture storage and processing techniques.

Finally, the gender related activities to create equitable conditions and opportunities for female members of fish-dependent households should result in the increase of the income of women that are involved in fishing activities in Benin.

**Impact**

On the impact level, the application of better evidence based regulatory rules should result in general changes of the use water resources in the sense that the use of water resources for inland fishing in Benin is more sustainable.

In addition, the better understanding of inland fishing vulnerability in Benin should lead to an adaptation of inland fishers to negative impacts of climate change.

Due to an uptake of improved or new fishing techniques the fish production in general should increase.

Finally, the higher income of women involved in fishing activities should result in improved livelihoods of these women.

**Evalability**

**Objective 1**

Understanding of regulatory rules and vulnerability of shared water resources by fishermen is improved

**Indicator 1.1**
The number of fishermen that indicate the minimum level of understanding (3 points out of 5) of the inland fishing vulnerability has increased in 05%

The indicator is achieved according to final report by the project. The evaluation team deems this plausible as interviews conducted with local authorities and the national fisherman’s association confirmed that sensitization measures conducted by the project have raised awareness about inland fishing vulnerability.
### Objective 2
Application of regulatory rules of shared water resources by fishermen is improved

<table>
<thead>
<tr>
<th>Indicator 2.1</th>
<th>The number of inland fishermen in the complex lake Nokoué-Lagoon of Porto-Novo following the regulatory rules of shared water resources increased at least 05%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 2.1.1</td>
<td></td>
</tr>
</tbody>
</table>

### Objective 3
Stakeholders have now access to solutions that will improve the resilience of the fishery sector

<table>
<thead>
<tr>
<th>Indicator 3.1</th>
<th>50% of institutions (public, private, research, NGOs) supporting the fishery sector in the complex lake Nokoué-Lagoon of Porto-Novo have access to the decision support tool to improve the resilience of fishermen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 3.1.1</td>
<td></td>
</tr>
</tbody>
</table>

### Objective 4
Increased adoption of new/improved fishing techniques and technologies by fishermen

<table>
<thead>
<tr>
<th>Indicator 4.1</th>
<th>The number of inland fishermen in the complex lake Nokoué-Lagoon of Porto-Novo that adopt sustainable new/improved fishing techniques practices regarding the shared water resources has increased at least 05%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 4.1.1</td>
<td></td>
</tr>
</tbody>
</table>

### Objective 5
Understanding of gender related issues in the inland fishery sector by stakeholders is improved

<table>
<thead>
<tr>
<th>Indicator 5.1</th>
<th>The number of representatives of fishermen that indicate the minimum level of understanding (3 points out of 5) of gender issues in the fishery sector has increased at least 30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 5.1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator 5.2</th>
<th>The number of representatives of women that indicate the minimum level of awareness (3 points out of 5) of gender issues in the fishery sector has increased at least 30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 5.2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator 5.3</th>
<th>The number of representatives of relevant institutions that indicate the minimum level of awareness (3 points out of 5) of gender issues in the fishery sector has increased at least 30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 5.3</td>
<td></td>
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</tbody>
</table>
### Objective 6
The income of women involved in fishing activities has increased

#### Indicator 6.1
The income of women involved in fisheries that adopt the new/improved techniques/technologies has increased at least 10%  

#### Baseline 6.1.1
Indicator is achieved according to final report by the project. This is however not plausible according to the evaluation team, as no new / improved techniques were introduced by the project.
Programme name | ARF
---|---
Project name | Designing appropriate agronomic and processing practices for pineapple supply chains in Benin
Project number | W 08.270.2015.207
Project duration | 36 months
Financial budget | ARF-funding: 239,348 EURO, Co-funding: 60,600 EURO, Total: 299,948 EURO
Country of implementation | Benin, Netherlands

Members of consortia:
- Mahoutondji Félicité Djivoh (Group Magnificat GM)
- Djidjoho Joseph Hounhouigan (University of Abomey Calavi, Faculty of Agronomic Sciences, UAC/FSA)
- Adanguédé Athanase Akpoe (Table Filière Ananas TFA (Pineapple stakeholders platform))
- Paul Struik (Wageningen University WU)

Impact Pathway

Focus Areas (pillars)

- Increased sustainable agricultural production

Output

The project should achieve outputs in three thematic areas:

In the field of pineapple quality attributes, the output includes the elaboration and validation of pineapple quality attributes and criteria for stakeholders, amongst them producers, traders and processors, for local, regional and international markets through a participative method, e.g. workshops with stakeholders.

Within the area of pineapple cultural practices, the output comprises joint experiments with stakeholders in Benin. Hence the output in this field includes the development, approval and dissemination of agronomic and processing practices for yielding fresh pineapples that are appropriate in terms of meeting the needs of local, regional and international markets.

In the field of juice processing technology, appropriate processing technologies that deliver stable pasteurised pineapple juice and meet the local and regional market requirements should be developed and disseminated. This will be done by optimising the processing technologies based on the best pasteurisation parameters by assessing and comparing the quality of pasteurised pineapple juice from current juice processing methods and good production practices.

Outcome

Within the first area of pineapple quality attributes, the identification of pineapple criteria should lead to a better knowledge of stakeholders of quality attributes for local, regional and international markets as a first outcome.

Concerning the pineapple cultural practices, the development and dissemination of appropriate agronomic practices yielding fresh pineapple fruit and juice should result in an uptake of the agronomic practices meeting fresh pineapple and pasteurised pineapple juice demands for local, regional and international markets by the producers.

In the field on juice processing technology, the development of appropriate processing technologies delivering stable pasteurised pineapple juice should lead to an increased satisfaction of pineapple juice consumers.

Impact

On the impact level, the better knowledge of market requirements regarding pineapple quality attributes of stakeholders as well as the access of pineapple producers and exporters to appropriate agronomic practices meeting market demands should not only result in an increase in the volume of fresh pineapple fruit and juice and in an increase in the volume and proportion of exported pineapples to international markets, but also lead to more job opportunities in the corresponding sector and to the development of specialised markets for fresh and juice pineapple.

In addition, the increased satisfaction of pineapple juice consumers should lead to a higher demand for pineapple juice from Benin.

Evaluability

Objective 1

Pineapple producers and traders in local and regional markets in Benin apply the pineapple quality attributes that were developed for local, regional and international markets.
### Indicator 1.1
At least 1900 producers apply the pineapple quality attributes for local, regional or international markets in Benin.

Baseline 1.1.1

No reporting data available yet at the time of case study conducted in 2018 as the project has been extended until 30.09.2019. Not plausible from the perspective of evaluation team as number of producers with whom project works directly is only roughly 50, and there is no dissemination mechanism.

### Indicator 1.2
At least 50 traders in local markets make use of the pineapple quality attributes developed for local markets in Benin

Baseline 1.2.1

No data available yet at the time of case study conducted in 2018 as the project has been extended until 30.09.2019. Plausible from the perspective of evaluation team.

### Indicator 1.3
At least 50 traders in regional markets make use of the pineapple quality attributes developed for regional markets in Benin

Baseline 1.3.1

No data available yet at the time of case study conducted in 2018 as the project has been extended until 30.09.2019. Too early for evaluation team to assess plausibility, as farmers were only beginning to experiment with new techniques at the time of field mission.

### Indicator 1.4
The volume of pineapples (in tons) sold by specialised producers and traders in local and regional markets in Benin that apply the required pineapple quality attributes increased at least 10%.

Baseline 1.4.1

No data available yet at the time of case study conducted in 2018 as the project has been extended until 30.09.2019. Too early for evaluation team to assess plausibility.

### Objective 2
The developed agronomic practices for producing pineapple are applied by pineapple producers and exporters in Benin.

### Indicator 2.1
A least 1900 fresh pineapple producers in Benin adopted the developed agronomic practices for producing pineapple

Baseline 2.1.1

No reporting data available yet at the time of case study conducted in 2018 as the project has been extended until 30.09.2019. Not plausible from the perspective of evaluation team as number of producers with whom project works directly is only roughly 50, and there is no dissemination mechanism.

### Indicator 2.2
The volume (in tons) of fresh pineapple exported by exporters in Benin who applied our agronomic practices increased by at least 10%

Baseline 2.2.1

No data available yet at the time of case study conducted in 2018 as the project has been extended until 30.09.2019. Too early for evaluation team to assess plausibility, as farmers were only beginning to experiment with new techniques at the time of field mission.

### Objective 3
The developed pineapple juice processing technology is applied by specialised fresh pineapple processors in Benin.

### Indicator 3.1
The number of specialised fresh pineapple processors that applied the developed juice processing technology increased by 20%

Baseline 3.1.1

No data available yet at the time of case study conducted in 2018 as the project has been extended until 30.09.2019. Plausible from the perspective of evaluation team on the basis of focus groups conducted with different pineapple processors during the field mission.

### Indicator 3.2
The sales of pineapple juice of pineapple processors that applied the processing technology increased by 10%

Baseline 3.2.1

No data available yet at the time of case study conducted in 2018 as the project has been extended until 30.09.2019. Too early for evaluation team to assess plausibility.
The project plans to achieve outputs via eight steps. The first output comprises the inventory of knowledge as well as the development of new technologies and techniques for rice production, processing and marketing in Benin. Second, the project aims at strengthening technical capacities of extensionists and beneficiaries through trainings. Furthermore, new approaches of promoting local parboiled rice added value chain should be developed. This includes the editing of manuals or contracts with radio stations. The fourth output includes the implementation of an innovative multi-actor platform on local parboiled rice. The project also plans to implement an advocacy plan in order to promote the local parboiled rice in Benin. This includes also the development of strategic alliances with civil society organizations and meetings with authorities. In addition, a model of how to organize marketing of local parboiled rice should be elaborated. The next output comprises the facilitation of relationships between stakeholders of the local parboiled rice added value chain. This output comprises the organization of meetings in order to establish business links among agricultural companies. Finally, the consumption of local parboiled rice should be promoted through culinary demonstrations and on the outcome level, both the newly developed techniques and technologies for rice production, processing and marketing and the strengthened technical capacities of extensionists and beneficiaries should result in an adoption of techniques and technologies along the local parboiled rice chain. Furthermore, the development of new approaches of promoting local parboiled rice added value chain should lead to an adoption of the new good intervention approaches by the involved stakeholders. Not only the establishment of a multi-actor platform but also the implementation of an advocacy plan for local parboiled rice should result in new institutional arrangements and best practices as well as in the institutionalization of the local parboiled rice added value chain. As a result of the development of a model of organization and the facilitation of relationships between the stakeholders towns are better supplied with local parboiled rice. Finally, the promotion of the consumption of local parboiled rice should lead to an increased demand for local parboiled rice on the urban markets.

On the impact level, both the adoption of new techniques and technologies and of good intervention approaches should increase the availability and the quality of local parboiled rice. Besides, the new institutional arrangements and the institutionalization of the local parboiled rice added value chain should result in an improvement of the stability of local parboiled rice supply in the towns of Borgou and Alibori in Benin. Finally, the enhanced supply of towns with local parboiled rice as well as the increased demand on urban markets lead to an improved accessibility of quality local parboiled rice with competitive costs.
### Evaluability

<table>
<thead>
<tr>
<th>Objective 1</th>
<th>Adoption of technics and technologies along the local parboiled rice chain in Gogounou and Banikoara</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indicator 1.1</strong></td>
<td>The rate of adoption of technics of seeds treatment before sowing by producers beneficiaries of the project in Gogounou and Banikoara has increased 40%.</td>
</tr>
<tr>
<td><strong>Baseline 1.1.1</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Indicator 1.2</strong></td>
<td>The rate of adoption of technics of rice sowing by producers beneficiaries of the project in Gogounou and Banikoara has increased 40%.</td>
</tr>
<tr>
<td><strong>Baseline 1.2.1</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Indicator 1.3</strong></td>
<td>The rate of adoption of technics of soil fertility management by organo-mineral fertilization by beneficiaries of the project in Gogounou and Banikoara has increased 30%.</td>
</tr>
<tr>
<td><strong>Baseline 1.3.1</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Indicator 1.4</strong></td>
<td>The rate of adoption of technics of weeds control by beneficiaries of the project in Gogounou and Banikoara has increased 30%.</td>
</tr>
<tr>
<td><strong>Baseline 1.4.1</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Indicator 1.5</strong></td>
<td>The rate of adoption of technics of rice parboiling with the improved kit of parboiling by beneficiaries women of the project has increased 30%.</td>
</tr>
<tr>
<td><strong>Baseline 1.5.1</strong></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Objective 2</th>
<th>Adoption of good intervention approaches developed by the stakeholders for the promotion of the local parboiled rice added value chain in Gogounou and Banikoara</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indicator 2.1</strong></td>
<td>The rate of adoption of developed intervention approaches by NGOs for the promotion of the local parboiled rice added value chain in Gogounou and Banikoara has increased of 30%.</td>
</tr>
<tr>
<td><strong>Baseline 2.1.1</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Indicator 2.2</strong></td>
<td>The rate of adoption of developed intervention approaches by producer unions for the promotion of the local parboiled rice added value chain in Gogounou and Banikoara has increased of 30%.</td>
</tr>
<tr>
<td><strong>Baseline 2.2.1</strong></td>
<td></td>
</tr>
</tbody>
</table>
### Objective 3
New institutional arrangements have been adopted in the local parboiled rice added value chain in Gogounou and Banikoara

#### Indicator 3.1
The number of paddy rice producers in Gogounou and Banikoara that have access to credit has increased 30%

- Near achieved according to project monitoring (27%), plausible according to data gathered in project monitoring

#### Baseline 3.1.1

#### Indicator 3.2
The number of rice processing women in Gogounou and Banikoara that have access to credit has increased of 30%

- Only partly achieved according to project monitoring (21%)

#### Baseline 3.2.1

#### Indicator 3.3
The rate of access of producers to improved seeds and fertilizers (provided by local agricultural services) in Gogounou and Banikoara has increased of 30%

- Achieved according to project monitoring, plausible according to data gathered in focus groups during field mission.

#### Baseline 3.3.1

#### Indicator 3.4
The rate of access of processing women in Gogounou and Banikoara to improved rice parboiling kit has increased of 40%

- Only partly achieved according to project monitoring (25%)

#### Baseline 3.4.1

### Objective 4
The towns are better supplied with the local parboiled rice

#### Indicator 4.1
The number of local parboiled rice traders in the urban markets of Gogounou and Banikoara has increased 30%

- No data available

#### Baseline 4.1.1

### Objective 5
Increase of the demand of the local parboiled rice on urban markets in Gogounou and Banikoara

#### Indicator 5.1
The volume (in tons) of local parboiled rice that is commercialized on the urban markets of Gogounou and Banikoara has increased of 20%

- Only partly achieved according to project monitoring (11%)

#### Baseline 5.1.1
5.3 Methodological Steps

The ARF evaluation was closely linked to the evaluation of GCP. Therefore, the comprehensive methodological steps concerning ARF and GCP are outlined. The evaluation process started with the **context analysis and baseline phase**. The main objectives of this first phase in the evaluation process were twofold. The first objective was to finalise the evaluation design and methodological concept. The second objective was to conduct baseline studies, which included drawing out a motivated sample of nine ARF and four GCP projects of the first and second call to allow for a sufficiently long time span between the gathering of baseline data and the ex-post impact evaluation. With the submission of the second inception report in October 2015 the context analysis and baseline phase of the evaluation was concluded.

Syspons submitted the **first inception and baseline report** to NWO-WOTRO in November 2014. The draft report included a first analysis of the two instruments, the methodological concept for the two instruments, the conducted baseline studies as well as an updated timeframe and revised budget. The findings of the report and the methodological concept for the evaluation were presented to the Programme Committee and NWO-WOTRO in a workshop in January 2015. The **second inception and baseline report** further detailed the conducted first analysis of the two instruments, the methodological concept for the two instruments, documented the selected research projects of the first and second call, the conducted baseline studies and included an updated timeframe and revised budget. The findings of the report and the adjusted methodological concept for the evaluation were presented to the Programme Committee and NWO-WOTRO in a workshop in September 2015.

In the following **interim progress evaluation**, the objective was to populate the existing impact pathways on instrument and project level with existing data and evidence in order to assemble and assess the theory of change of ARF. In addition, it was the aim of this phase to continuously report analysis results to NWO-WOTRO, enabling a constant improvement of the two instruments and their projects. To meet these objectives Syspons in a first step conducted an **online survey** among Dutch research organisations and Dutch private or public practitioner organisations as well as southern research organisations and southern private or public practitioner organisations.

The general objective of the online-survey during the mid-term and final evaluation was to collect comprehensive data regarding the implementation mechanisms of ARF, as well as their interlinkage with the Food & Business Knowledge Platform. The collected quantitative data was then validated in the project site visits (see below). The advantage of the survey was that they collected data from two different perspectives (Dutch and southern organisations) that can be validated against each other. Additionally, it enables us to analyse possible differences between regions and organisations (e.g., research organisations vs. private practitioner organisations) on a broader scale.

**Figure 17 - Overview of survey response rate for the online surveys**

<table>
<thead>
<tr>
<th></th>
<th>Population</th>
<th>Response rate in the mid-term</th>
<th>Response rate in the final survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consortia members</td>
<td>122</td>
<td>83 (68%)</td>
<td>53 (43%)</td>
</tr>
<tr>
<td>Projects</td>
<td>30</td>
<td>30 (100%)</td>
<td>27 (90%)</td>
</tr>
</tbody>
</table>

After the survey, the data was triangulated with the results of the monitoring data of the selected projects. Finally, Syspons implemented **three ARF case studies** in the sampled countries (Uganda, 

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9 In light of the revised timeframe of the implementation of the two instruments, NWO-WOTRO and Syspons agreed to merge the foreseen two inception and two baseline reports of the first call (for each instrument one baseline and inception report) into one report –called the "first inception and baseline report".
Ghana and Benin) for the interim progress evaluation. These case studies took place in the last quarter of 2016 (Ghana and Benin) and in the first quarter of 2017 (Uganda). The objective of the case studies was to validate the findings of the conducted surveys, to collect data about the implementation status and process of the sampled projects as well as to analyse their relevance, potential sustainability and first outcomes (effectiveness). They evolved around the organised knowledge exchange workshops by NWO-WOTRO in the partner countries. In each selected partner country (Uganda, Ghana and Benin) three sampled ARF projects were analysed (see Figure 18).

Figure 18 - Overview of ARF project sample

<table>
<thead>
<tr>
<th>ARF</th>
<th>Name</th>
<th>Country</th>
<th>Content</th>
</tr>
</thead>
</table>
| 1st Call | Cashew nuts for farmers' income Uganda       | Uganda     | • Integration of the cashew nut tree as a perennial cash crop as an additional source of income for the livelihoods of poor farmers in Uganda.  
• Main goal is to enhance cashew nut production and productivity by introducing, developing and maintaining cashew varieties with desirable traits, adapted to various agro-ecologies and acceptable to international markets |
| 1st Call | Stabilizing sesame productivity in northern Uganda | Uganda     | • The overall objective is to stabilize and improve sesame productivity in the Lango region, as yields and production of sesame in this region are low and unstable, causing frequent food shortages.  
• It is estimated that about 80% of the population in this region depend on sesame for food and income security. |
| 1st Call | Farmer-led innovations to sustainable food production | Uganda     | • This research project aims at establishing and understanding the relationship between initiatives in the domain of Conservation Agriculture, the productivity of the farming systems, and the sustainability and resilience of its land management.  
• It also aims to identify and develop methods for improving the effectiveness, sustainability and resilience of the local CA initiatives |
| 1st Call | Improving agricultural productivity using organic waste | Ghana      | • The project’s trains and enables local government agricultural extension officers and five farmers’ groups in composting and sustainable soil management to boost their capability to increase yield and tackle fertility issues.  
• The projects also aims at building the infrastructure and organizational capacity of a youth-operated waste collection and compost production to contribute to (among others) the availability of accessible organic fertilizer. |
| 1st Call | Solar Drying Technology for Smallholder Farmers in Ghana | Ghana      | • This project seeks to address poverty among smallholders and their dependants through the introduction of low-cost entry technology for mango drying for both local and export markets.  
• It aims to catalyze small scale farm processing of mangoes which otherwise would have gone waste, thereby substantially increasing household income, improving nutritional status and reducing poverty. |
| 1st Call | Water and Weather Monitoring Services for Cocoa Farmers in Ghana | Ghana      | • Establishment of a reliable weather forecast based on data from on-the-ground weather monitoring stations to help cocoa farmers better manage their crops.  
• The combination of a low-cost weather stations combined with mobile information services will foster economic development and food security by enabling local smallholders to manage their limited resources and increase productivity. |
| 2nd Call | Improving the resilience of the inland fisher communities and aquatic systems to overfishing and water resource degradation in Benin | Benin       | • The project studies the functioning of institutions among fisher communities and tests if regulations are sufficiently resilient to cope with the increasing pressures on water resources caused by a mounting population.  
• A study on the degradation of inland water resources quantifies the production potential for inland fisheries should motivate the fishery communities to implement new and sustainable regulations. |
| 2nd Call | Designing appropriate agronomic and processing practices for pineapple supply chains in Benin | Benin       | • The project aims at improving the quality of fresh pineapple and pasteurised pineapple juice for local, regional and international markets.  
• The project combines crop sciences and food sciences to (i) determine appropriate agronomic practices yielding fresh fruits meeting markets requirements and (ii) determine appropriate processing technologies delivering stable pasteurised pineapple juice for local and regional markets. |
| 2nd Call | Ensuring Sustainable and Sustained Food Security by Enhancing local parboiled rice value-Chain Competitiveness in Gogouou and Banikoara areas in Benin (PARCO) | Benin       | • This intervention aims at putting in place an adapted model of rice intensification, promoting the best rice-processing practices at local level and developing collective marketing mechanisms for the processed rice. |
After the ARF case studies, Syspons synthesised and systematised the collected data to assess the theory of change of the two instruments and their sampled projects.

To develop recommendations based on the synthesised findings, Syspons first identified possible “fields of action” in which to find possible options for recommendations. These options were tested by all involved evaluation experts along the SMART-Criteria (Specific, Measurable, Attainable, Realistic and Time-Bound) to ensure that the developed recommendations are realistic and can be financed and implemented by the relevant stakeholders. The aim of the recommendations is to draw attention to possible actions for the implementation of the GCP and ARF instruments to improve their future effectiveness, impact and sustainability\textsuperscript{10}.

All results of the mid-term evaluation were in the mid-term evaluation report for both GCP and ARF\textsuperscript{11}. It was submitted to NWO-WOTRO in the third quarter of 2017. Syspons presented the findings of the report to NWO-WOTRO, the Programme Committee and representatives from the F&BKP Steering Committee in a workshop. All feedback received was incorporated into the report. The final version of the report was be submitted to NWO-WOTRO in December 2017.

Next, in the final evaluation phase, the purpose was to seek additional evidence on the effectiveness and first insights into the impact of the ARF programme. Furthermore, it was the aim to analyse the implemented measures for sustainability of ARF as well as to develop recommendations for similar future instruments.

In this phase, another online survey was prepared to be distributed among the same target group as the target group of the interim progress evaluation phase, namely Dutch research organisations and Dutch private or public practitioner organisations and Southern research organisations and southern private or public practitioner organisations. The general objective of the online survey was to collect comprehensive data regarding the effects and impacts of the project, including the number of persons reached directly, as well as measures for the financial, institutional, ecological, technological and social sustainability of the projects. Furthermore, the survey addressed the role and support from NWO-WOTRO as well as the Food & Business Knowledge Platform. As many of the questions were structured in a similar way to the mid-term survey, the data can be directly compared to the collected baseline data from the previous survey.

The advantages of these surveys are the same as with the surveys in the interim progress evaluation phase. The implementation, triangulation and analysis of the surveys was conducted analogously to the implementation and analysis of the surveys in the interim progress evaluation phase (see above).

The development of the questionnaire for this survey was done in close cooperation with NWO-WOTRO to guarantee that all relevant epistemological interests are included in the questionnaire. In the development of the survey, the updates regarding the Impact Pathway of ARF were taken into account. However, since the survey had to be sent out before the Impact Pathway was finalised, the preliminary new Impact Pathway was taken as a basis for the indicators used in the survey.

In parallel to the implementation of the surveys, the three ARF ex-post case studies in the sampled countries (Uganda, Ghana and Benin) were conducted in the 4\textsuperscript{th} quarter of 2018. The preparation and implementation of these case studies was conducted along the lines described in the interim progress evaluation phase (see above). However, the objective of the case studies was different. In contrast to the case studies of the interim progress evaluation, the case studies of the ex-post evaluation will focus on seeking additional evidence for the contribution analysis in order to finalise the theory of change of ARF. Content wise, the case studies analysed the effectiveness and impact of the ARF sampled projects as well as their different dimensions of sustainability.

\textsuperscript{10} With regard to the concept of sustainability we refer in this evaluation to financial, institutional, ecological, technological and social sustainability. The definitions are outlined in the sustainability chapters.

\textsuperscript{11} In the light of the revised timeframe of the implementation of the two instruments NWO-WOTRO and Syspons agreed to merge the original foreseen two mid-term interim reports for GCP and ARF into one report – called the mid-term interim report for GCP and ARF.
### Overview of the ARF Impact Pathway Assumptions

<table>
<thead>
<tr>
<th>Assumptions assessed in the mid-term and final evaluation</th>
<th>Evaluation Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On the food security issues addressed in the calls for proposals</strong></td>
<td></td>
</tr>
<tr>
<td>1) Business models and value chains can be developed in inclusive ways</td>
<td>Partially confirmed</td>
</tr>
<tr>
<td>2) Nutrition is in the minds of all engaged actors</td>
<td>Not confirmed</td>
</tr>
<tr>
<td>3) Increased income of farmers and other producers leads to increased food security</td>
<td>Not confirmed</td>
</tr>
<tr>
<td><strong>On the Food Security policy guiding ARF</strong></td>
<td></td>
</tr>
<tr>
<td>1) Local demand is in accordance with the MASPs in the respective ARF countries</td>
<td>Partially confirmed</td>
</tr>
<tr>
<td>2) Private sector development will lead to enhanced integration of small-scale farmers in markets</td>
<td>Partially confirmed</td>
</tr>
<tr>
<td>3) Private sector supports dissemination of knowledge</td>
<td>Partially confirmed</td>
</tr>
<tr>
<td>4) Increased income leads to increased (local) food and nutrition security</td>
<td>Not confirmed</td>
</tr>
<tr>
<td>5) Small-scale farmers and other producers need to scale up practices to enhance local food and nutrition security</td>
<td>Partially confirmed</td>
</tr>
<tr>
<td><strong>On the research framework applied in ARF</strong></td>
<td></td>
</tr>
<tr>
<td>1) A contribution to food security and private sector development is achieved ...through ARF projects creating knowledge that can be further developed and applied by the target groups (e.g. the food insecure).</td>
<td>Confirmed</td>
</tr>
<tr>
<td>2) By putting the lead of the consortium in the hands of a practitioner’s organisation research will be demand-driven and this will lead to ownership and uptake of results</td>
<td>Partially confirmed</td>
</tr>
<tr>
<td>3) Interests of consortium partners and stakeholders are aligned</td>
<td>Partially confirmed</td>
</tr>
<tr>
<td>4) Actors from policy and practice are willing and able to be informed by knowledge; new and pertinent knowledge is used in decision-making</td>
<td>Partially confirmed</td>
</tr>
<tr>
<td>5) More knowledge leads to application</td>
<td>Partially confirmed</td>
</tr>
<tr>
<td>6) Collaboration between various partners leads to synergies &gt; interests and world views of partners align</td>
<td>Partially confirmed</td>
</tr>
<tr>
<td>7) Engagement of stakeholders leads to research uptake &gt; stakeholders are homogeneous and have similar interests</td>
<td>First part confirmed, second part not confirmed</td>
</tr>
<tr>
<td>8) Stakeholders are well organised and part of well-functioning institutions</td>
<td>Partially confirmed</td>
</tr>
</tbody>
</table>
I. After we collected the necessary data and evidence, Syspons conducted an internal workshop for synthesising the results of the different case studies and the online survey. Following the internal workshop, a workshop with NWO-WOTRO was held, discussing the main insights from the case studies and the online surveys. This workshop also served as an opportunity for the NWO-WOTRO team to uptake Syspons on recent developments regarding the instruments. Syspons is submitting a draft of the final evaluation report to NWO-WOTRO in the second quarter of 2019. Once Syspons has received feedback from NWO-WOTRO on the draft, it will finalise the report.