Influencing policies and practice for improved food and nutrition security

Research outcomes for policy formulation and implementation

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The Food & Business Research programme

Food & Business Research aims at addressing persistent food and nutrition security challenges in low and middle income countries. It focuses on the urgent and growing need for adequate knowledge and solutions for regional and local problems related to food security. Food & Business Research has supported 75 research projects under two funding instruments: the Food & Business Global Challenges Programme (GCP) and the Food & Business Applied Research Fund (ARF). Both are part of the Food & Business Knowledge Agenda of the Netherlands Ministry of Foreign Affairs (MoFA). The objective of GCP is to promote research-based advanced understanding of emerging key issues in global and regional food security and their impact on local food security and the role of private sector development. The objective of ARF is to promote research-supported innovations that contribute to food security and private sector development in the partner countries of Dutch development cooperation. Food & Business Research is funded jointly by the MoFA and NWO-WOTRO and is managed by NWO-WOTRO.

Research for Impact

NWO-WOTRO Science for Global Development aims to support researchers in increasing the societal and policy impact of their research projects. NWO defines societal impact of research as 'the contribution that innovative research makes to understand and solve global issues, with a focus on sustainable development and poverty reduction'.[1]

NWO-WOTRO developed its 'Research for Impact' approach[2] starting from the realisation that research insights and innovations do not automatically lead to changes in society. The Research for Impact approach is expected to contribute to and facilitate the relevance, and accordingly the use, of research results for policy makers, practitioners, private sector stakeholders and other relevant actors. The approach consists of three elements, also applied in the Food & Business Research programme: i. Co-creation of knowledge by transdisciplinary consortia, ii. Theories of Change and Impact Pathways as guiding frameworks for research formulation and execution, and iii. Research Uptake strategies that spell out which efforts are undertaken to enhance the potential of the research to contribute to societal impact.

More detailed information on NWO-WOTRO's Research for Impact approach can be found on the NWO-website.

[1] From: www.nwo.nl/en/common/about-nwo/organisation/nwo-divisions/wotro/the-impact-of-research

[2] NWO-WOTRO's approach builds on concepts, frameworks and visions developed by partners such as DFID, ODI and IDRC.

1. Introduction

Worldwide, 820 million people regularly go to bed hungry - those were the telling figures of the food crisis in 2019. The Covid-19 pandemic has exacerbated this situation and is expected to most severely impact already marginal and resource-poor consumers. Food and nutrition security is high on the international agenda. Yet to achieve Sustainable Development Goal 2, which aims for Zero Hunger by 2030, governments and their development partners need to increase investment and accelerate action (FAO 2017).[3] The trend of dwindling donor investments in agriculture - from 25 per cent in the mid-1980s to 5 per cent of total aid budgets in 2017 - needs to be reversed. The governments of 44 African countries that signed the Comprehensive Africa Agriculture Development Programme (CAADP) committed to allocate 10% of their national budgets to agriculture, but actual investments are lagging behind. To promote a transition to sustainable food systems, both nationally and globally, it is understood that concerted policy efforts are urgently needed.

The design of food security policies is influenced by knowledge, research and ideas. A better understanding derived from research, can help policymakers and practitioners reconsider their policy priorities and strategies and refine or adjust policy stances.[4] Policy changes and policymaking clearly depend on much more than research insights, and will always be influenced by the current policy discourses about development as well as by political and economic interests of a variety of stakeholders.[5] All policy decisions eventually taken, in turn influence the incentives and actions of farmers, the agricultural and food industry, and consumer groups – and thus enhance the potential for achieving nutrition and food security goals.[6]

> ***Food and nutrition security*** *refers to a situation wherein 'all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life'. (FAO 2002)*

The Food & Business Research programme funded by NWO-WOTRO Science for Global Development aimed to contribute new knowledge and insights to strengthen policies and practices to meet food security challenges.[7] In order to enhance the relevance of the research and increase the chances for uptake of its findings, the programme required that policymakers and practitioners in LMICs participated in the co-creation processes of the funded research projects throughout the design and implementation phases. This focus on co-creation is a defining feature of the programme and a key strategy of NWO-WOTRO's Research for Impact approach. Throughout the article, references will be made to the complex nature of policy influencing processes. Policy influencing that may have continued after project closure, is unfortunately not accounted for in this article.

This article discusses the *outcomes* that have been achieved by a selection of research projects in terms of influencing FNS (Food & Nutrition Security) policy processes and their implementation. In its Research for Impact approach (see cover page), NWO-WOTRO defines outcomes as *'changes in behaviour (relationships, actions and*

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[3] More information on the progress in meeting SDG2 can be found here https://sustainabledevelopment.un.org/sdg2

[4] See Policy Research Brief series 31 and 61 on the Kaleidoscope model of policy change by the Feed the Future Innovation Lab for Food Security Policy, which can be found here https://www.canr.msu.edu/fsp/publications/fsp-policy-research-briefs

[5] See e.g. David Mosse (2005) Cultivating Development.

[6] Resnick 2018: blog: https://www.canr.msu.edu/resources/spinning-the-kaleidoscope-model

[7] The need has been expressed in all GCP call for proposals.

activities) of stakeholders in the business and policy environment, resulting from exchange of knowledge and the uptake of research output from the research projects'.[8] From a policymaker and practitioner's perspective, this relates to the changes in attitudes and/or behaviour towards policy prioritisation, formulation and implementation as a result of research findings. Our interpretation of policy processes is not limited to government policies. The policy strategies and actions of private non-profit organisations are often as important for the communities they work with or the clients they serve, as those of government agencies (see also Box 1).

Based on a review of 16 projects (see Box 2), the synthesis study distinguishes between outcomes that were achieved towards FNS policy *formulation* (Section 2) and outcomes on government and non-profit agencies *implementation* of FNS policies (Section 3). Section 2 focuses on changes achieved in three relevant policy areas for the research projects studied for this synthesis: i. declining natural and food resources, ii. changing food demands, and iii. livelihood development of smallholders. Section 3 focuses on the roles that policy actors play in making research findings available and applicable for farmers and consumers, in particular, the role of government and non-government extension services, and the role of policy actors in standardisation and certification and of (research) innovations. Throughout both sections, we reflect on the engagement strategies that were adopted to include policymakers and practitioners in the research process and how this influenced the uptake of research findings. Section 4 provides a reflection on the lessons learned for policymakers, practitioners and other stakeholders who aspire to improve policy formulation and implementation of FNS.

Box 1: Policymakers and practitioners: who is who?

This outcome synthesis article focuses on two types of stakeholders: actors from public organisations and private non-profit organisations.

Public organisations work with an official government mandate and determine and/or implement local (community, district, provincial) or national government policies. Most projects engaged public organisations during the research and/or for research uptake purposes. Private non-profit organisations that participated in the reviewed projects include non-governmental service providers, NGOs, CSOs and networking agencies.

The term 'practitioner' in this article refers to stakeholders that work for private non-profit organisations, while the term 'policymakers' refers to stakeholders from government agencies. This article joins the perspectives of policymakers and practitioners because the dynamic between these two types of stakeholders was often important in reaching the projects' policy objectives. A separate synthesis article was published on research outcomes for and by private for-profit enterprises.[9]

[8] More information on NWO-WOTRO's approach to Research for Impact can be found here.

[9] In the F&B Research calls for proposals, NWO-WOTRO used this same distinction between public organisations, private non-profit organisations and private for-profit enterprises. The outcome synthesis article on private for-profit actors, is *Capitalising on knowledge: How research can enhance business opportunities that serve marginalised farmers and consumers*.

Box 2: Project selection

For this synthesis, we reviewed 16 projects in total out of 75 projects funded under the F&BR programme, of which all but one (Bangladesh) projects were implemented in sub-Saharan Africa (see Annex). The 16 projects were selected on the basis of purposive sampling. Findings presented in this article are not necessarily representative for the entire F&B Research programme.

Because of the way the calls for proposals were formulated the funded projects all related to the pillars of the Dutch government's Food Security policy at the time. Projects were to be driven by local demands, including policies and priorities of the project country's governments, and - for ARF projects - to align with the Multi Annual Strategic Plans of the embassies of the Netherlands in the respective countries.

2. Research outcomes for a better FNS policy environment

The reviewed projects shared an ambition to contribute to a better enabling policy environment for improved Food and Nutrition Security (FNS). Creating an enabling environment for farmers and producers to grow, process and market their agricultural produce is a key responsibility of policymakers and practitioner organisations. This first outcome area therefore addresses the uptake of research insights and findings by policy makers and practitioners for new or better policies, legal instruments, practices, priorities and guidelines that are meant to benefit FNS.

Three FNS policy topics addressed by the reviewed projects are discussed in this section:

Promoting alternatives for declining resources (2.1)

Growing and changing food demands due to more affluent (urban) population (2.2)

Supporting rural economic development for smallholder livelihoods (2.3)

While not selected as a key FNS policy topic in this synthesis study, we acknowledge that gender equality and women's empowerment are crucial to achieving food and nutrition security. Some of the projects reviewed for this article included a gender dimension in their research goals. However, as far as we could assess, it was not explicated how this translated to the projects' policy influencing activities. A separate article in the outcome synthesis series (to be published in late 2020/early 2021) will be fully dedicated to a more thorough exploration of the focus on gender in the cycle from research design, to implementation and uptake strategies for different stakeholders.

The case examples from the projects presented in this article illustrate the achievements and obstacles that consortia experienced in their efforts to co-create relevant knowledge and influence policy and practice. Even though co-creation was pursued, in many cases we are limited to discussing the research projects' *potential* of influencing policy and practice, or their initial progress. Examples of projects that can claim a contribution to tangible changes in policy or practice that have already happened are listed in Table 1. An external evaluation of the Food & Business Research programme' Applied Research Fund (ARF) provides more insights into the factors that enhanced the relevance of the research projects for policy development.[10] In addition, a separate synthesis article (to be published in early 2021) will be fully devoted to the different Research for Impact approaches developed and applied across the Food & Business Research programme.

[10] Syspons 2019.

Table 1: Progress towards policy changes[11]

(Progress towards) policy changes	Expectations for the (near) future	Project
Results from the project were instrumental in creating an enabling environment for the development of **product standards and legislation for the use of dried insect-based protein ingredients in compounding animal feeds**, thus opening new markets and opportunities for large-scale production and commercialisation of insect-protein based products.	Roadmap was developed to establish a clear and comprehensive (inter)national legal framework to pave the way for more investment in insect-based enterprises. Contains advice for research, government, donors and private industry.	**Insect-based Feed in Kenya**
The project aimed to establish resilient cassava varieties fitting the requirements of small-scale farmers. The project successfully used research findings for two policy changes. First, **a local government ordinance stating that animals are no longer allowed to freely roam in the dry season** to avoid them destroying cassava plants. Second, to stop the spread of cassava diseases, a **policy stipulating that planting material must be accompanied by a movement permit** to be distributed or sold across district boundaries.	The national research institute NaCCRI expects that the Ugandan government will approve and release new cassava varieties that have been identified in a participatory manner with the farmers under this ARF project.	**Cassava for Food Security in Uganda**
Aiming to stimulate the domestic production of potatoes, the project tested local potato seed varieties for local production. During the project, the **seed law was revised in part due to advocacy efforts of project partners** to rethink the requirements for seed potato multipliers. Before the revisions, it was required to multiply certified potato seed on at least 2 ha, but now it is allowed to multiply seed on 1 ha.	The amendments to the law have opened up opportunities for small-scale farmers to participate in the market as quality seed multipliers. More potato seed multipliers have been registered since and more are to be expected.	**Potato Seed Innovations in Burundi**

[11] Full titles of the listed projects are available in the Annex.

Inland fishing in Benin faces a number of challenges for small-scale fisheries, including increasing restrictions to fishing practices used by local fishermen in light of environmental sustainability. Research findings have **contributed to national level discussions about new Implementation Decrees** that are to be issued based on the Fisheries Law of 2014.	The project expects that these outcomes contribute to a sustainable use of water resources for inland fishing in Benin, an adaptation of inland fishers to the negative impacts of climate change, an increase in the fish production and an improvement of the livelihoods of women involved in fishing activities.	**Resilient Fisheries in Benin**
The project interventions – setting up a cooperative under a shareholder model and providing evidence of significant post-harvest milk losses - **influenced both the county and national government investment decision** to support dairy farmers in the project location with milk cooling and pasteurizing infrastructure. The project findings also contributed to the **development of a Food Safety Policy** at county level in Nakuru county.	The project partners expect that lessons from the project will keep feeding into county government policy processes thanks to ongoing close engagement between the project partners and the county government. The county intends to develop a Feed and Food policy that looks into diversifying protein sources and feed preservation during the dry season.	**Smallholder Dairy in Kenya**
The research has led to an uptake by the Kisumu County Governor to make a **political plea for creating spaces for 'mini-farming' or 'green spaces' in urban areas.**	It is expected that the call for 'green spaces' in peri-urban areas will be included in the County Integrated Development Plan (CIPD) of Kisumu county.	**Women Food Entrepreneurs in Kenya**

A survey[12] among external stakeholders of the research projects (n=78) shows that nearly all respondents representing government (n=26) and practitioner organisations (n=24) stated that participation in the research project events offered them valuable new insights, information or knowledge. In the majority of cases, the events allowed them to broaden their understanding of the respective topics and complemented their existing knowledge. Their willingness to implement changes based on the research results was scored very high across the board, which was reflected in the majority of respondents sharing that the research findings inspired them to change their professional approaches to the topics at hand (29 out of 39 respondents). A snap-shot of first-hand impressions from policy and practice stakeholders that were involved in or engaged by the projects, is provided in Box 3.

[12] An online survey was conducted among external stakeholders of the GCP and ARF projects of the Food & Business Research programme. External stakeholders include those actors that participated in project events and/or were actively involved by – but not partner in - the project consortia. 408 surveys were sent and 78 valid responses were received (response rate 19%).

Box 3: Changes in professional approaches: a selection of survey responses

A survey among external stakeholders to the research projects harvested examples of ways in which participation in research activities led to changes in their approach to a policy topic, the practices or the content of policy:

- 'Farmers have now been advised to embrace crop rotation and soil testing and analysis of soil fertility management', government representative Kenya
- 'I operate a plant health clinic and the information broadened my knowledge on diagnostic skills and decisive recommendation friendly to the pocket, the consumer and the environment.', government representative Zambia
- 'The department of agriculture has started advising farmers on non-chemical methods of controlling tomato leaf miner', government representative Kenya
- 'I have gained knowledge on Integrated Pest Management and now I can train farmers on the subject.', government representative Kenya
- 'We have incorporated the research findings regarding the studied technology in our Farmer Field School curriculum', NGO representative Indonesia
- 'More emphasis is now given to activities of women entrepreneurs to ensure quality and high standards of hygiene are maintained.', government representative Kenya
- 'We are considering to broadening our research topics to include traditional fermented foods', government representative Zambia
- 'Because of the project, I now encourage my fellow plant doctors to recommend other pest control measures as opposed to the pesticides used.', government representative Kenya
- 'I have, since the project, connected with the Dairy Transformation programme with the government and I see that it has changed the mindset of producers that I am working with.', government representative Zambia.
- 'By engaging with the project, we got to know how big the challenge is of informing policymaking in the fishery sector and started organizing policy dialogues with local leaders.', NGO representative Benin

2.1 Promoting alternatives for declining resources

The depletion of natural resources is a major threat to food and nutrition security. Think of the consequences of over-fishing in Lake Victoria in East Africa, or the problems of water scarcity and soil depletion affecting farmers and fishers globally. Governments have started formulating and implementing new policies to address this persistent resource depletion, which in many cases is exacerbated by climate change.[13] The Insect-based Feed project (Kenya) and the Resilient Fisheries project (Benin) both responded to the growing attention of national governments to resource depletion threats. They explored alternative and innovative solutions to respond to the policy challenges of overfishing and water scarcity.

The Insect-Based Feed project in Kenya[14] responded to the declining numbers of fish in Lake Victoria due to overfishing. The main reason for overfishing is not the fishing for human consumption, but the high demand for fish oil and fishmeal, which are core ingredients for animal feed. The growing scarcity of these fish-based ingredients has caused their prices to increase by 100% in the last five years. This is driving up the cost of animal feed, which,

[13] The synthesis found that nearly all projects addressed - to a certain extent – policies and practices related to the impact of climate change on FNS (e.g. water scarcity, drought, soil depletion). Due to its relevance and wide applicability, the topic of climate-smart agriculture will be addressed in a separate synthesis article to be published later in 2020.

[14] 'Improving livelihood by increasing livestock production in Africa: An agribusiness model to commercially produce high quality insect-based protein ingredients for chicken, fish and pig industries' (see Annex)

representing 60-70% of animal rearing costs, is already prohibitive for most resource-poor farmers. Rather than focusing on how improved practices or legal guidelines to make fishing in Lake Victoria more sustainable, the project instead took a radically different approach: introducing an alternative protein ingredient to reduce the need for fishmeal in the first place. Based on ongoing research, the project suggested using protein from insects – the Black Soldier Fly - to replace fishmeal as a core ingredient in animal feed. This raised technical issues, but also a key policy question: what are the implications – in terms of food safety as well as consumer preferences - of using insects to produce animal products meant for human consumption? To raise awareness on the potential of alternative feed ingredients, the project organised an International Conference on Legislation and Policy on the Use of Insects as Food and Feed in East Africa, with 105 participants from 13 countries. The goal was to inform governmental regulatory authorities and other stakeholders of the importance of insects as food and feed to improve FNS in East Africa and the need to develop, adapt and strengthen legislations and policy to govern their use. Following this conference, a roadmap was developed to establish a clear and comprehensive (inter)national legal framework that can pave the way for more investments in insect-based enterprises. A major outcome was that the Kenyan Bureau of Standards developed a standard for insects as feed component, which was vital for enabling the production of insect-based feed in Kenya.

A second project that responded to declining resources and the absence of regulatory measures, was the Resilient Fisheries project in Benin.[15] The project focused on improving the resilience of inland fisher communities and aquatic systems to overfishing and water resource degradation. To reconcile the conflicting interests of the multitude of stakeholders involved in the inland fisheries sector, the project developed a roadmap to balance the livelihood interests of the fisher communities against quality and sustainability of inland waters. The project established a multi-stakeholder committee comprised of a representatives from the Ministry of Agriculture, fishermen associations, local agricultural advisory services, associations of women in fishery, and representatives from the municipalities. The Chairman of the National Federation of Fishers, who is a member of the multi-stakeholder committee set up by the project, also sits on the national committee on fisheries established by the Ministry of Agriculture. This dual role allows him to liaise and feed research findings to the official government committee. He mentioned that the research evidence about the type and degree of pollution of the lakes, which was lacking before, has given him increased credibility with policy makers on this committee. The project also made an effort to translate the scientific knowledge into easily understandable formats for practitioners and policy makers. The project's research furthermore shed a new light on the contested yet profitable fishing system of *acadjas*: if this system is well controlled, it does not need to be banned. The findings are contributing to national level discussions about new Implementation Decrees that are to be issued, based on the Fisheries Law of 2014. However, despite the vigorous attempts of the project, the partners still found the trajectory of policy influencing 'extremely complex' and 'challenging'. Rather than accepting that fate, the lead partner ACED, a Beninese NGO, used this realisation as an opportunity to start a new project with funds from Hewlett Foundation, based on ARF findings. The spin-off project focuses on how to use evidence for influencing policy change and how to ensure that research is demand driven (based on needs of policy makers). Building on the lessons learned in the ARF project, ACED focuses first on the opportunities with local governments because it was realised that it is easier to demand action from the national government when local governments are visibly activated and making an effort.

2.2 The changing food demands of a growing and more affluent urban population

Many LMICs are experiencing shifting consumer behaviours and demands when it comes to food consumption. A fast-increasing demand for meat and dairy products is especially apparent. This is mostly the result of growing

[15] 'Improving the resilience of the inland fisher communities and aquatic systems to overfishing and water resource degradation in Benin' (see Annex).

middle-classes and more affluent urban populations. [16] In LMICs, the middle-class accounts for more than two thirds of total consumption (ADB, 2017).

Several of the reviewed projects were designed in response to the efforts of policymakers and practitioners to adjust agricultural and food policies in line with this growing consumerism and the emerging food trends. This is also true for the projects in Kenya and Benin discussed in Section 2.1, which relate to the increased national and global demand for meat and fish. The Smallholder Dairy project in Kenya[17] was fully designed in response to the Kenyan government's efforts to promote the intensification of smallholder dairy farming. and therefore actively, and successfully, engaged with policy makers at both national and county level. See Box 4 for the perspective of a local government officer who was very closely engaged with this research project.

Box 4: Liaising with the County Government to support smallholder dairy farmers

The livestock industry is a key driver of Kenya's economy, and employs close to 50% of Kenya's agricultural labour force. Promoting the dairy smallholder sector is a national government priority for two reasons: first, to improve the livelihoods and nutrition security of the smallholders, and second, to respond to the increasing demand for milk in the country due to a growing and more affluent population.

The Smallholder Dairy project was designed fully in response to the government's policy priority. It was moreover implemented in Nakuru County because this county has the largest number of cows in Kenya, yet is only the third largest producer of milk. This means that there are opportunities for improving the efficiency of the smallholder dairy farms.

Dr Immaculate Maina is the Nakuru County Executive Committee Member (CECM) in charge of Agriculture, Livestock and Fisheries. She came into office when the research project was already underway, yet soon became closely involved. She explains: 'This project, which trained farmers on sustainable dairy management strategies such as better feed and hygiene, was perfectly in line with our county objectives. It therefore immediately sparked my interest when the research team presented itself at the Dairy Farmers Platform. The county convenes this platform to bring all relevant stakeholders in the dairy value chain together on a regular basis.'

The project team started actively engaging with the county government, which was very receptive to its research findings. This is not a given among local government agencies, but in this case was facilitated by the fact that the County Executive herself has a research background as well as professional ties with Egerton University, one of the project partners. Dr Maina: 'The fact that the project's research team managed to quantify farmers' losses due to milk spoilage caused by their lack of basic infrastructure, triggered us to solicit practical support. Our county government liaised with the Ministry of Agriculture and Fisheries and together we provided two milk coolers and a pasteurizer to the dairy cooperative that was set up during the project.'

Research evidence and lessons from the project also contributed to the county government's decision to draft a Food Safety policy for the county. Dr Maina emphasises that the county's eagerness to adopt research outcomes also creates dilemmas. Research by one of the project partners for instance showed the importance of using aluminium or stainless-steel transportation containers for milk quality and safety. Dr Maina: 'As a county, we want to promote these insights, but for farmers this means extra costs to replace their plastic containers, so the county will need to support a mindset change through training and capacity building among the smallholders'.

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[16] The global middle-class is expected to grow and reach 5.5 billion by 2030. From 'Developments and Forecasts of Growing Consumerism' https://ec.europa.eu/knowledge4policy/foresight/topic/growing-consumerism/more-developments-relevant-growing-consumerism_en

[17] 'Innovations for sustainable and profitable intensification of smallholder dairy in Kenya' (see Annex).

2.3 Supporting rural economic development and smallholder livelihoods

Smallholders play a key role in contributing to food and nutrition security for their households and communities, yet they are among the poorest and most food insecure people in the global South.[18] Rural development policy aimed at improving the livelihoods of smallholders is therefore a key national policy area for FNS. Several of the reviewed projects focused (parts of) their research on contributing to rural development policy for improved FNS.

One example is the Cashew Nut Farming project[19] in Uganda. This project successfully encouraged the government to include the cashew tree as a priority cash crop for northern Uganda in its Operation Wealth Creation' programme, which aims to transform the Ugandan agricultural sector. Halfway during the project, the research and business partners were invited to give a pitch about their findings at the Prime Minister's office. Their research findings about both the agronomic suitability of cashew and its potential profitability convinced the government of the benefits of cashew trees for the diversification of smallholders' economic activity in this arid region of the country. Long-standing good rapport of the project partners with both government officials in Kampala and local government offices in the project area contributed to this policy change. When the government included the cashew tree crop in the national agricultural policy, this gave private parties, especially SMEs, the confidence to start investing in setting up cashew nurseries and some plantations. However, smallholders, who were the project's target group, were not sufficiently convinced of the business prospects and therefore scarcely invested time and resources in growing cashew on their farms.[20]

Also in northern Uganda, the Cassava for Food Security project[21] initiated multi-stakeholder platforms at district level to encourage the productivity of cassava as an income-generating and food crop for smallholders. The project was designed in response to the government's decision to give the staple crop cassava was 'priority crop' status for eastern and northern Uganda because of its known climate resilience (it neither needs very fertile soil nor a lot of water). This may also explain why the district governments of Pader and Oyam were eager to participate in the multi-stakeholder platforms and very supportive of the project. The project team used the research findings to request for an ordinance to be issued that forbids animals to roam freely without the supervision of their owners, to stop the destruction of young cassava plants. Farmers own cattle as part of their mixed farming systems, but due to reducing pastures, the cows are left to find whatever grazing land they can find, which causes conflicts within the community. The new ordinance, supported by the research findings, is in line with ongoing government efforts to encourage farmers to only rear a manageable number of cows. The project team also worked on curbing the indiscriminate movement of cassava planting material between districts, which causes cassava diseases to spread fast. Researchers from project partner NaCCRI, together with opinion leaders and the government, developed a new policy. This policy stipulates that planting materials moving from one area to another should have a movement permit from the Ministry of Agriculture, showing that the source fields were inspected and approved as safe for use as seed. Finally, the Ugandan research partner in the project, NaCCRI, expects new cassava varieties that were selected in a participatory process with 12 farmers groups (360 farmers of whom 60% female), will soon be approved by the Variety Release Committee of the Ministry of Agriculture, paving the way for smallholders to benefit from more resilient varieties.

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[18] It is estimated that smallholders produce 50-80% of the world's food (Ricciardi et al. 2018). Two synthesis articles focus on the role of smallholders in FNS: thematic and outcome.

[19] 'Introduction of cashew nut for income security for poor farmers in Northern Uganda' (see Annex).

[20] See the thematic and outcome articles on smallholders for an elaboration on this case.

[21] 'Cassava Applied Research for Food Security in Northern Uganda' (see Annex).

3. Research outcomes that support the role of policymakers and practitioners as primary actors for FNS

This section presents outcomes achieved by the reviewed projects in terms of supporting policy actors in the role they play in making new knowledge and research findings available and applicable for farmers and consumers. The reviewed projects engaged with policymakers and practitioners responsible for certification and standardisation of (research) innovations in the food and farming sectors (3.3), and with government and non-government extension services (3.2). Section 3.1 briefly looks at a few research projects that contributed to facilitating direct policy implementation.

3.1 Research projects as catalysts for FNS policy implementation

The outcome synthesis reveals that in a few cases, research projects supported local and national institutions not only in policy (re)formulation, but also tried to contribute in very practical ways to the roll out of certain (new) government strategies or services.

The project partners of the Fertile Grounds project[22] in Burundi, for example, established a first-of-its-kind soil testing centre in Burundi, setting in motion a more effective awareness raising campaign by the government on more environmentally sustainable fertiliser usage. The study identified different agroecological zones in Burundi and determined their differing needs for fertiliser application. Before, the standard practice in the country, which was also promoted by the government, was to use three types of fertiliser for all soil types. This approach ignored the diverse agricultural conditions and soil improvement needs across the country. After the realisation sunk in that productivity of smallholder land could multiply when applying a fertiliser that matched specific soil requirements, the need for soil testing in Burundi grew. However, the project partners discovered that the only testing facility available was located in Kenya, which made large-scale testing of smallholder soils impossible due to high costs and the time incurred before results come back. As a result, the project sought the support from the Embassy of the Netherlands, to set up a national soil testing centre; jumpstarting a more active involvement of the government to promote a test-based fertiliser usage by smallholders. This project intervention, in a way, acted as a catalyst for government policy to be more easily implemented and scaled.

The Irrigation App project in Bangladesh[23] serves as another example. This project aimed to contribute to smallholder livelihoods by building on several policy priorities of the national government: the growing (non-saline) water scarcity as a result of climate change, improving the livelihoods of smallholders, and integrating technology solutions for the agricultural sector following the 'Digital Bangladesh Vision 2021'. The project developed a user-friendly smartphone app that can provide field-specific irrigation advice to subsistence farmers, to help them use water more economically and to be able to cultivate their fields during the dry winter months. Initially the project had planned to sell the app subscription directly to the farmers, or to the private irrigation service providers. When both declined, the team realised that embedding this innovation in existing government services might be a better strategy to ensure widespread uptake. For this purpose, they engaged the government's Department of Agricultural Extension (DAE) as part of a new project that builds on the insights of the ARF project. Project partners realised that Bangladeshi farmers have trust in public services, especially extension services, and would more easily accept the application if it was promoted by the government. To increase the chances of support from DAE, the team simultaneously engaged the government research agency BARI (Bangladesh Agricultural Research Institute), as their endorsement of the innovative technology will help to get the DAE officers, who work in a more traditional

[22] 'Building on fertile grounds in Burundi' (see Annex).

[23] 'Bangladesh: ground cover app for scheduling irrigation' (see Annex).

government department, on board. There are clear signs of interest from DAE, yet, given that this project finished in 2017 shows what a long process it can be to influence policy makers to take evidence-based decisions.

3.2 Facilitating training & support services for small-scale farmers and producers

Policymakers and practitioners play an important role in facilitating training and support services for small-scale farmers and producers. Many of them lack access to up-to-date agricultural and market information. Consequently, it is even more important that the information that *does* reach smallholders and small-scale producers is contextualised, validated and applicable to their farming and livelihood needs.

The key stakeholders for achieving outcomes in this area are indeed the providers of advisory or extension services, which can either be public, private or non-profit agencies. The role of such agencies is widely acknowledged as fundamental for transferring technological and market-related knowhow and skills to farmers, teaching farmers how to diversify farming systems, and organising farmers into cooperatives or producer groups. All these services are provided to increase farmers' productivity (and increasingly sustainability), with a view to achieving both livelihood and FNS benefits. However, it is widely reported that extension systems, especially the public services, often lack the necessary resources and capacities to carry out extension programme activities in the field at the scale and quality required for innovations to take hold at smallholder level (The World Bank, 2010). Sub-standard service provision by existing extension and advisory services can exacerbate the problem of misguided agricultural information provision to smallholders, which can affect the growth and sustainability of agricultural sectors.[24]

The synthesis study shows that the reviewed projects engaged with both public and private extension services in two ways. First, some projects used capacity building to improve the quality of the services and expand their reach among farming communities. Second, some projects focused on co-creating and sharing research insights with policymakers and practitioners responsible for extension services, to ensure that the content of their services is optimally relevant to what small-scale farmers and producers need to know to improve their practices.

As for the first category, several research projects trained existing advisory service providers or extension workers to capacitate them to adequately transfer newly gained insights from the research projects to the field. In Kenya, the Integrated Pest Management project[25], for instance, established a partnership with Plant Doctors, supported by the iNGO CABI, which organises clinics in various markets where farmers bring infected and affected plants to seek advice. The lack of access to timely and relevant advice on crop health problems poses a significant challenge to farmers to take action at the right time to mitigate crop losses. In efforts to address this issue, plant clinics offer plant health advice to farmers by diagnosing samples of their 'sick' crops. (Tambo, 2020). The doctors in Kenya were trained in IPM strategies researched by the project and spread the word to farmers that visited the clinic. However, that was also the limitation to the project: it reached only those who visited the plant clinics, thinning the scope of research uptake – not so much in numbers (over 14.000 farmers were reached) but in the type of farmers (only those that can afford to visit and have access to the plant clinics). The project emphasised that to achieve training results at impactful scale requires a strong commitment and the respective investments by government, development and private sector stakeholders.

[24] The project Market-oriented Dairy System project provides more in-depth analysis of different advisory and extension services models in Ethiopia and Kenya. See Annex for further project references.

[25] 'Development, Validation and Dissemination of Integrated Pest Management Packages for Tomato Leafminer (Tuta absoluta) and Fusarium wilt-root knot nematode complex affecting tomato production in Kenya' (see Annex).

In Burundi, the Potato Seed Innovations project[26] actively engaged with policymakers to emphasise the importance of expanding training and accreditation of extension workers who can then conduct quality control and inspection of potato seed varieties. These efforts were successful and have helped to ensure that project outcomes could be sustained and upscaled (see Box 5).

Box 5: Increasing the capacity of extension inspection services in Burundi

Gilbert Buhanza, National Office of Control and Certification of Seeds in Burundi: 'Insights from the Seed Potato Innovations project made me realise that if we want to change the seed sector, our policies should target smallholders. Regulations for seed multiplication in Burundi stipulated that certified potato seed can only be produced on areas of at least 2 ha. This excluded smallholders from participating in this key value chain activity. Partly as a result of advocacy efforts based on the project's insights, the national law was amended, allowing certified seed multiplication on 1 ha plots. As a result, many smallholders became registered seed producers. Simultaneously, our office started training extension workers to conduct quality control and inspection of seed multiplication. The capacity increased from 5 to 47 trained (of whom 35 operating) seed inspectors country-wide. These changes have helped to increase the quantity of seed potato production in Burundi, reducing the farmers' dependency on imported seeds. The same strategy of small-scale multiplication is now being introduced for other crops such as maize and beans.

Secondly, several projects encouraged the sensitisation of both public and private extension and advisory services about new agronomic insights, improved agricultural practices, or new standards for implementation that were generated by the research. Project partners emphasised that due to their lack of access to information on tested and proven new practices, farmers often rely on familiar and traditionally accepted practices, which might include the use of chemicals and fertilisers that are not the most suitable for their soil and climate conditions. This unfamiliarity with new technologies and products (due to a lack of access to information) is also a contributing factor to invalid risk perceptions by farmers in adopting innovations. Often, extension officers are the only source of scientifically validated information that farmers have access to. This reliance on advisory services can be a virtue or a curse; it all depends on the quality of the information that is provided. The Integrated Pest Management project in Kenya, for instance, found a strong tradition among extension services of promoting conventional fertilisers and chemicals in the tomato sector, and little attention if any to alternative – more sustainable - opportunities. The project therefore included extension officers in their trainings on more sustainable integrated pest management practices and successfully called on government extension agencies to include this information in their engagement with farmers.

Other research projects too set out to ensure that research findings – when adequately tested and validated – were embedded in the curricula and trainings of public and private extension services. Several projects were successful in this (e.g. Fertile Grounds in Burundi; Integrated Pest Management in Kenya; Smallholder Dairy in Kenya; Irrigation App in Bangladesh).

3.3 Supporting standardisation and certification processes

Policymakers have an important responsibility in ensuring that products that reach consumer markets meet quality standards and are safe for human and/or animal consumption. These quality and safety standards are laid down in

[26] 'Development of potato seed quality based innovations for small-scale farmers in the three provinces surrounding Bujambura town in Burundi' (see Annex).

national guidelines and codes of practice.[27] As a strategy for increasing their incomes, smallholders are often directed by NGOs and governments to start entering formal markets.[28] This automatically implies that their products need to comply with the said quality and safety standards, which often requires certification. In addition, farmers in the Global South increasingly need to comply with sustainability standards for their products to enter, especially international, consumer markets.

National Standard Organisations (NSOs) play a key role in standard setting and certification. They can be either government bodies or non-profit organisations representing the Trade & Industry sectors. All research projects listed in Table 2 actively engaged with the NSOs in the respective countries because they researched and developed innovative solutions for new or improved agricultural technologies and products that required an official seal of approval (standardisation or certification) to be allowed on the market. [29] These solutions ranged from new seed varieties (e.g. indigenous vegetable seeds, improved seeds for better climate resilience), to new fertilisers (e.g. from organic urban waste), and to new or improved value-added products through adoption of (new) techniques (e.g. fermented foods, infant foods, drying of indigenous vegetables).

[27] To ensure harmonisation of standards across borders, regional and international guidelines have also been developed, such as the *CODEX Alimentarius*. The *CODEX Alimentarius* is set by the FAO and WHO and functions as the principal international code of practices to protect consumer health and promote fair practices in food trade. See: http://www.fao.org/fao-who-codexalimentarius/en/

[28] The decision to formalise may increase incomes and market opportunities for some smallholders, but there are also many potential downsides for smallholders entering formal markets. It is also likely to increase costs and additional burdens. While on the one hand formal contracts and inclusion in value chains may provide security regarding prices, quality standards and the potential for collective investments in farm productivity, farmers on the other hand may incur high costs for certification and compliance measures and are less flexible due to formal frameworks they have to comply with. The discussion about pros and cons of formalisation of smallholder production is beyond the scope of this article.

[29] More information on the diversity of insights and innovations developed can be found in the thematic synthesis articles.

Table 2: Selection of products and technologies that have been or are in the process of being standardised or certified

New product or technology that has been standardised or certified	Institution involved	Project
The project focused on establishing standardised value-added products from dairy and cereals, specifically the local Zambian fermented foods *mabisi* and *munkoyo*. These products could be certified based on good manufacturing practices, however, product-specific standards are currently unavailable. A follow-up project will help to establish these standards and to ensure scaling up of the production processes.	Zambia Bureau of Standards (ZABS)	**Fermented Foods in Zambia**
In Uganda, the Value Addition Institute (VAI) focused on having 3 milk fortified products certified for national and regional sales. Their product was tested for long-shelf life and higher nutrient levels, to meet the needs of both urban and rural consumers. The product was certified and partners are in the process of harmonising the certification for sales in other African countries.	Uganda National Bureau of Standards (UBNS)	**Affordable Food Cereals in Uganda**
To ensure quality standards were met, and to convince consumers of its quality, the project set out to have the locally produced urban organic waste fertiliser of women food entrepreneur groups certified. The product received certification and is now sold on the local market.	Kenya Bureau of Standards (KEBS)	**Women Food Entrepreneurs in Kenya and Burkina Faso**
In Kenya, using insect-based feed for animals that are reared for human consumption was not yet permitted. The project worked towards certification of using Black Soldier Flies (BSF) as feed component. KEBS developed a standard for insect feed components, and mass rearing protocols of BSF and its nutrient value and safety quality have been successfully established.	Kenya Bureau of Standards (KEBS)	**Insect-Based Feed in Kenya**
The project established the first ever certified commercial infant food made from local plant and animal resources for national and regional market. The methods developed can in the future be applied for certification of other infant foods. As a project result, FARIFORTI is now allowed for sale on national and regional markets.	National Agency of Food Safety, Benin	**Local infant foods in Benin**
The characteristics of the project's four dried indigenous vegetables became the national standard for such products. The Trans Nzoia county authorities now buy MACE Foods seeds for indigenous vegetables, which they distributed for free to farmers.	Kenya Bureau of Standards (KEBS)	**Indigenous Vegetables Marketing in Kenya**
A new regulation was accepted that introduced a new seed category, the 'quality declared seeds', which refers to a lower grade standard for indigenous vegetable seeds. This allowed the formal recognition of seeds that stay or are traded within villages/communities, instead of on formal markets, and of which the quality is established via self-declaration by local communities.	Ministry of Agriculture, Uganda	**Gender Responsive Seed Systems in Uganda**

How did the projects approach the issue of standard setting and certification given the needs and possibilities of the ultimate target group of the Food & Business Research projects, the marginalised farmers and consumers?

Firstly, standard setters can play an important role in creating a more level playing field that allows participation of small-scale farmers. The key challenge is to establish standards that ensure food safety and quality while at the same time meeting the needs and capacities for small-scale farmers. Unsurprisingly, for most smallholders in LMICs, the investments required to meet national or regional market standards are beyond their capacities and resources. At the same time, national government policies increasingly support small-scale farmers in their pursuit to ensure food and nutrition security. Standard setters repeatedly emphasised that standards should take into account the capacities and resources of small-scale farmers (see Box 6), while input and advisory services should be supported to have the capacity to assist famers in meeting those standards (see 3.2).

The Local Infant Foods project in Benin[30] took its own approach to levelling the playing field. The project partners were successful in having their newly developed infant food, the first one made entirely from local plant and animal resources, certified for commercial sales at national and regional markets. However, the partners soon realised that such a commercial product was unaffordable for those who need it most: marginalised, rural consumers. Therefore, the project set out to build on the certified product and distribute, free of charge, a set of (uncertified) recipes that can be used by rural consumers based on the resources they have available in their agricultural zones.

Another example of how certification can support more equitable markets is shown in the Gender Responsive Seed System project in Uganda[31]. The project found that a major challenge for increased production and profitable trade of the indigenous vegetable *Solanaceae* is the limited access to quality seeds and the lack of participation in profitable formal seed markets by women who are the producers of the vegetables. The issue at stake is that the indigenous vegetable seeds are not certified, and that the sale of uncertified seeds and products is illegal. However, getting the indigenous seeds certified is a difficult, costly and long-drawn process. The project points to another key concern: due to the associated costs, the formalisation of seed markets through certification is bound to make the certified seeds unaffordable for small-scale producers.[32] The project's strategy therefore was to try and make seed registration cheaper for local communities. Together with other partners and initiatives in Uganda, the project lobbied the Ministry of Agriculture to issue a new regulation for an improved legal recognition of indigenous vegetable seeds. This new regulation introduced a new seed category, the 'quality declared seeds'. The quality of these seeds is established via self-declaration by local communities. They can be traded formally without their prices becoming a barrier for resource-poor communities.

[30] 'Infant foods from local resources as a pathway to a better food and nutrition security in Benin' (see Annex).

[31] 'Development of a Gender Responsive Commercial Seed System for African Indigenous Vegetables in Uganda' (see Annex)

[32] Inclusion of ongoing debates on formalisation of seed markets is beyond the scope of this article. See for instance: Both Ends (2018) UPOV 91 and trade agreements. Compromising farmers' right to save and sell seeds.

Box 6: Contextualising standards for the Global South

Based on interviews with Anthony Munyenyembe, standard officer for Zambia Bureau of Standards and participant in the Fermented Foods project.

The findings of the Fermented Foods project[33] showed that to achieve research uptake, new legislation is needed to enhance indigenous food products, in this case fermented foods, on the formal Zambian market. Both mabisi (based on raw milk) and munkoyo (produced using plant roots) are currently sold on informal markets, however, there are no standards for these products to address quality and food safety aspects. The process of developing a standard for munkoyo stalled due to inadequate information to distinguish between toxic and non-toxic roots used in the brewing of munkoyo. There is, therefore, need for research to profile the chemical characteristics of munkoyo for easy differentiation. The Zambia Bureau of Standards (ZABS) actively engaged with the research project. This was facilitated by the fact that upscaling traditional and local foods has become one of the Zambian government's priorities to promote food and nutritional security as well as to foster small-scale and larger business opportunities.

Officers at ZABS saw a great value in their close engagement with the research project. Munyenyembe emphasised that as standard setters, ZABS' interest lies with research that can contextualise international standards and adapt these to national circumstances.

Many food product and process standards are developed and set by developed economy benchmarks. As a result, they do not necessarily correspond with the needs and capacities (e.g. laboratory testing facilities) of NSOs in countries of the Global South. Furthermore, poverty levels in these countries pose another dilemma, as Munyenyembe puts it: 'We live in communities that face competing needs between food safety and food security. Food safety is not a choice when it is either that or starvation.'

Munyenyembe therefore emphasises the need for some 'levelheadedness' when recommending standards in the Global South. He points to the reality that the capacities and resources for investment at small-scale farmer or processor level are very different than those at commercial enterprise level. 'While the products coming from these two levels might turn out slightly different, the standards need to respond to this reality if we want to level the playing field. Large scale processors can invest capital in high-tech equipment (i.e. meeting developed economy requirements), while small-scale facilities do not have access to the most advanced technologies. We have to be careful that standards are not biased to one end of the sector.'

Secondly, this synthesis study shows that certification and standard setting can play a strong part in changing perceptions of consumers, which in turn can benefit smallholder food producers. A lack of certification can impede consumer acceptance of middle-class consumers in urban areas who may not trust the microbiological safety of uncertified products.

The example of the Women Food Entrepreneurs project[34] in Kenya shows how research partners supported urban food entrepreneurs to overcome the reservations consumers had about buying their fertilisers made from urban organic waste. Urban consumers in Kisumu, Kenya's third largest city, were reportedly wary of buying fertilizers produced from organic urban waste originating from the city slums. Consumers expressed reservations about the

[33] 'Enhanced nutrition security through traditional fermented foods in Zambia' (see Annex).

[34] 'Women Food Entrepreneurs in Kenya and Burkina Faso: Building inclusive business models for food security in the city slums of Kisumu and Ouagadougou' (see Annex).

quality and safety of the product, fearing pollution in some way. The Kenyan consortium partner effectively acted as a 'connector' between the Kenya Industrial Research and Development Institute (KIRDI) and researchers from universities in Eldoret and Nairobi. The outcome was that the fertiliser made by the women food entrepreneurs received official approval from the Kenyan government. With dedicated product labelling, the women were then able to show that their product was officially recognised and 100% safe to use for growing crops.

Consumer surveys conducted by the Fermented Foods (Zambia) and Indigenous Vegetables Marketing (Kenya) projects showed a high interest from urban consumers for the indigenous fermented foods produced and the indigenous vegetables grown in rural areas, but similarly revealed concerns about the safety of these products on the part of urban consumers. Receiving certification for their products was an important way to address these concerns. In Kenya, this was achieved during the project period, in Zambia, a follow-up project to the GCP Fermented Foods project will continue to work together with ZABS on this.

Finally, the synthesis study shows that the process of achieving the certification was not always smooth sailing. Due to a lack of existing standards (e.g. Local Infant Foods, Affordable Food Cereals) or conflicting national or regional protocols (i.e. Fermented Foods, see Box 6), certification of products sometimes experienced challenging delays, affecting the timeframe of the research projects. In the case of the Affordable Food Cereals project[35], the process was hindered as no standard was available for one of the core ingredients of the product (i.e. type of composite flour), which thus had to be developed from scratch. Through frequent engagement, the research team and the Uganda Bureau of Standards found a solution to meet the standards for certification: replacing the component with an existing standardised product, allowing the product to be certified and the product to be marketed.

This synthesis study shows that, from the perspective of the standard setters, the participatory approach of the research projects was rather new. NSOs are used to respond to industry demands only when a product has already been developed and requires their final seal of approval. The participatory process even sparked ideas for a national agency to adapt their standard setting approaches in the future with an emphasis on earlier involvement in research and development practices.

4. Key findings and ways forward

Policy makers and practitioners are key actors in providing the conditions and creating an enabling environment for FNS innovations to flourish. The Food & Business Research programme started from the premise that multifaceted and inclusive policies and practices are needed to achieve food and nutrition security for all. Such policies and practices require national and international cooperation between governments, the private sector, NGOs and knowledge institutions. The funded projects were thus encouraged to pro-actively engage with policymakers and practitioners. In some projects, policymakers and practitioners were part of the project team; in others, close contact was maintained with these stakeholders throughout the project duration. This synthesis article has shed light on the engagement strategies, which have supported the outcomes achieved in terms of changes in behaviour and attitudes of policymakers and practitioners. As the aim of the GCP and ARF projects is to contribute to long-term learning experiences, and not necessarily to provide solutions to acute problems, the outcomes presented throughout this article show where progress towards improved food and nutrition security through policy and practice was made, and which lessons can be learned.

First, on **policy formulation,** this synthesis article presented outcomes in terms of **actual, or initiated and ongoing, changes in policies, practices and services to which the research projects and their findings contributed**. Table 1 listed a number of cases where research projects have supported or influenced the work of public and practitioner

[35] 'Macro Nutrient Fortification of first-line food cereals with milk protein to produce affordable value added cereal products in Uganda/East Africa' (see Annex).

organisations, for example by providing research-based input for a Food Safety policy in Nakuru County, Kenya, or by proving insects can be an alternative source of protein for animal feed in Kenya (thereby addressing overfishing in Lake Victoria as fishmeal is currently the main component of animal feed). Projects also closely engaged with policy makers regarding policy challenges resulting from the growing and changing food demands, especially increased consumption of meat and dairy by middle-class groups. **Where projects were aligned with these local or national government policy objectives, co-creation with policy makers was facilitated and policy actors were generally receptive to embracing research findings**. The same is true for projects that aimed at improving smallholder livelihoods if and when this was a standing policy objective.

Establishing early engagement with policy makers, which was a condition set by the F&BR programme, proved to be another key factor in successful research uptake. The external mid-term evaluation of the GCP and ARF projects demonstrated the important role of the stakeholder workshops convened in the project countries during the project conceptualisation phase. GCP projects that managed to ensure proactive participation by the relevant stakeholders and implemented a bottom-up approach to formulating their research questions, usually depicted a higher relevance within the country context and also a better prospect for achieving their research uptake goals.

Secondly, on **policy implementation**, this synthesis article presented a range of **outcomes concerning the influence and role that policy actors play in making research findings available and applicable for farmers and consumers.** One group of outcomes related to **the role of government and non-government extension services in supporting smallholder FNS**. The synthesis showed how projects focused on improving the quality and expanding the reach of such services, as well as on ensuring that research findings are translated into (advice on) training programmes or curricula and other support mechanisms for smallholders. Overall, the synthesis found that, **as smallholders have very limited access to accurate sources of information, it is essential that the information that does reach them is contextualised, validated and applicable to their farming needs**.

Another group of outcomes related to **the role of policy actors in standardisation and certification of (research) innovations**. National Standard Organisations (NSOs), which can be public or private institutions, play a vital role in ensuring alignment of such innovations in the food sector with national and regional quality and safety standards. Several reviewed projects actively worked with NSOs to support the complex processes of regulation, legislation and/or certification of new products to enable their market access. There are also major challenges. First, the often internationally developed food safety, production and processing standards need to be made to fit the contexts and capacities of smallholders and food SMEs in LMICs. And secondly, introducing standards can also have negative consequences for smallholders in terms of high costs and formal agreements that restrict the flexibility of their small-scale business processes. The study nevertheless demonstrated that **policymakers and practitioners can (1) play an important role in creating a more level playing field that allows participation of small-scale farmers, and (2) play a strong part in changing perceptions of (middle-class) consumers by providing a seal of approval in terms of food safety, which will eventually benefit the small-scale producers**.

Across the board, the reviewed research projects showed that instigating major changes in government policy takes dedicated time and effort. The projects used different approaches for co-creation and for sharing research findings with decision-makers. Where for some projects long-standing relationships with policymakers proved essential in having their findings heard and accepted (e.g. Cashew Nut Farming), others pointed at the need for establishing new mechanisms, such as multi-stakeholder platforms, to encourage adoption of research findings (e.g. Resilient Fisheries). All reviewed projects emphasised that close and continuous involvement with the policy stakeholders was essential for research uptake.[36]

[36] The drivers and barriers for multi-stakeholder involvement as identified by the F&B Research projects will be discussed in more detail in a separate article to be published in early 2021.

Finally, reflecting on ways forward to strengthen FNS policy formulation and implementation, the synthesis study showed the importance of:

- **Acknowledging the two-way street of research and policy for contextualised and research-based policy formulation.** Supply and demand of knowledge can be aligned through early engagement and continuous co-creation between research and policy formulation processes. Relevant projects efforts took place at both international level (e.g. cross-border roadmaps for new legal frameworks for insect-based feed or regional seed laws) and local level (e.g. research engagement in multi-stakeholder committees at county or district level)
- **Partnering up to reveal possible missing 'implementation nodes' along the policy implementation chain.** Research can help unravel where implementation gets stuck, by pinpointing missing capacities and resources (e.g. over-stretched public extension services), lacking local facilities (e.g. national laboratories), or missed opportunities for information sharing (e.g. introducing technology and IT solutions to ease government interventions).
- **Ensuring that research findings are translated and contextualised to reach and be relevant for local implementors working with farmers and producers at local and national level** (e.g. advisory and extension services and local training and support institutes).
- **Treading cautiously when setting standards and quality expectations for small-scale agricultural producers in the Global South.** Internationally developed food safety, production and processing standards are often biased towards conditions in the North (e.g. sophisticated technologies, ample resources, and easy access to new information and knowledge). To achieve a level playing field, such standards need to be made to fit the contexts and capacities of smallholders and food SMEs in LMICs.

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Annex 1: Reviewed projects

ARF projects included:

Affordable Food Cereals in Uganda

Macro Nutrient Fortification of first-line food cereals with milk protein to produce affordable value added cereal products in Uganda/East Africa

Dr. Gaston Ampe Tumuhimbise (Value Addition Institute, Uganda)

https://www.nwo.nl/en/research-and-results/research-projects/i/58/12558.html

Cassava for Food Security in Uganda

Cassava Applied Research for Food Security in Northern Uganda

Harriet Mbabazi (Oxfam Uganda)

https://www.nwo.nl/en/research-and-results/research-projects/i/40/14140.html

Cashew Nut Farming in Uganda

Introduction of cashew nut for income security for poor farmers in Northern Uganda

Hellen Acham (North East Chilli Producers Association)

https://www.nwo.nl/en/research-and-results/research-projects/i/90/11690.html

Fertile Grounds in Burundi

Building on fertile grounds in Burundi

Geoff Andrews (ZOA, Burundi)

https://www.nwo.nl/en/research-and-results/research-projects/i/89/11689.html

Gender Responsive Seed System in Uganda

Development of a Gender Responsive Commercial Seed System for African Indigenous Vegetables in Uganda

Dr Apolo Kasharu (CHAIN Uganda Ltd., Uganda)

https://www.nwo.nl/en/research-and-results/research-projects/i/24/29024.html

Indigenous Vegetables Marketing in Kenya

Systemic approach to overcoming constraints of production and marketing of indigenous vegetables in Western Kenya

Margaret Komen (MACE Foods, Kenya)

https://www.nwo.nl/en/research-and-results/research-projects/i/14/12214.html

Integrated Pest Management in Kenya

Development, Validation and Dissemination of Integrated Pest Management Packages for Tomato Leafminer (Tuta absoluta) and Fusarium wilt-root knot nematode complex affecting tomato production in Kenya

Geoffrey Ongoya Wafula (Koppert Biological Systems (K) Ltd., Kenya)

https://www.nwo.nl/en/research-and-results/research-projects/i/37/13737.html

Irrigation App Bangladesh

Bangladesh: ground cover app for scheduling irrigation

Shahid Akbar (BIID)

https://www.nwo.nl/en/research-and-results/research-projects/i/32/14132.html

Local Infant Foods in Benin

Infant foods from local resources as a pathway to a better food and nutrition security in Benin

Professor Joseph Hounhouigan (University of Abomey-Calavi, Benin), Sébastienne Adjadogbedji-Avouzoukan (Groupe Pépite d'Or, Benin)

https://www.nwo.nl/en/research-and-results/research-projects/i/61/12561.html

Potato Seed Innovations in Burundi

Development of potato seed quality based innovations for small-scale farmers in the three provinces surrounding Bujambura town in Burundi

Pierre Nahayo (CAPAD, Burundi)

https://www.nwo.nl/en/research-and-results/research-projects/i/13/12213.html

Resilient Fisheries in Benin

Improving the resilience of the inland fisher communities and aquatic systems to overfishing and water resource degradation in Benin

Frejus Thoto (ACED, Benin)

https://www.nwo.nl/en/research-and-results/research-projects/i/67/13167.html

Smallholder Dairy in Kenya

Innovations for sustainable and profitable intensification of smallholder dairy in Kenya (ISPID)

Godfrey Nyang'ori (Mt Clara Mtakatifu Mwangaza Centre, Kenya)

https://www.nwo.nl/en/research-and-results/research-projects/i/31/14131.html

GCP projects included:

Fermented Foods in Zambia

Enhanced nutrition security through traditional fermented foods in Zambia

Dr. Sijmen Schoustra (WUR, the Netherlands)

https://www.nwo.nl/en/research-and-results/research-projects/i/07/11507.html

Insect-based feed in Kenya

Improving livelihood by increasing livestock production in Africa: An agribusiness model to commercially produce high quality insect-based protein ingredients for chicken, fish and pig industries (ILIPA)

Dr. Marcel Dicke (WUR, the Netherlands)

https://www.nwo.nl/en/research-and-results/research-projects/i/36/12836.html

Market-oriented Dairy System in Kenya and Ethiopia

Assessing and supporting input and advisory service systems for resilient market-oriented smallholder dairy systems in the Ethiopian and Kenyan highlands

Professor Laurens Klerkx (WUR)

https://www.nwo.nl/en/research-and-results/research-projects/i/94/14294.html

Women Food Entrepreneurs in Kenya and Burkina Faso

'Women Food Entrepreneurs in Kenya and Burkina Faso: Building inclusive business models for food security in the city slums of Kisumu and Ouagadougou'

Dr. Nicky Pouw (UvA, the Netherlands)

https://www.nwo.nl/en/research-and-results/research-projects/i/40/12840.html