



RESEARCH
PROGRAM ON
Livestock

More meat, milk and eggs by and for the poor

Applying a theory of change based approach to livestock research for development: Uganda country report

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CGIAR is a global partnership that unites organisations engaged in research for a food-secure future. The CGIAR Research Program on Livestock provides research-based solutions to help smallholder farmers, pastoralists and agro-pastoralists transition to sustainable, resilient livelihoods and to productive enterprises that will help feed future generations. It aims to increase the productivity of livestock agri-food systems in sustainable ways, making meat, milk and eggs more available and affordable across the developing world. The Program brings together five core partners: the International Livestock Research Institute (ILRI) with a mandate on livestock; the International Center for Tropical Agriculture (CIAT), which works on forages; the International Center for Research in the Dry Areas (ICARDA), which works on small ruminants and dryland systems; the Swedish University of Agricultural Sciences (SLU) with expertise particularly in animal health and genetics and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) which connects research into development and innovation and scaling processes.

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1 Introduction

The CGIAR Research Program on Livestock Agri-food systems (CRP Livestock for short) provided research-based solutions to support smallholder farmers, pastoralists and agro-pastoralists transition into sustainable, resilient livelihoods and to productive enterprises that will help feed future generations. An important component of the CRP Livestock research agenda was to demonstrate how livestock research can translate into impact through livestock value chain transformation in four selected priority countries, Ethiopia, Tanzania, Uganda and Vietnam. These projects built on work started by the CRP on Livestock and Fish, which ran from 2012 to 2016. In both research programs, an important component of the research agenda was to deliver impact through livestock research. Starting in 2019, a more concerted investment was made to package the research outputs and pilot an integrated livestock development intervention in each country that could take the research outputs to scale. A key notion was to ‘accelerate’ research to outcomes and impact by transforming the entire value chain, working with development partners from the start. This was done by building on ‘best-bet interventions’ already identified, involving all thematic teams of the program (covering the topics of animal health, genetics and breeding, feeds and forages, marketing and business skills, and the environment), and establishing in-country project leadership and coordination. The ambition was to integrate a range of research outputs into an intervention package (or a basket of intervention options) and pilot these as an integrated livestock development intervention in each site, with the ultimate goals of taking research outputs to scale.

KIT Royal Tropical Institute partnered with the CRP Livestock to support the four priority country projects in monitoring and learning on livestock research for development (LR4D). The support provided by KIT consisted of two main components:

1. Facilitate mainstreaming a Theory of Change (ToC) approach in the priority country projects, which involved further development of the country projects’ ToCs, and supporting their use for reflection and review, establishing an evidence base to assess the cause and effect logic, and documenting lessons learned.
2. Monitor and document the lessons learned on the process of developing and delivering integrated intervention packages through the priority country projects, and document the lessons learned.

This report describes the main results from the first component for the project in Uganda. It also served as an input into a synthesis with lessons learned across the four country projects (Kruijssen et al., 2021). The remainder of this document is structured as follows, Section 2 describes the methodology used for the analysis, including the theoretical underpinnings of the methodology. Subsequently, Section 3 provides a short description of the country project in Uganda and its ToC. Section 4 presents the results and finally in Section 5 some conclusions are provided.

2 Methodology

2.1 Realist evaluations

The methodology applied for lessons learning and assessing the project’s ToC against evidence on its outcomes is based on realist evaluation, and contribution analysis. Realist evaluation is a sub-stream of theory-based evaluation approaches. Theory-based evaluation has been popularised in recent

years as a response to the inability of impact evaluation methods (e.g. Randomised Controlled Trials) to determine the mechanisms by which interventions and research for development can achieve impact, and generate institutional lessons on research and innovation processes (Hall et al., 2003). While (semi-) experimental evaluation methods can determine whether an intervention works, it does not explain why and how the intervention works. However, this knowledge is crucial to scale innovation beyond test locations (Maru et al. 2016). Impact assessments thus need to be complemented with analytical frameworks that allow for institutional learning (Hall et al. 2003).

Theory-based evaluation approaches aim to develop a ‘program theory’, that clarifies “how program activities are understood to cause (or contribute to) outcomes and impacts” (Westhorp, 2014; pp 4). Impact pathways describe the results chains (linkages from outputs to outcomes and impact), but a ToC adds the causal assumptions behind these links, i.e. what has to happen for the causal linkages to be realised (Mayne and Johnson, 2015). Theory-based evaluation approaches map the causal chain from inputs to outcomes and impact, and test the underlying assumptions to answer the ‘why’-question of impact.

A realist evaluation seeks to improve understanding of how and why interventions work or do not work in particular contexts, and why different outcomes are achieved in different contexts. This approach is specifically based on the assumption that there is no one-size-fits-all solution; context strongly influences program outcomes. This implies that understanding context is an important part of understanding how and why programs work or not, so that informed decisions can be made about which programs or policies to use and how to adapt them to local contexts. A realist evaluation thus looks at what works for whom, to what extent, under what circumstances and over what duration (Westhorp, 2014). It is therefore particularly appropriate for evaluating pilot programs that are being scaled out.

Realist evaluation tries to explain causation through observable and non-observable processes; in essence, the program activities (observable) influence the reasoning, norms, capacity and collective beliefs of the participants or stakeholders (non-observable) which determine decisions and choices of the same actors that result in program outcomes (observable). This underlying causal process may function differently in one context compared to another (Westhorp, 2014; Pawson and Tilley, 1997). A realist evaluation thus tests how these processes cause desired outcomes in a given context (White and Phillips, 2012).

The starting point of a realist evaluation is the ToC of the program or project, which needs to be able to answer the following questions:

1. For *whom* will this program theory work and not work, and why?
2. In what *contexts* will this program theory work and not work, and why?
3. What are the main *mechanisms* by which we expect this program theory to work?
4. If this program theory works, what *outcomes* will we see?

For the purpose of the research in the CRP Livestock priority country projects, we have operationalised realist evaluation through a participatory process developed by Douthwaite et al. (2008). This process helps to make outcomes more explicit in a ToC, by reflecting on groups of ‘next users’, i.e. those actors that are using the research outputs. In particular this looks at the changes in

practice of the different actors that are envisioned, and what changes in the set of knowledge, attitudes and skills are required to achieve that change of practice, as well as the assumptions that need to hold for this to happen.

2.2 Contribution analysis

To assess whether the ToCs of the CRP Livestock priority country projects have held and planned outcomes have been achieved, contribution analysis has been applied. Contribution analysis compares an intervention's ToC against the evidence, and is mostly used in complex systems where changes in outcomes are the result of a several factors in addition to the intervention (Koleros and Mayne, 2019). A contribution story is constructed by building up evidence that demonstrates the contribution of an intervention while also establishing the relative importance of other influences on observed outcomes (White and Phillips, 2012).

In contribution analysis, two concepts are important to build evidence of attribution:

- *Necessity*: the intervention actually caused the changed; i.e. nothing would have changed in the absence of the intervention. The intervention was thus necessary.
- *Sufficiency*: the intervention was the only cause of the change; i.e. nothing else was needed to bring about the change. The intervention was sufficient.

If evidence can be found that the intervention was both necessary and sufficient, the achieved change can be attributed to the intervention. The evidence base can be built by quantitative methods, but also by eliminating plausible alternative explanations for the change at outcome level (e.g. other donor interventions, new policies, market forces). Note that causation is often directly experienced or observed by project staff, participants and stakeholders. Collecting views from different key informants is thus essential qualitative data to be used in contribution analysis (Makaurau 2010).

Different levels of contribution are distinguished, based on Ton and Glover (2019):

- No contribution: there is no evidence that the causal process (change pathway) took place.
- Weak contribution: there is some evidence that the intervention contributed to the causal process (change pathway).
- Fair contribution: there is evidence that the intervention was a causal factor contributing to the acceleration or scaling of the causal process (change pathway).
- Strong contribution: there is evidence that the intervention was a necessary (non-redundant) causal factor of starting the causal process (change pathway).

Table 1 categorises the different levels of contribution based on observed changes.

Table 1. Distinctive levels of contribution

Question	Level of Contribution			
	none	weak	fair	strong
Did the change occur?	Yes			
Did it result from a process in which project support was used?	No	Yes		
Did this support contribute to the acceleration or scaling of the change?		No	Yes	
Was this support a necessary (non-redundant) causal factor?			No	Yes

Source: Based on Ton and Glover (2019).

2.3 Implementation of the methodology

To implement the realist evaluation and contribution analysis methodology, a process was developed consisting of four main steps: 1) Validation of the projects' ToCs, 2) Reflections on this ToC with project staff and partners; 3) Collection of data on knowledge, attitudes and practices among next users and analysis of all data; 4) A validation workshop to reflect on the results and joint contribution analysis. Figure 1 provides a timeline for how this process was implemented. The steps are further described below.

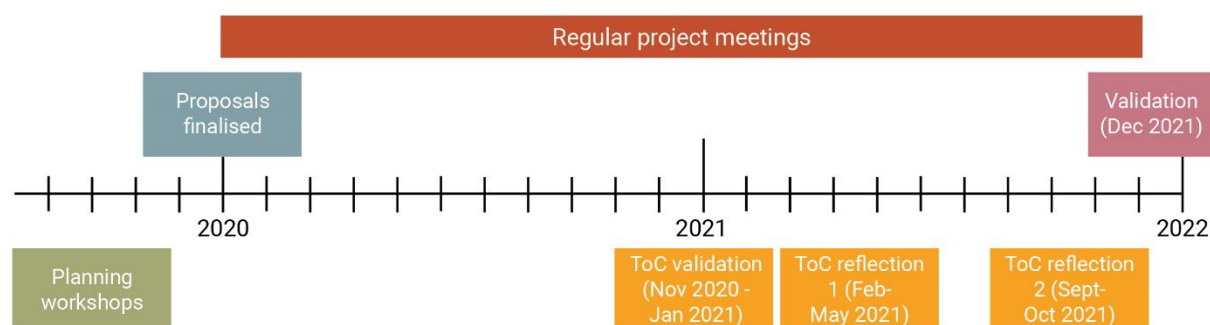


Figure 1. Timeline of the contribution analysis process

Step 1: Validating the initial Theory of Change

This consisted of:

- Finalisation of ToC diagrams
- Mapping of assumptions against scaling ingredients
- Identification of anticipated changes among next users (early, intermediate and ultimate outcomes).

The country teams identified the change pathways and underlying assumptions during the inception phase of the project. In the first step this has been collated in a ToC, which was validated by the country teams. This step had as an output a new ToC diagram for each country, depicting the change pathways and underlying assumptions at the start of the country projects, including the anticipated changes (in knowledge, attitude, skills or practices) among next users at outcome level, and a mapping of assumptions against the scaling ingredients (based on Dror and Wu (2020)).

Step 2: Reflections on Theory of Change

This consisted of:

- Reflection on key strategies, activities, outputs and outcomes. Is the project on track to achieve them?
- Review of whether changes need to happen in the project to ensure they will be achieved.
- Assessment if the assumptions hold.
- Reflection on the extent to which the ToC holds.

A virtual reflection workshop was held in the second quarter of 2021, in order to gauge early project progress along the ToC developed in step 1. The focus was on revisiting the change pathways and the underlying assumptions, and assessing progress towards achieving outputs and outcomes as identified in the ToC. A second and final reflection was held in each country during the country stakeholder meetings in the third quarter of 2021, to again assess the progress made and what the

contributions of the priority country project was to this progress. In Uganda, this was a hybrid online and face-to-face meeting. At the start of the project it was anticipated that these meetings would happen in in-country workshops, however due to the Covid-19 pandemic these were moved online, using MURAL. The participants for both sessions were project implementers, from CGIAR and partner organisations. Workshop participants were separated in smaller sub-groups to discuss and reflect on one next user group or impact pathway of the ToC.

Guided by a set of questions (see Box 1) each group discussed for that particular user-group the (early) intended and unintended outcomes that were emerging and any differences observed compared to the ToC, as well as any potential changes required in the project strategy to achieve planned outcomes. In addition, assumptions were reviewed to assess if they held and if they influenced the achievement of outputs and outcomes, and identify any new assumptions and/or preconditions needed to achieve outcomes.

Step 3: KAP outcome harvesting

This consisted of collection and analysis of outcome level data from the project's 'next users' on their perceptions of changes in knowledge, attitudes, and practices, and the likelihood that these will be continued beyond the project. Outcome harvesting was implemented through an adapted Knowledge, Attitudes Practices (KAP) survey to assess changes among next users, at the expected outcome level in the ToC, including perceptions on the contribution of the project to those changes. The anticipated outcomes in the ToC are then assessed (i) *whether* they occurred, (ii) *to what extent*, and (iii) *why* they can be attributed to the country projects.

Box 1: Guiding questions for reflection sessions

Part 1: outcomes

- What early outcomes have you seen emerge? What other early outcomes are likely to emerge soon?
- How is this different from what was intended?
- What are the reasons for this difference, and what has contributed? (think about: contextual factors, project delays, unexpected issues, assumptions that did not hold etc.
- What more is needed to achieve these outcomes? (e.g. adaptations in activities)
- How have/ are partners supporting or hindering these early outcomes?
- Any other (unintended) outcomes that emerged?

Part 2: Assumptions

- Did assumptions hold?
- If not, are they a threat to achieving the early outcomes?
- Are any assumptions missing? (refer to the scaling ingredients)

In Uganda, a tablet-based questionnaire was developed for this study and used for data collection in November and December 2021. The questionnaire was conducted by a team of three independent consultants experienced in qualitative field data collection. The sample for this survey included:

- 20 farmers from both Mukono and Masaka sites, randomly selected from the project participant list, and evenly distributed between men and women where possible,
- 12 vets and extension workers involved in the project activities
- 9 district and national level policy makers involved in the project activities
- 16 aggregators from both sites who were involved in the project
- 11 feed stockists involved in the project

The questionnaire was based on the project's ToC and the knowledge attitudes and practices that were expected to change among the next user groups as a result of the project (for more

information see Section 3.2). The questionnaire took about 20-25 minutes to complete. The questionnaire was developed in English and, if necessary, translated into local language during the interview by the enumerator. Questions on knowledge aimed to assess what respondents identified as the most important learnings related to pig production and whether they perceived these learnings as applicable to their situation. These questions were either open-ended, or were Likert-type questions with five levels of (dis)agreement. Questions on attitudes were about the agreement with statements about key areas of relevance to the ToC and the assumptions part of the ToC. They also used the agreement scale and had open-ended follow-up questions to understand the motivations behind respondents' answers. Finally, questions on practices, were aimed at assessing which practices respondents have implemented, which were open-ended and Likert-scale questions with a frequency scale. The survey questions can be found in Annex 1.

Step 4: Validation and contribution analysis

This consisted of a presentation of and reflection on the analysis of all data collected throughout the process and a joint contribution analysis. A joint validation workshop for all countries was organised on the 15th of December 2022. During this workshop, the results were presented of the KAP survey and combined with the results of the ToC reflection workshops to jointly develop the contribution analysis.

3 The priority country project in Uganda

3.1 Background

The overall objective of the project 'Improving pig productivity and incomes through an environmentally sustainable and gender inclusive integrated intervention package in Uganda' – also known as MorePork - was to improve pig productivity and strengthen marketing arrangement at the level of pig aggregators with a view to increase the market linkage between them and pig farmers, and link the farmers to input and service providers. The interventions were implemented through an integrated digital platform called PigSmart, which is intended to provide advisory support to value chain actors. The interventions consisted of:

- *Market*: Focus of this intervention was capacity building of pig aggregators, feed, and drugs stockists. A series of trainings, coaching and mentoring sessions were carried out with various value chain actors and service providers.
- *Pig health*: Disease control through implementation of biosecurity and herd health through 'PigSmart', which includes disease reporting and advisory services.
- *Pig genetics*: Improved pig genetics through artificial insemination after estrous synchronization using hormones.
- *Pig feed and forages*: Improving pig feeding through use of superior and heat tolerant forages and food-feed crops, least cost feed balancing (using Feed Calculator App) and certification of small-scale commercial feed producers for quality feed production.
- *Livestock and environment*: Assessment of environmental impact (land, water) of pig production, food-feed competition, manure management etc. to reduce environmental footprint and adaptation to heat stress.



Figure 2. Map of the MorePork intervention and control sites.

The project was implemented with a total of 800 households in five districts, with two districts as control sites (see Figure 2). There was a heavy focus on an interactive approach and capacity building of value chain actors on the best-bet interventions. Farmers and input suppliers were linked to the 'PigSmart' platform, where they had access to information /knowledge, best practices on biosecurity, husbandry, drug management and other digital solutions. The web-based platform also had a disease reporting module to enable farmers to send messages or pictures of sick animals suspected of African Swine Fever or other diseases to the district veterinary office. Farmers were also able to obtain advice on management of disease outbreak cases via PigSmart. Tools such as the 'Feed calculator' (enable farmers to formulate balanced ration at cheaper cost) and the 'gross margin calculator' (to calculate input cost and output prices) were part of the platform.

The pig aggregators, input suppliers, and service providers were trained to strengthen their entrepreneurial capacities and to support them in market system development. About 59 aggregators and 24 feed and drug stockists from the project sites were trained as part of market development. The project also trained 30 extension agents on the use of the 'gross margin calculator' to support small-scale farmers to understand their businesses. The interventions included customized and specialized entrepreneurship training, mentoring, networking, and peer learning engagements.

The project strengthened advisory services to the value chain actors (farmers, traders, butchers) on herd health and best practices in biosecurity with value chain actors. The health package was delivered by veterinarians. They were contracted by pig aggregators to provide service to individual farmers on credit, if required based on their guarantee. The project also used veterinarians as champions to provide support, training, and mentorship to fellow veterinarians in the area to help them to apply herd health principles at farm levels during the project implementation period and beyond.

In the pig genetics intervention, the awareness of pig farmers on artificial insemination (AI) was improved, and linkages between AI service providers and semen suppliers were established. This was done in collaboration with local partners and private sector. The communities were sensitized on the community-based AI model, and farmers willing to participate in the trial were offered subsidized artificial insemination after training on AI. A series of training workshops were organized, including practical demonstrations on heat detection. Private AI service providers performed the inseminations. They were given refresher training on AI based on a training needs assessment. Feedback from the participating women and men farmers and AI service providers were also obtained and recommendations made for further scaling out.

For feeds and forages, the project used a business development service (BDS) approach to develop capacity of feed compounders to provide better quality feeds. As part of this, commercial feed producers were given training and then linked to feed analysis labs. They were intended to be qualified as certified feed producers, and farmers were encouraged to buy feed from them. To access good quality forages, farmers were linked with forage seed distributors' network in Uganda. Village based extension workers contracted by aggregators were trained on feed balancing using the 'feed calculator' app, who in turn supported farmers to formulate balanced rations.

In the markets component, the project worked with pig aggregators and pork joint owners to create a market pull by way of market arrangements that provided reliable pig markets to men and women farmers and where possible also provided linkages to input suppliers as well as other necessary business development services.

National and regional pig multi-stakeholder platform meetings were organized to share learnings on productivity enhancement, marketing and environmental interventions. A 'Scaling Scan' assessment was also used to understand scaling readiness of one of the innovations (certification of small-scale feed producers) and a scaling plan was developed to upscale the innovation tested. Partnerships were developed with local and national academic research institutes and relevant government ministries.

3.2 Theory of change and assumptions

As part of the project proposal an initial ToC was developed. This ToC was further refined and validated during the first stage of the process described in the methodology section (Figure 3).

Given the restricted timeframe of the remainder of the CRP Livestock (2.5 years), and the fact that the project started in a new site with a farming systems focus, the expectation from the start was that the project would not be able to reach beyond the early outcome level of the ToC by end of 2021.



Assumptions:

- Criteria for identifying service providers leads to correct identification
- Funding is adequate; Evaluations of forages climate independent; Small feed producers willing to participate despite operating illegally; Goodwill of government and support to formalize feed producers provided; Availability of liquid nitrogen for cooling semen.
- Buy-in from aggregators for code of conduct.
- Feed is cost effective; Providers willing to adopt integrated package, and willing to pay for extension services; Providers willing to change the way they do business; Trust between extension/aggregators allowing services on credit.
- Aggregators will use digital platforms; Likely financial benefits are understood or perceived; Reduction in perceived risks; Pigsmart can attract more players; Users willing to pay for PigSmart digital services.
- Farmers and traders are willing to adhere to contractual arrangements.
- Aggregators can access market niches; Aggregators can respond to market demands.
- Farmers willing to adopt best practices.

Source: Stylized version of output of validation session with project staff, December 2020.

Figure 3. Theory of Change of the MorePork project, Uganda

4 Results

This section presents the results of the reflections on the Theory of Change, those of the KAP survey, and the contribution analysis conducted during the validation workshop (i.e. the results of Step 4 in the process explained in Section 2.3 that describes the methodology).

4.1 Reflections on the Theory of Change

The reflections on the Theory of Change are presented by pathway in Table 2, Table 3 and Table 4, which in this case corresponds with the next user group. As there were only 5 months between the first and second reflection it is clear that the main activities of the project were concentrated in quite a restricted timeframe. Table 2. Reflections on the input and service providers pathway of the ToC

Table 2. Reflections on the input and service providers pathway of the ToC

Early (signs of) outcomes	Reflection 1 (May 2021)	Reflection 2 (October 2021)
Volumes of compounded feed increased	No. Uncertainty around whether this was related to production and/or sale of compounded feed. Technical training of 20 feed producers per site is underway. Assumption that compounded feed is cost effective may not be holding, farmers prefer individual ingredients.	Yes. Six trainings for feed producers completed and equipment purchased Associations being established. Increasing number of farmers are buying, although it is still considered expensive.
Feed compounders self-regulate quality of feed	No. First steps towards feed certification scheme established including discussions with Ministry. Too early to see if feed producers are increasing quality of feed.	No. First steps towards feed certification scheme established, draft handbook produced, associations are providing incentives. Concerns remain taxes and ability to meet standards.
Increased trust leads to more investment in value chain	No. No evidence of better trust between feed producers and feed users/farmers	Yes. Appears to be happening, albeit tentatively. A missing assumption is identified: awareness of standards for feeds does not necessarily result in ability to apply them.

Source: Summary of discussion of reflection workshops.

The following observations can be made:

- Increased trust in value chain actors is an outcome, but during the reflection (lack of) trust was a major discussion point. There appear to be no specific activities targeted at improving levels of trust.
- Significant progress was made by the time of the second reflection session, although changes identified are anecdotal and not backed up by evidence.

Table 3. Reflections on the aggregators pathway of the ToC

Early (signs of) outcomes	Reflection 1 (May 2021)	Reflection 2 (October 2021)
Improved oversight, management of aggregators and value chain, including pricing	No. Not yet, but aggregator groups are being formed. They recognize the need to organize themselves first. PigSmart tools not yet available.	Yes. Digital apps developed and seeing limited use linking farmers to aggregators. Some aggregators do not have a smartphone and may need a village agent to get PigSmart access.
Quality and weight standards adhered to, improved hygiene.	No. Farmers are not yet comfortable with the standardized weighing system. One site does have a central abattoir.	No. First steps towards feed certification scheme established, draft handbook produced, associations are providing incentives. Code of conduct under discussion.

Early (signs of) outcomes	Reflection 1 (May 2021)	Reflection 2 (October 2021)
Contracts or supplier agreements ('allegiances')	No. Aggregators in one site not comfortable to work with farmers yet. Acknowledgement that contracts will likely not eventuate where aggregators have sufficient power/market share. Will require a code of conduct.	No. Although some informal agreements related to supply of pigs. Aggregators are generally not willing to adopt contracts for pig procurement

Source: Summary of discussion of reflection workshops.

The following observation can be made: Contracts or formal supply agreements were a key outcome, but it appears there was little interest from aggregators, particularly where they had little competition or enough market clout.

Table 4. Reflections on the pig producers pathway of the ToC

Early (signs of) outcomes	Reflection 1 (May 2021)	Reflection 2 (October 2021)
Farmers can access credit as a result of links and arrangements	No. A plan was developed and farmers were linked to banks. Significant awareness raising took place with farmers and banks.	No. Some now some farmers were accessing new credit facilities, but access is not widely available. Interest rates are still too high, and pigs are not accepted as collateral.
Improved availability of relevant inputs and services	Yes. Artificial insemination, forage feeds, seeds and associated service provision has become more available.	Yes. However not yet all farmers are aware of the products and services. Gross margins app still too difficult to use. There is still limited forage seed availability, so there is a supply gap. Some linkages with the private sector are still missing

Source: Summary of discussion of reflection workshops.

Observations:

- Beyond linking producers with micro-finance institutions, there were no specific interventions for improving access to finance.
- The improved availability of inputs and services is an important outcome. The extent to which these are being used by farmers, feed stockists and aggregators is likely less than intended, as indicated by the producer KAP survey below.

4.2 Results from stakeholder workshop

A stakeholder workshop was convened in Kampala in February 2021 for which Uganda project stakeholder groups – aggregators, policymakers and input and service providers were asked to form groups and document the key changes that had taken place as a result of the project interventions over the last 18 months. Participants were then asked to rank the changes in terms of priority or impact and subsequently describe, using a provided form, the key changes in more detail. These were then presented and discussed in plenary. Each of the key outcomes as described by the three stakeholder groups is presented below:

Table 5. Changes made by pig aggregators over the last 18 months

Change	Rank	Good or Bad change?
Building relations among traders	3	+
Developing a system of financial support among the traders		+
Strengthened relations and trust with the farmers, local government	2	+
Started slaughtering at the abattoir	1	+
Strife among traders as they can now monitor each other's income because of a common slaughtering place		-

Source: Summary of discussion during stakeholder workshop.

The aggregator group reported that the presence of an abattoir had promoted positive relations and better working together as a group among the traders. However, it had also resulted in wrangles among the traders, based on how much some of them earn. This has also impacted on leadership of the association, with some traders assuming that the current leadership earns more from the abattoir. Aggregators report now being able to give farmers a competitive price for their pigs, which has promoted pig farming, and that their income has increased. They furthermore reported that the project had helped identify gaps where improvement was needed, including the benefits of clean slaughter facilities, and the benefits of good relationships with farmers etc. They found that the project has provided a platform for traders to interact with local government, NGOs, private sector which provided trainings and more capacity building.

Table 6. Changes made by input and service providers over the last 18 months

Change	Rank	Good or Bad change?
Adoption and buy in into practice of use of Apps/tools/practices	1	+
Demand for the smart tools (Feed Calculator) and services has grown	4	+
Willingness to shift from informality to formality	6	+
Increased knowledge about feeds production, feeding, markets, financial tracking	2	+
Strengthened coordination amongst the player/actors	3	+
Improvement in business internal systems (Basic Record keeping)	5	+

Source: Summary of discussion during stakeholder workshop.

The input and service providers identified the adoption and buy-in into digital apps as the biggest change they had made in the last 18 months. The reasons for the change were cited as being good information targeting, the right actors, appropriate technology and ‘services transfer approaches’. The input and service providers group was very small, so the changes listed may not be representative for the wider group.

Table 7. Changes made by input and service providers over the last 18 months

Change	Rank	Good or Bad change?
Recognition of the importance of the pig value chain as a strategic enterprise for households	1	+
Policy issues were identified at that level as the feed policy, breeding policy,		+
Pig Multi-stakeholder platforms were formed as a result		+
Research conducted and a number of publications produced		+
Participatory identification of priorities along the PVC as : challenge of ASF; Nutrition; markets & marketing and pig breeding		+
ILRI-phase II was developed as a result of this intervention		+
The focus was shifted from sole production to a market support system approach	2	+
There is a new strategic direction that focuses on the relationship between farmers and aggregators		+
Increased AI adoption rates		+

Source: Summary of discussion during stakeholder workshop.

The policymaker stakeholder group was well-represented in the workshop. They indicated that the most important change they had made was that that the government had recognized pig production as an important enterprise for household income development, thus gearing most of the research towards development of the value chain rather than academia. They reported new policies had been drafted, although these were not specified. When asked about whether the change would have

happened without the project, they responded that the project sped up the process of stakeholder engagement and had enhanced the value of pork.

Policymakers said the second most important change was a change to a market-oriented intervention, as opposed to a production-focused one which usually dealt with farmers but ‘forgot’ about the many other value-chain actors. The causes for the change were mentioned as being because it was informed by research, there was an increase in demand by the farmers especially for markets, because of distrust between the producers, middle men and traders, and it was demanded by traders and other stakeholders felt that they were being neglected. The project helped to alleviate some of these issues by strengthening stakeholder engagements through trainings and meetings; provided evidence by way of research; and through the introduction of PigSmart digital technologies.

4.3 Results of the KAP survey

The results of the KAP survey are also presented by end user group.

Pig producers

The survey started with an open ended question with regard to the most important learnings livestock producers had gained in the past 18 months. The most frequently mentioned learning was on artificial insemination (mentioned by 45%), followed by improved pig productivity, improved pig feeds (20%), better management of animal health (10%), disinfection and sanitation (10%), and lastly improved pig breeds (Table 9).

Table 8. Most important learnings for pig producers

Most important learnings (open question)	Frequency
Artificial insemination	9
Improving pig productivity	4
Improved feeds	2
Health management	2
Sanitation	2
Improved pig breeds	1

Source: KAP survey, 2021.

Several follow up questions were asked with statements with regard to knowledge, attitudes and practices (Table 10). These questions were Likert scale questions, with different answer options depending on the questions. Average scores were calculated (not applicable answers were excluded), and these are colour-coded depending on the degree of agreement/ adoption, where the lowest scores correspond with red, middle with yellow and highest with green. The results show that pig producers feel they have significantly improved their *knowledge* of healthy pig production and the use of compound feed and are able to apply this learning in their daily activities.

Table 9. KAP survey scores for pig producers

Question	N	Average score	Min, max	Type (range)
Knowledge				
2. What is the most important thing you have learned related to animal husbandry practices, breeding practices, feeds and forages, business management or environmental degradation in the past 12 months? (q3 and 4 apply to the answer to q3)				
3. This is something I can apply in my work	20	4.45	4, 5	Agreement (1-5)
4. As a result of the project, I have improved my knowledge of healthy pig production and the quality demands of the market	20	4.40	4, 5	Agreement (1-5)
5. I am aware of the benefits of using compound feed / good quality feed ingredients	20	4.50	3, 5	Agreement (1-5)
Attitudes				
6. I am willing to continue engaging with the project	20	4.75	4, 5	Agreement (1-5)
7. I am interested in (more) technical training on pig production	20	4.65	4, 5	Agreement (1-5)
9. It would be useful for me to have contracts with my input suppliers (e.g. feed stockists, veterinary drug stockists)	20	3.65	1, 5	Agreement (1-5)
11. It would be useful for me to have contracts with buyers of my pigs (e.g. aggregators or companies)	20	3.65	1, 5	Agreement (1-5)
12. I trust the people I buy inputs from	20	3.80	3, 5	Agreement (1-5)
13. I trust the buyers of my pigs	20	3.50	2, 5	Agreement (1-5)
14. I trust the Uganda pig value chain project partners	20	4.45	4, 5	Agreement (1-5)
Practices				
15. I weigh my pigs or pork products when selling them	20	1.40	1, 5	Agreement (1-5)
16. I use the products and services that you have been informed about/trained in by the project	20	3.20	2, 5	Agreement (1-5)

Source: KAP survey, 2021. Note: Colours indicate the degree to which a particular change in knowledge attitude or practice has taken place. The scores and color-coding are as follows. Agreement (1-5): 1-Strongly disagree, 2-Disagree, 3-Neither agree nor disagree, 4-Agree, 5-Strongly agree; red 1-2.33, yellow 2.34-3.67, green 3.68-5.

The subsequent set of questions regards pig producers' *attitudes* towards the technologies and practices distributed by the project. Three of the average scores on attitudes are in the middle (yellow) category, including the attitudes to do with contact with input suppliers and pig buyers, and those about trusting the purchasers of their pigs. This suggests that while knowledge can be imparted relatively quickly, changing attitudes may involve a longer process. Finally the last set of questions regards the practices that pig farmers implement. For the two questions on practices, the scores are significantly lower. Most farmers do not weigh their pigs when selling them, and there is still some hesitancy in actually using the technologies that have been promoted. It is likely too early in the process for farmers to already have fully adopted these practices.

Aggregators

For the aggregators, the most frequently mentioned 'most important learning' was related to improved business accountability and financial management (mentioned by 38%), followed by sanitation (13%), networks and collaboration amongst aggregators (13%), not to buy diseased or sick pigs (6%) and on improved customer relations (6%) (see Table 11).

Table 10. Most important learnings for aggregators

Most important learnings (open question)	Frequency
Business accountability / Financial management	6
Sanitation	2
Networks, collaboration amongst aggregators	2
Animal health (not buying diseased animals)	1
Customer relations	1

Source: KAP survey, 2021.

As for the pig farmers, the survey indicated that aggregator knowledge had increased and was useful for their work (Table 12). They also had positive attitudes towards key issues addressed by the project, with the exception of a question related to attitudes about digital tools. Most aggregators responded to that question with a 'do not know/no answer', and one indicated that these tools were not very useful. With regard to practices, aggregators responded positively – most belong to an association and use scales when purchasing pigs from farmers. However, no aggregators used formal purchase contracts.

Table 11. KAP survey scores for pig aggregators

Question	N	Average score	Min, max	Type (range)
Knowledge				
2. What is the most important thing you have learned in the past 12 months related to your business in pork aggregation? (q1 and 2 apply to the answer to q3)				
3. This is something I can apply in my work	16	4.68	4, 5	Agreement (1-5)
4. As a result of the project, I have improved knowledge on the applicable standards for pork weight and quality	16	4.63	4, 5	Agreement (1-5)
Attitudes				
5. I am willing to continue engaging with the project	16	4.93	4, 5	Agreement (1-5)
6. I am interested in receiving more business skills training.	16	4.68	1, 5	Agreement (1-5)
7. The development and use of standards for pork weight and quality is important	16	4.88	4, 5	Agreement (1-5)
8. Digital tools (like PigSmart) are useful	1	2.00	2	Agreement (1-5)
11. I am interested in using contracts to support pork	16	4.06	1, 5	Agreement (1-5)
13. I trust other project partners	16	4.38	2, 5	Agreement (1-5)
Practices				
9. Are you a member of an association of aggregators?	16	0.93	0, 1	Yes/No (0-1)
12. Do you use formal contracts to procure pork or to supply to your clients?	16	0	0	Yes/ No (0-1)
17. Do you weigh your pork using scales when purchasing or selling in order to agree on the price?	16	0.87	0, 1	Yes/No (0-1)

Source: KAP survey, 2021. Note: Colours indicate the degree to which a particular change in knowledge attitude or practice has taken place. The scores and color-coding are as follows. Agreement (1-5): 1-Strongly disagree, 2-Disagree, 3-Neither agree nor disagree, 4-Agree, 5-Strongly agree; red 1-2.33, yellow 2.34-3.67, green 3.68-5; Yes/No (0-1): 0-No, 1-Yes; red 0-0.33, yellow 0.33-0.67, green: 0.67-1..

Vets and extension agents

Table 12. Most important learnings for vets and extension agents

Most important learnings (open question)	Frequency
Better use of drugs/ medication	3
Knowledge on feeding	3
The use of digital tools	2
Farmers are unwilling to pay for services	1

Source: KAP survey, 2021.

For the vets and extension agent group, the two most frequently mentioned ‘most important learnings’ were related to the better use of veterinary drugs or medication and improved knowledge on animal feeding (both 33%). The use of digital tools was mentioned twice (22%), and one vet indicated that he or she had learned that ‘farmers are unwilling to pay’ for services (see Table 13).

Table 13. KAP survey scores for vets and extension agents

Question	N	Average score	Min, max	Type (range)
Knowledge				
2. What is the most important thing you have learned in the past 12 months related to providing extension, advisory services to pig producers? (q1 and 2 apply to the answer to q3)				
3. This is something I can apply in my work	15	4.27	1, 5	Agreement (1-5)
4. I have improved skills for disease diagnostics	15	4.20	2, 5	Agreement (1-5)
5. I have improved knowledge around antibiotics use	15	4.47	4, 5	Agreement (1-5)
6. I have improved skills and knowledge around animal breeding and artificial insemination	15	4.07	4, 5	Agreement (1-5)
7. I have improved skills in general herd health management and biosecurity	15	4.67	2, 5	Agreement (1-5)
8. I have improved skills in integrating the use of the feed calculator app	15	4.33	1, 5	Agreement (1-5)
9. This learning was a result of participating in trainings or support from the project	15	4.67	3, 5	Agreement (1-5)
Attitudes				
10. I am willing to continue engaging with the project	15	4.73	4, 5	Agreement (1-5)
11. I am interested in receiving more training.	15	4.87	4, 5	Agreement (1-5)
12. Smallholder pig producers are interested in the practices and technologies promoted by the project	15	3.93	1, 5	Agreement (1-5)
13. Women pig farmers are interested in the practices and technologies promoted by the project	15	4.33	2, 5	Agreement (1-5)
14. I am interested in applying my new skills and knowledge to support pig producers	15	4.60	1, 5	Agreement (1-5)
15. I feel supported by my employer to apply my new skills and knowledge	12	4.00	4, 5	Agreement (1-5)

Source: KAP survey, 2021. Note: Colours indicate the degree to which a particular change in knowledge attitude or practice has taken place. The scores and color-coding are as follows. Agreement (1-5): 1-Strongly disagree, 2-Disagree, 3-Neither agree nor disagree, 4-Agree, 5-Strongly agree; red 1-2.33, yellow 2.34-3.67, green 3.68-5.

Vets and extension agents responded very positively to questions related to improved knowledge and indicated that this learning was a result of trainings or support provided by the project. The positive assessment carried over to their attitudes, which they also cited as being highly favourable. It is worth noting that for a number of the questions - although the answers very rather positive on average - there was a wide range in the responses, with one or two vets and extension agents providing very low scores. Due to the nature of the work of vets and extension agents, changes in their practices was considered less relevant and thus no questions were asked.

Feed stockists

The 'most important learning' for feed stockists was clearly related to mixing feeds and/or the related use of the feed calculator, with 60% of stockists citing this. Second was learning around sanitation and quality (20%). How to improve the relationship and engagement with customers (10%), and knowledge on age-based feeding (10%) were each cited once by feed stockists (Table 15).

Table 14. Most important learnings for feed stockists

Most important learnings (open question)	Frequency
Mixing feeds / feed calculator	6
Sanitation, quality	2
Age-based feeding	1
Customer relations	1

Source: KAP survey, 2021.

When asked about their knowledge, attitudes and practices, feed stockists provided positive answers related to learning, generally good responses to questions related to attitudes (including two questions with a wide range of responses (related to farmer interest in purchasing improved feed, and access to affordable finance). For changed or adopted practices, all feed stockists indicated that they had increased the quality of their feed, and that most had also increased the price accordingly. Charging more for better feed is justifiable, but should also be seen in the context of feed stockists' perception that not all farmers are interested in buying mixed feed.

Table 15. KAP survey scores for feed stockists

Question	N	Average score	Min, max	Type (range)
Knowledge				
2. What is the most important thing you have learned in the past 12 months related compound feed production? (q1 and 2 apply to the answer to q3) – Next slide				
3. This learning is something I can apply in my work	11	4.63	4, 5	Agreement (1-5)
4. As a result of the project, I have improved knowledge on the applicable standards for pork weight and quality	11	4.72	4, 5	Agreement (1-5)
Attitudes				
5. I am willing to continue engaging with the project	11	4.54	4, 5	Agreement (1-5)
6. I am interested in receiving more project training.	11	4.73	4, 5	Agreement (1-5)
7. Farmers are interested in buying compound feed	11	3.36	1, 5	Agreement (1-5)
8. There is much competition from other feed producers	11	4.36	4, 5	Agreement (1-5)
9. I offer compound feed at an affordable price	11	3.81	2, 5	Agreement (1-5)

Question	N	Average score	Min, max	Type (range)
10. I am interested in becoming a certified provider of compound feed	11	4.60	3, 5	Agreement (1-5)
11. I have access to an affordable source of finance when I need it	11	2.90	1,5	Agreement (1-5)
12. I trust other project partners	11	4.00	3,5	Agreement (1-5)
Practices				
16. Has the amount of compound feed you sell changed?	11	0.54	0, 1	Yes/No (0-1)
17. Have you increased the quality of the feed ingredients you sell?	11	1.00	1	Yes/ No (0-1)
18. Have you increased the price of feed?	11	0.82	0, 1	Yes/No (0-1)

Source: KAP survey, 2021. Note: Colours indicate the degree to which a particular change in knowledge attitude or practice has taken place. The scores and color-coding are as follows. Agreement (1-5): 1-Strongly disagree, 2-Disagree, 3-Neither agree nor disagree, 4-Agree, 5-Strongly agree; red 1-2.33, yellow 2.34-3.67, green 3.68-5; Yes/No (0-1): 0-No, 1-Yes; red 0-0.33, yellow 0.33-0.67, green: 0.67-1.

Policy makers

A number of policy and decision-makers were also surveyed to evaluate new learning, attitudes and whether they had made any important changes as result. The 'most important learning' for policymakers was on the importance of engaging multiple actors and stakeholders along the pig value chain (33%). 22% reported that they had learned that pig farming is rapidly growing sector with high potential (see Table 17).

Table 16. Most important learnings for policymakers

Most important learnings (open question)	Frequency
Pig farming is rapidly growing sector with high potential	2
Importance of engaging multiple actors and stakeholders along pig value chain	3
Need for integrated baskets of technologies	1
Alternative feeds	1
Need to support the sector given importance as alternative source of income	1
The impact of climate change on pig production	1

Source: KAP survey, 2021.

When asked about their knowledge, attitudes and practices, policymakers responded positively across the board. Both the statements on knowledge as well as attitudes were rather strongly agreed with, with the moderated exception of the need to change socio-cultural norms in order to provide equitable access to services for women. Questions on practices were also positively answered on average, but with a wider range of individual scores (Table 18).

Table 17. KAP survey scores for policymakers

Question	N	Average score	Min, max	Type (range)
Knowledge				
<i>2. What is the most important thing you have learned in the past 12 months related compound feed production? (q1 and 2 apply to the answer to q3) – Next slide</i>				
3. This learning is something I can apply in policy dialogue	9	4.77	4, 5	Agreement (1-5)
4. As a result of the project, I have improved my understanding of the needs of pig producers	9	4.67	4, 5	Agreement (1-5)
Attitudes				
5. I am willing to continue engaging with the project	9	4.89	4, 5	Agreement (1-5)
6. I am interested in receiving more evidence to support policy dialogue	9	4.56	4, 5	Agreement (1-5)
7. It would be useful for me to engage in policy dialogue	9	4.78	4, 5	Agreement (1-5)
8. I trust the evidence generated by research related to pig production	9	4.44	4, 5	Agreement (1-5)
9. I believe in the value of credible evidence for policy dialogue and reform	9	4.78	4, 5	Agreement (1-5)
10. Socio-cultural norms need changing to ensure equitable access to services, input suppliers and service providers, especially for women	9	3.90	3, 5	Agreement (1-5)
Practices				
13. Do you participate in events that enable you to obtain more evidence of the value of improved pig animal husbandry practices?	9	2.11	1, 3	Frequency (0-3)
14. Do you participate in events that enable you to obtain more information about the link between pig animal husbandry practices and the environment?	9	2.00	1, 3	Frequency (0-3)
15. Do you make use of the evidence that you have been informed about in policy dialogues and related forums?	9	2.22	1, 3	Use (0-3)

Source: KAP survey, 2021. Note: Colours indicate the degree to which a particular change in knowledge attitude or practice has taken place. The scores and colour-coding are as follows. Agreement (1-5): 1-Strongly disagree, 2-Disagree, 3-Neither agree nor disagree, 4-Agree, 5-Strongly agree; red 1-2.33, yellow 2.34-3.67, green 3.68-5. Frequency: 0-No, never, 1-Yes, occasionally, 2-Yes, most of the time, 3-Yes, always; red 0-1, yellow 1-2, green 2-3. Use: 0-Don't use; 1-Use some; 2-Use most, 3-Use all; red 0-0.99, yellow 1-1.99, green 2-3.

4.4 Contribution analysis

Table 19 sets out the status of the early and intermediate outcomes of the theory of change for each user category / impact pathway, informed primarily by the two ToC reflection sessions and the KAP survey as well as further input provided by key MorePork staff.

Table 18. Contribution analysis

Early or intermediate outcome	ToC reflection	KAP survey	Additionality	Necessity
Input and service providers				
Volumes of compounded feed increased	Yes. Quality has gone up, but price still high	Yes, only slightly	No	No
Feed compounders self-regulate quality of feed	No. Associations providing incentives, but concerns remain around standards	Feed quality has increased for all feed stockists.	Yes	Yes
Increased trust leads to more investment in value chain	No. Trust is increasing, but not yet leading to more investment	Lack of finance cited as major constraint		
Increased profitability and return on investment for input and service providers	Not discussed, but not likely	Not asked		
Aggregators				
Improved oversight, management of aggregators and value chain, including pricing	Yes. Limited use of digital tools. Most are members of an association	Yes, only slightly	Yes	Yes
Quality and weight standards adhered to, improved hygiene	No. There are no official quality standards yet	Feed quality has increased for all feed stockists.	No	No
Contracts or supplier agreements ('allegiances')	No. Aggregators are unwilling to work with contracts	Lack of finance cited as major constraint		
Increased market opportunities and income through contractual arrangements	No. No evidence of any contractual arrangements	Not asked		
Pig producers				
Farmers can access credit as a result of links and arrangements	No. Interest rate too high and pigs not accepted as collateral	Not asked		
Improved availability of relevant inputs and services	Yes. AI services, compounded feed, veterinary services are available	Not asked. Limited use by farmers of promoted products and services.	No	No
Farmers adopt integrated package	Not discussed	Yes. Limited use by farmers of promoted products and services.	Yes	No
Improved access and use of relevant inputs and services	Not discussed	Not asked		
Improved market organisation	Not discussed	Not asked		
Improved pig productivity	Not discussed. Likely too early to tell	Not asked		
Farmers supply better quality pigs	Not discussed. Likely too early to tell	Not asked		

5 Conclusions

The Uganda MorePork project attempted to achieve ambitious changes in pig producers, aggregator, vets, feed stockists and extension agents in only two and a half years. It is clear that whilst progress has certainly been made with (and amongst) some of these groups, the behaviour changes necessary to achieve the (early) outcomes were not seen across the board by the close of the project. We observed strong improvements in knowledge and positive attitudes in individual stakeholder groups, but these did not appear to result in better ways of working and interacting that were foreseen by the project.

An important and clear project outcome is improved compound feed quality available from feed stockists. A number of related trainings were rolled out by the project, that together with the purchase of equipment and scales enabled *all* feed compounders to increase the quality of their feed offering. This was, however, accompanied in some cases by price rises which made it more difficult to convince farmers to try improved pig feeds. Irrespective of cost, there is still wariness amongst some farmers to embrace compound feed.

Another success is the increased availability of products and services (such as artificial insemination, animal health and veterinary services) for producers and aggregators. Although uptake of these services is uneven, some farmers perceived that this had started to have a positive impact on pig health and better pork quality. A concern is whether the demand for some of these services can be sustained after the project, particularly without subsidy or the availability of institutional and technical support.

Two linked challenges identified during the ToC reflections and KAP survey are trust-building amongst the pig value chain actors, and the shift towards the formalization of relationships between actors. 'Increased trust leading to more investment in the value chain' has not materialized as an outcome, although levels of trust have increased in some areas. Building trust is a slow process, and it will likely take longer for trust to manifest itself in measurable investments in the pig value chain. One way of encouraging trust building is to formalize market arrangements to provide certain securities, such as legal recourse, as a backstop. This was an ambition of MorePork, but there was ultimately little evidence of demand for formalized contracts. Most aggregators are in a position of power with respect to producers, and there is resistance to creating a more level playing field. This will take more time, and perhaps more aggregator competition to resolve.

At project inception and in the ToC, improved availability of finance for business investment was a clear objective for the producers. The (implicit) assumption was that simply 'linking' farmers and micro-finance institutions would be sufficient. However, the challenge seems to be more structural, given high interest rates and unwillingness of financial institutions to accept pigs as collateral. Access to affordable finance for businesses – whether for producers, aggregators, feed stockists or other actors – remains a key challenge that is central to unlocking more rapid development of the pig value chain.

A final comment relates to the policymakers as a distinct stakeholder category. In the project theory of change, the single reference to policy relates to 'policy enforcement'. This suggests that policy

reform or government support was initially not considered critical to achieving the stated project outcomes. However, in the later stages of the project, significant additional investments were made to capitalize on interest expressed by policymakers on the issue of climate change and pig heat stress. This is of course positive from an awareness-raising standpoint – and was confirmed by policymaker statements to this effect from the KAP survey - but it is unclear what broader policy changes, if any, were expected from this stakeholder group in order to strengthen the enabling environment for the pig value chain.

References

- Douthwaite B, Alvarez S, Thiele G, Mackay R. 2008. Participatory Impact Pathways Analysis: a practical method for project planning and evaluation. ILAC Brief 17. CGIAR
- Dror, I. and Wu, N. 2020. Scaling better together: The International Livestock Research Institute's framework for scaling. Nairobi, Kenya: ILRI.
- Hall A, Sulaiman VR, Clark N, Yoganand B. 2003. From measuring impact to learning institutional lessons: an innovation systems perspective on improving the management of international agricultural research. *Agricultural Systems* 78: 213-241
- Koleros A, and Mayne J. 2019. Using actor-based Theories of Change to conduct robust evaluation in complex settings. *Canadian Journal of Program Evaluation* 33(3)
- Kruijssen, F., Dhamankar, M., van Schagen, B. and Posthumus, H. 2021. Applying a Theory of Change based approach to Livestock Research for Development (LR4D): Learnings from the CGIAR Research Program on Livestock agri-food systems. Nairobi, Kenya: ILRI, Amsterdam, Netherlands: KIT.
- Makaurau T. 2010. Outcomes, impacts and causal attribution; affordable, practical, feasible options for the real world. ANZEA regional symposium; May 21st 2010; Auckland, New Zealand
- Maru Y, Sparrow A, Stirzaker R, Davies J. 2016. Integrated agricultural research for development (IAR4D) from a theory of change perspective. *Agricultural Systems* 165: 310-320
- Mayne J, Johnson N. 2015. Using theories of change in the CGIAR Research Program on Agriculture for Nutrition and Health. *Evaluation* 21(4): 407-428
- Ton G, Glover D. 2019. Improving knowledge, inputs and markets for legume expansion: a contribution analysis of N2Africa in Ghana and Ethiopia. IDS Practice Paper 10. Institute for Development Studies
- Westhorp G. 2014. Realist impact evaluation; an introduction. Methods Lab publication. ODI / DFAT / Better Evaluation. Overseas Development Institute, London
- White H, Phillips D. 2012. Addressing attribution of cause and effect in small *n* impact evaluations: towards an integrated framework. 3IE Working Paper 15. International Initiative for Impact Evaluation.

Annexes

Annex 1: Survey questions KAP survey MorePork project

Question	Type
LIVESTOCK PRODUCERS	
1. What is the most important thing you have learned related to the production of pigs for the market in the past 12 months??	text
2. From who or where did you learn this?	text
3. This learning is something that I can apply in my work	select_one agreement
4. As a result of the project, I have improved my knowledge of healthy pig production and the quality demands of the market	select_one agreement
5. I am aware of the benefits of using compound feed / good quality feed ingredients	select_one agreement
6. I am willing to (continue) engaging with the project	select_one agreement
7. I am NOT interested in (more) technical training on pig production	select_one agreement
7b. Why or why not?	text
8. Do you have a contract or formal agreement with one or more of your input suppliers?	select_one agreement
9. It would be useful for me to have contracts with my input suppliers (e.g. feed stockists, veterinary drug stockists)	select_one agreement
9b. Why or why not?	text
10. Do you have a contract or formal agreement with one or more buyers of your pigs?	select_one agreement
11. It would be useful for me to have contracts with buyers of my pigs (e.g. aggregators or companies)	select_one agreement
11b. Why or why not?	text
12. I trust the people I buy inputs from	select_one agreement
12b. Why or why not?	text
13. I trust the buyers of my pigs	select_one agreement
13b. Why or why not?	text
14. I trust the Uganda pig value chain project partners	select_one agreement
15. Do you weigh your pigs or pork products when selling them?	select_one agreement
16. Do you use the products and services that you have been informed about/trained in by the project?	select_one agreement
16b. Why not?	text
17. What are the 3 most important changes you have made in the last 12 months with regard to pork production?	text
18. Which of the above changes are as a result of your involvement in the Uganda pig value chain project? (more than one answer possible)	select_multiple change
19. Which of the above changes are you planning to maintain in the future (beyond 2021)?	select_multiple change
19b. If applicable, why will you NOT maintain some or all changes?	text
20. What is the most important change you've seen in your livestock production after using the practices and technologies and services provided by the project?	text
21. What is the most important recent change you've seen in one or more of your input suppliers?	text
22. What is the most important recent change you've seen in one or more of your buyers that buy your pork?	text

VETS AND EXTENSION

1. What is the most important thing you have learned in the past 12 months related to providing extension / advisory services to pig producers?	text
2. From who or where did you learn this?	text
3. This learning is something that I can apply in my work	select_one agreement
4. I have improved skills for disease diagnostics	select_one agreement
5. I have improved knowledge around antibiotic use	select_one agreement
6. I have improved skills and knowledge about animal breeding and artificial insemination	select_one agreement
7. I have improved skills in general herd health management and biosecurity	select_one agreement
7b. Why or why not?	text
8. I have improved skills in integrating the use of the feed calculator app in pig nutrition/ production	select_one agreement
9. This learning was a result of participating in trainings or support offered by the Uganda pig value chain project	select_one agreement
9b. Why or why not?	text
10. I am willing to (continue) engaging with the project	select_one agreement
10b. Why or why not?	text
11. I am interested in receiving (more) training	select_one agreement
11b. Why or why not?	text
12. Very few smallholder pig producers are interested in the practices and technologies promoted by the project	select_one agreement
12b. Why or why not?	text
13. Very few women pig farmers are interested in the practices and technologies promoted by the project	select_one agreement
13b. Why or why not?	text
14. I am interested in applying my new skills and knowledge to support pig producers	select_one agreement
14b. Why or why not?	text
15. I feel supported by my employer to apply my new skills and knowledge	select_one agreement
15b. Why or why not?	text
16. What are the 3 most important changes you have made in the last 12 months in the way you provide extension and advisory services to pig producers?	text
17. Which of the above changes are as a result of your involvement in the Uganda pig value chain project? (more than one answer possible)	select_multiple change
18. Which of the above changes are you planning to maintain in the future (beyond 2021)?	select_multiple change
18b. If applicable, why will you NOT maintain some or all changes?	text
19. What still needs to happen or change for you to get more/ new pig producers to adopt the animal husbandry, health, and marketing practices?	text
20. What is the most important change you've seen in pig producers with respect to their production and/or marketing practices?	text

POLICY MAKERS

1. What is the most important thing you have learned related to the pig sector?	text
2. From who or where did you learn this?	text
3. This learning is something that I can apply in policy dialogue	select_one agreement
4. As a result of the project, I have improved my understanding of the needs of pig producers	select_one agreement

5. I am willing to (continue) engaging with the project	select_one agreement
5b. Why or why not?	text
6. I am NOT interested in (more) training and/or evidence to support policy dialogue on pig production, pig value chains, and the environment	select_one agreement
6b. Why or why not?	text
7. It would be useful for me to engage in policy dialogue (at district, regional or national level) to promote improved pig animal husbandry practices	select_one agreement
7b. Why or why not?	text
8. I trust the evidence generated by research related to pig production and value chains	select_one agreement
8b. Why or why not?	text
9. I believe in the value of credible evidence for policy dialogue and reform	select_one agreement
9b. Why or why not?	text
10. Existing socio-cultural norms need to be changed to ensure equitable access (esp.for women) to extension services, input suppliers and service providers	select_one agreement
10b. Why or why not?	text
11. What are the 3 most important policy changes you have proposed in the last 12 months or plan to propose in the near future with regard to the pig value chain?	TEXT
12. Which of the above (planned) changes are as a result of your association with the Uganda pig value chain project?	select_multiple change
13. Do you participate in events that enable you to obtain more evidence of the value of improved pig animal husbandry practices?	select_one frequency2
14. Do you participate in events that enable you to obtain more information about the link between pig animal husbandry practices and the environment?	select_one frequency2
15. Do you make use of the evidence that you have been informed about in policy dialogues and related forums?	select_one use
15b. If you don't use most or all of the evidence, why not?	text
16. What is the most important recent change you've seen in vets and extension workers in Masaka or Mukono related to pig extension and advisory services?	text
AGGREGATORS	
1. What is the most important thing you have learned related to your business in pork aggregation in the past 12 months?	text
2. From who or where did you learn this?	text
3. This learning is something that I can apply in my work	select_one agreement
4. As a result of the project, I have improved my knowledge on the applicable standards for pork weight and quality	select_one agreement
5. I am willing to (continue) engaging with the project	select_one agreement
5b. Why or why not?	text
6. I am NOT interested in receiving (more) business skills training	select_one agreement
6b. Why or why not?	text
7. The development and use of standards for pork weight and quality is important	select_one agreement
8. Digital tools or platforms (like PigSmart) are NOT very useful	select_one agreement
8b. Can you explain your answer?	text
9. Are you a member of an association for aggregators?	select_one agreement
10. If no, would you be interested in being a member of an association for aggregators?	select_one agreement
10b. Why or why not?	text

11. I am NOT interested in using contracts to source or supply pork	select_one agreement
11b. Why or why not?	text
12. ARE you using formal contracts to procure pork from farmers or to supply to your clients?	select_one agreement
13. I trust other MorePork project partners	select_one agreement
14. What are the 3 most important changes you have made in the last 12 months with regard to pork aggregation or running your business?	text
15. Which of the above changes are as a result of your involvement in the MorePork project? (more than one answer possible)	select_multiple change
16. Which of the above changes are you planning to maintain in the future (beyond 2021)? (more than one answer possible)	select_multiple change
16b. If applicable, why will you NOT maintain some or all changes?	text
17. Do you weigh your pork using scales when purchasing or selling in order to agree on the price?	select_one agreement
17b. If you answered 'no', why not?	text
18. What still needs to happen or change for you to buy and sell even more pork than you do now?	text
19. What is the most important change you've seen in the farmers you buy pork from in the past 12 months?	text
FEED STOCKISTS	
1. What (if anything) is the most important thing you have learned related to compound feed production in the past 12 months?	text
2. From who or where did you learn this?	text
3. This learning is something that I can apply in my work	select_one agreement
4. As a result of the project, I have improved technical knowledge on how to produce quality compound feed	select_one agreement
5. I am willing to (continue) engaging with the project	select_one agreement
5b. Why or why not?	text
6. I am NOT interested in receiving (more) training	select_one agreement
6b. Why or why not?	text
7. There are few buyers interested in buying compound feed	select_one agreement
8. There is much competition from other feed producers	select_one agreement
9. I offer compound feed at an affordable price for pig producers	select_one agreement
10. I am NOT interested in becoming a certified provider of compound feed	select_one agreement
10b. Why or why not?	text
11. I have access to an affordable source of finance when I need it	select_one agreement
12. I trust other MorePork project partners	select_one agreement
13. What are the 3 most important changes you have made in the last 12 months with regard to compound feed or running your business?	text
14. Which of the above changes are as a result of your involvement in the MorePork project? (more than one answer possible)	select_multiple change
15. Which of the above changes are you planning to maintain in the future (beyond 2021)? (more than one answer possible)	select_multiple change
15b. If applicable, why will you NOT maintain some or all changes?	text
16. Since being involved in the Uganda pig value chain project has the amount of compound feed you sell changed?	select_one agreement

17. Since being involved in the Uganda pig value chain project have you changed the quality of the feed ingredients you sell?	select_one agreement
18. Since being involved in the Uganda pig value chain project, have you changed the price of the feed (ingredients) you sell?	select_one agreement
18b. Why or why not?	text
19. What still needs to happen or change for you to produce and sell even more compound feed (ingredients) than you do now?	text
20. What is the most important change you've seen in your clients related to compound feed?	text