APRIL 2021

COMPLETE SCALING READINESS STUDY

of the pig market arrangement framework in Uganda

ILRI
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UGANDA

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Executive Summary

Many technologies that can improve the livelihoods of small-scale livestock farmers are not adopted due to the financial resource constraints of farmers (Ouma et al., 2018). Such limitations are further exacerbated by market inefficiencies in the value chain that limit pig producers' and aggregators' investments and the use of new technologies. The pig market arrangement framework is a promising framework that improves pig value chains through formalized and sustainable transactions in pig markets. To improve the pig value chain in Uganda, international organizations, including International Livestock Research Institute (ILRI)/Consultative Group on International Agricultural Research (CGIAR), have provided significant support for pig market arrangement framework efforts.

This document complements the ongoing CGIAR Research Program on Livestock (Livestock CRP) efforts in Uganda. It utilizes a state-of-the-art Scaling Readiness approach to scientifically assess the current pig market arrangement framework and provide recommendations for further improvements. The information presented in the document is synthesized from the evidence on the pig market arrangement framework components in Uganda and the rest of the world. The evidence collection is partially guided by selected experts who have significant knowledge and experience designing and implementing pig market arrangement frameworks' components.

The study consists of three parts that address the needs of different users. The first part, 'Scaling Readiness assessment', provides a detailed description and the diagnosis of the pig market arrangement framework using an innovation and science perspective. It also presents the Scaling Readiness graph of the pig market arrangement framework and the innovation package that aims to improve the pig market arrangement framework at scale in Uganda. The second part, 'Scaling Readiness evidence review', explains this study's findings by discussing the evidence sources and gives an extensive list of the resources analyzed and used in writing this study. It also provides further insights in using the Scaling Readiness in assessing the impact potential of innovations at scale. The third part, 'scaling guidelines', presents the synthesis of the findings and provides actionable recommendations to designers, sponsors, and managers of the pig market arrangement framework projects, programs, policies, and professionals of specific innovations and elements in Uganda's pig market arrangement framework.

The Scaling Readiness assessment of Uganda's pig market arrangement framework shows that it consists of eight novel components critical for its successful implementation. It also shows that improving the maturity of the pig market arrangement framework requires seven other innovations to impact the formalized and sustainable transactions in pig markets in Uganda at scale. It indicates that the maturity and Use Levels of the novel components and the complementary innovations differ significantly. It presents that complementary models to the market arrangement framework are relatively more advanced while principle (only one) and practice types of complementary innovations are less advanced.

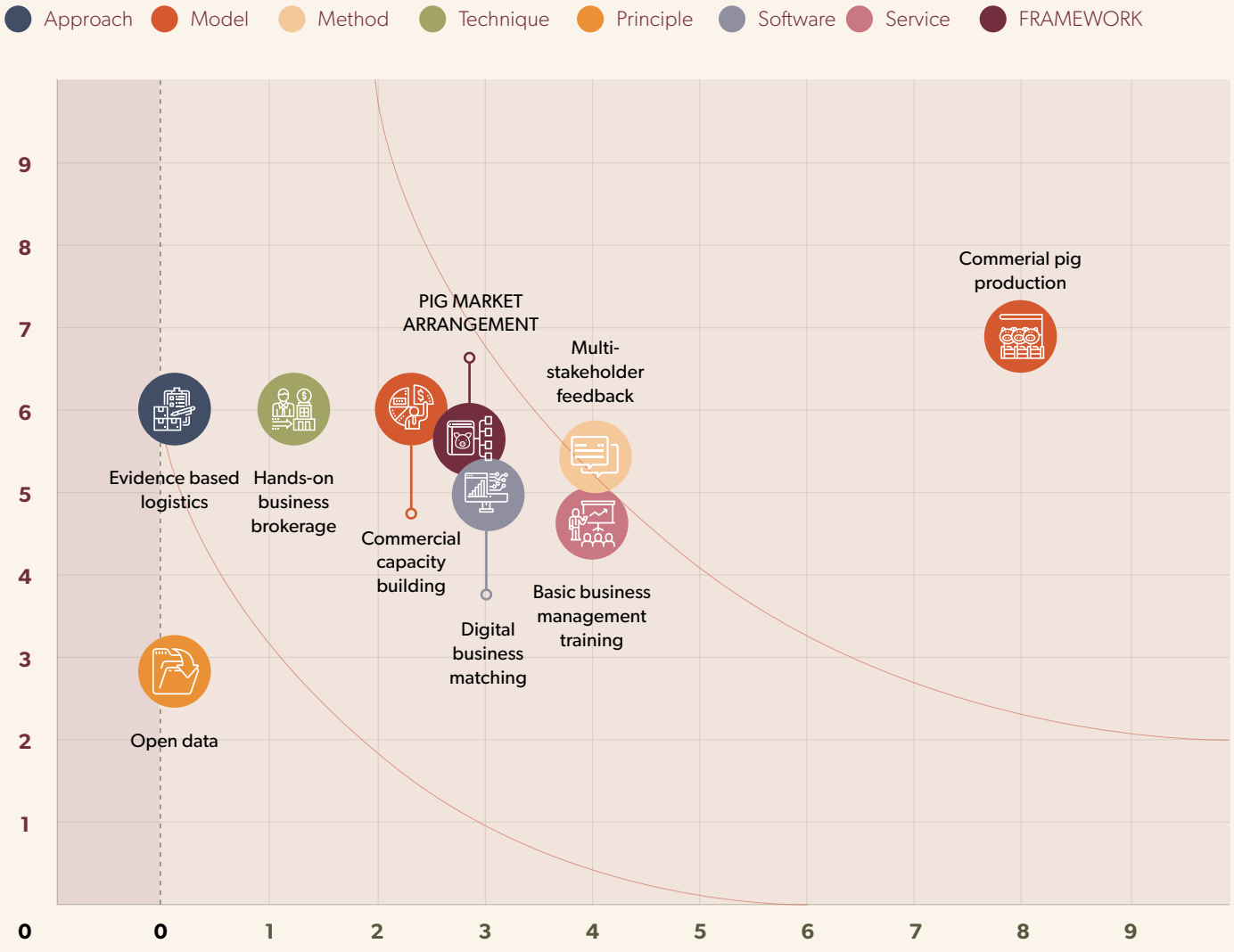
An April 2021 Scaling Readiness assessment of the novel components of the pig market arrangement framework in Uganda for achieving formalized and sustainable transactions in pig markets indicates that the Average Scaling Readiness Level of the framework components is about 15, and the Scaling Readiness Score is 0 (Figure 1).

Figure 1: Scaling Readiness assessment of the pig market arrangement framework for Uganda - April 2021 - formalized and sustainable transactions in pig markets

Pig Market Arrangement Framework for Formalized and Sustainable Transaction in Pork/ Pig Markets in Uganda, April 2021

The pig market arrangement framework in Uganda has

5.38	2.75	14.80
Average Readiness Level	Average Use Level	Average Scaling Readiness Level



The big gap between the two measures is the open data principle, which is not part of the Livestock CRP Uganda Priority Country Project. Suppose the project starts using the principle and improves its Readiness and use. In that case, the Average Scaling Readiness Level will approach 20, which is an approximate milestone for completing the design phases of the pig market arrangement framework in Uganda.

Most pig value chain framework components are clustered at the Readiness Level of 5 (proven application model) and 6 (unproven application). These are the two levels in which non-experimental research plays a significant role. In these levels, data across the value chains are generated, synthesized, and used to develop the first versions of the applied solutions that fit the needs of Uganda for achieving formalized and sustainable transactions in the pig value chain. Since ILRI's significant capabilities and comparative advantage lie in these two domains, the Scaling Readiness assessment showed that the Livestock CRP Uganda Priority Country Project efforts on the pig market arrangement framework are suitable to needs on the ground.

The Scaling Readiness assessment showed that a commercial value chain model is well established in pig value chains in Uganda. Although some of the interviews emphasized a lack of commercial understanding among pig farmers and aggregators, available evidence showed pig farmers and aggregators who are neither involved in research and development projects nor supported by incentives and subsidies have a commercial mindset of their own. They use pigs as short term investment assets that can finance the considerable expenditures of the family, such as school fees and marriages. This indicates a gap among some of the knowledge partners involved in the pig value chain about alternative commercial approaches used by the small-scale pig producers and aggregators.

The Scaling Readiness assessment could not identify the use of an open market data approach in the Livestock CRP Uganda Priority Project market arrangement component. Investments in the generation of market information and sharing them open access is a niche that can be addressed by support service providers of the pig value chain, including international organizations such as ILRI (if not already done). Since open access market data requires digital technologies, organizations working on digitalization might be interested in this niche.

Based on the findings, the Scaling Readiness assessment team recommends that interventions aiming to improve the pig market arrangement framework need to prioritize the following:

RESEARCH FOR DEVELOPMENT ACTIVITIES

conduct desktop research on successful implementations of openly sharing market-related information in livestock value chains in East Africa

validate existing evidence-based logistical arrangement approaches in pig value chains and tailor them for use in Uganda at scale

validate existing effective hands-on-brokerage techniques in pig value chains and tailor them for implementing them at scale in Uganda

conduct desktop research on existing transportation best-practices in pig value chains and design a blueprint of how they can be implemented in Uganda

validate how existing pig health, weight, and other price and quality-related inspection practices can perform in Ugandan pig value chains and co-design an application that combines the effective practices

UTILIZATION ACTIVITIES

plan how the Livestock CRP and other initiatives can support stakeholders in the Ugandan pig value chain to produce, access, and use reliable and affordable market information at scale and design a model for a market information system for the Ugandan pig value chain

plan how logistical data and conditions can guide designing and determining the strategies and research and development efforts in the pig value chain and design a model for the use of logistical data

sensitize and convince Livestock CRP partners about the benefits of implementing hands-on-brokerage techniques to enhance the market transactions in the pig value chain in Uganda

plan on how the Livestock CRP and other initiatives can address pig transportation and use available pig transportation best practices in their design

convince the Livestock CRP aggregator partners about the benefits of using pig purchase inspection practices, and train them on using the practices in their work

Acknowledgement

This study focuses on the Ugandan pig value chain of the CGIAR Research Program on Livestock (Livestock CRP). It has significantly benefited from technical and administrative support from the Livestock CRP's country team led by Ben Lukuyu, who helped mobilize support for this study.

The team was generous with their time, provided the authors with the relevant materials, and coordinated access to the study's stakeholders. The authors also thank Emily Ouma, Pius Lutakome, Joshua Isiko, Brian Ruabwogo, Fred Kabi, Christopher Mulindwa, Peter Lule, Lawrence Mayega, Robert Katende, and James Rao for their participation in the study interviews and valuable contributions to the study.

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Scaling Readiness Lexicon

Scaling Readiness is a decision support system to support international research for development projects and programs implemented by CGIAR in designing, developing, disseminating, delivering, and improving the use of innovations at scale. Scaling Readiness concepts and indicators used in this study are explained in the Scaling Readiness glossary. More general information about Scaling Readiness can be accessed via www.scalingReadiness.org. For the science dimensions of Scaling Readiness, a recent research paper (Sartas et al., 2020a) and implementation of the Scaling Readiness Guide (Sartas et al., 2020b) can be helpful.

EVIDENCE BASED MEASUREMENT:

Measures in Scaling Readiness are calculated using evidence. Specific claims of Readiness and use measures are assessed through a hierarchy of sources of verification. High-quality science articles and other peer-reviewed documents are the first sources. In their absence, technical documents or other publicly scrutinized documents are used to back up specific evidence claims. Where there is a lack of documents, experts' opinions proven to have sufficient competencies are triangulated to identify the measures.

INNOVATION COMPONENT:

A tool, concept, practice, technology, etc., that constitutes a part of innovations. They can be stand-alone innovations for other contexts and goals, but for the specific goals and contexts, an intervention operates, they are classified as components. Innovation has a very high number of components. Some of the components are novel and play a critical role in the maturity and use of the innovation. In Scaling Readiness, these novel components of innovations are characterized and diagnosed. Research for development interventions can control the design, development, and delivery of innovation components.

INNOVATION:

A novel product, service, arrangements, or their purposeful combinations with economic, environmental, health, industrial, etc., benefits. Innovations are different from inventions since they have explicit implementations. A product, service, arrangement, or combinations need to have clear use objectives to be considered innovation. Innovations can be technical or social. They can be tangible and intangible. In Scaling Readiness, innovations are characterized, diagnosed, and strategized. Research for development interventions can control or strongly influence design, development, and delivery innovations and catalyze or support their use at scale.

INNOVATION PACKAGE:

The combination of the innovations a project aims to scale and other innovations necessary to scale them. Innovation packages usually consist of technologies and other products, services, organizational and institutional arrangements, and systems required to improve awareness of accessibility, affordability, and other characteristics of an innovation that influence the maturity and usability at scale. An innovation package is the fundamental unit of analysis for scaling innovations in Scaling Readiness. Research for development interventions can influence the design and delivery of innovation packages, but they cannot control it. Many innovations in the innovation packages are beyond the control and influence zone of interventions; therefore, partnerships are vital in improving the overall Readiness of innovation packages.

INNOVATION READINESS LEVEL:

A number indicating how mature or practical an innovation achieves its use objectives. It can be considered as a systematic answer to the question 'how good an innovation works.' It can be between 0, which indicates that the innovation is just an idea in the mind of its potential designers and developers, and 9, suggesting that the innovation is a validated application with clear evidence of its value measured in terms of livelihood impact profit, etc. Research and development projects increase innovation Readiness Levels by improving the design of the innovations, developing and validating the improved designs in uncontrolled and controlled conditions.

INNOVATION USE LEVEL:

It is a number indicating the level of the use of innovations at scale. It can be considered systematic answers to the combined questions of "who uses an innovation and in which order of magnitude." It can be between 0, which indicates that the innovation is not being used in the context a project aims to increase to the use of the innovation, and 9, which suggests that the innovation is being commonly used among the users who are not involved in any innovation design, development or dissemination processes. Research and development projects increase existing innovation Use Levels by disseminating the innovations and expanding the use of innovations by other innovation professionals who are not involved in the same projects and users who are not involved in any innovation processes.

SCALING READINESS LEVEL:

It is a single number combining the Readiness and Use Level of all the innovations in the innovation package. It can be considered as a single answer to the question of 'what is the likelihood that an innovation package will achieve impact at scale.' There are different ways of calculating Scaling Readiness Levels based on the management system's preferences. It can be an average level, a minimal level, or a weighted Average level. In this study, two Scaling Readiness Levels are documented; the Average Scaling Readiness Level and Scaling Readiness Score. Scaling Readiness Level is the multiplication of the averages of the individual Innovation Readiness and Use Levels of components or innovations. The Scaling Readiness Score is the multiplication of the Readiness and uses Scores of the minimum level component or the innovation in the package. The Scaling Readiness Score is a more strict version focusing on the minimum. It aims to help the designers of the interventions prioritize the bottleneck components or innovations that hinder the high impact at scale.

CHARACTERIZATION:

Characterization is the first step of the Scaling Readiness cycle. It includes the activities to document and classify three critical units, i.e., interventions, innovations, and stakeholders. Two of these three critical units, intervention or the component and innovation, the program, are characterized in this study using a customized version of Scaling Readiness step 1.

DIAGNOSIS:

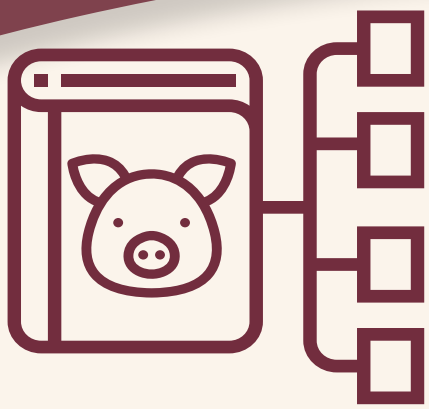
Diagnosis is the second step of the Scaling Readiness cycle. It includes assessments of the characteristics of the interventions, innovations, and stakeholders generated in the first step and the implications of these characteristics in achieving impact at scale. Diagnosis of the intervention and innovation is made in this study using a customized version of Scaling Readiness step 2.

STRATEGIZING:

Strategizing is the third step of the Scaling Readiness cycle. It includes strategies for addressing the diagnosis and improving the impact performance. Strategizing is done partially in this study by using a customized version of Scaling Readiness step 3.

PART

A



SCALING READINESS ASSESSMENT OF PIG MARKET ARRANGEMENT FRAMEWORK IN UGANDA

The Scaling Readiness Assessment provides detailed information about Uganda's pig market arrangement framework and complementary innovations necessary to achieve formalized and sustainable transactions in pig markets.

Specifically, it presents the following:

- the essential characteristics of a pig market arrangement framework relevant for its performance at scale
- the diagnosis of these essential characteristics from an innovation and scaling perspective
- Readiness and Use Levels of the novel components of the pig market arrangement framework
- innovations that are necessary to achieve a positive impact from using the pig market arrangement framework at scale
- the diagnosis of the innovations from an innovation and scaling perspective
- Readiness and Use Levels of the innovations in the pig market arrangement framework innovation package

The Scaling Readiness Assessment is at the implementation level. It aims to provide a deeper understanding of innovation-related information relevant to achieving impact at scale by implementing a pig market arrangement framework.

The Assessment is designed to be a stand-alone document for:

managers of projects, programs, and policies related to the pig market arrangement framework who are interested in developing a deeper understanding

designers, developers, and managers of specific innovations and elements in the pig market arrangement frameworks

The procedures for identifying the Scaling Readiness measures and the evidence sources are not articulated in this part. More information about the measures can be accessed from the Scaling Readiness Evidence Review (Part B). The assessment also does not articulate the implications of the findings for designing and implementing Scaling projects, programs, and policies. A synthesis of the findings and recommendations are provided in the Scaling Readiness Guidelines (Part C)

Innovation Profile of the Pig Market Arrangement Framework

Scaling Readiness Innovation Profile is a tool to describe the characteristics of an innovation aimed to be designed, developed, disseminated, or used at scale. It aims to contribute to improving the impact of the pig market arrangement framework at scale through

i. presenting gaps in the design of the pig market arrangement framework,

ii. developing a shared understanding between small scale pig producers, pig aggregators, international organizations, and all other value chain actors, including disadvantaged groups such as women and youth groups, about what the pig market arrangement framework is and what it entails and

iii. creating a brief communication product for presenting the innovation to various stakeholders.

This document uses a customized version of the Innovation Profile to characterize the pig market arrangement framework. In this section, the Innovation Profile Sheet, an overall diagnosis of the results in the Innovation Profile Sheet, and Innovation Readiness and Use assessments of the pig market arrangement framework are provided.

Innovation Profile Sheet

PIG MARKET ARRANGEMENT FRAMEWORK

The pig market arrangement framework is a framework for formalizing the transactions increasing the sustainability of a business. It addresses the need for setting up transparent, standardized, and predictable transactions enabling long-term and mutually beneficial business in pig markets characterized by many small-scale producers who are geographically scattered. It combines costs (reduces pig business time, reduces logistic costs) and revenue gains (increases the pig business volume). Relative to its alternatives, it offers a more predictable business environment for all pig value chain actors.

APPLIED BY

- Small scale pig producers
- Pig aggregators

SUPPORTED BY

- International organizations

BENEFITS

- other value chain actors including disadvantaged groups such as women and youth groups

AIMS AT

- Increasing pig market volume,
- Increasing profitability of pig business

PROS

- Reduces business time,
- Reduces transportation costs,
- Enables long term planning and efficiency gains,
- Develops business infrastructure

CONS

- Knowledge-intensive,
- Requires coordination at scale

CONTRIBUTES TO

Novel components of the pig market arrangement framework in Uganda

EVIDENCE-BASED LOGISTICS APPROACH

the principle of using data and evidence on the supply chain and other logistical facts in designing, implementing, and regulating market arrangements

COMMERCIAL PIG PRODUCTION MODEL

the use of commercial pig business models in designing, implementing, and regulating the market arrangement activities

COMMERCIAL CAPACITY-BUILDING MODEL

the selection of the capacity development targets of the intervention based on the commercial viability of the production in the short and medium-term

MULTI-STAKEHOLDER FEEDBACK METHODS

the use of multi-stakeholder consultation and engagement methods to design and implement market arrangement activities and periodically updating them based on the feedback from various value chain actors

HANDS-ON BUSINESS BROKERAGE TECHNIQUES

using customized best business brokerage techniques that fit the location of the project sites to facilitate and improve the market arrangements

OPEN DATA PRINCIPLE

open-access sharing of market information

A DIGITAL BUSINESS MATCHING TOOL

a multi-platform software that matches the buyers and sellers of pigs in real-time in different locations

TRAINING ON BASICS OF BUSINESS MANAGEMENT

provision of a practical course on basics of business management such as accounting and contracting

Innovation Profile Diagnosis

USERS

The pig market arrangement framework is used by small-scale pig producers and pig aggregators in Uganda, but other value chain actors including disadvantaged groups such as women and youth groups. Most of the activities relevant to the pig market arrangement framework are financed by international organizations, including CGIAR donors.

The current user profile of the framework does not include some of the key actors in the pig value chain in Uganda. However, since the Livestock CRP Uganda Priority Country Project includes multiple other components, focuses on the pork market arrangement framework, and collaborates with other projects, most of these stakeholders not included in the market arrangement components do not constitute a significant gap. That said, the Scaling Readiness team could not identify the involvement of influential decision-makers of the pig markets, i.e., the owners and financiers of abattoirs. The Scaling Readiness team recommends identifying the other projects, the owners and financiers of the abattoirs, i.e., the pig farmers union and pig farmers and traders association, and linking up the pig market arrangement framework. If there is no such project, it is vital to establish collaborations with them.

OBJECTIVES OF THE PIG MARKET ARRANGEMENT FRAMEWORK IN UGANDA AND ITS CONTRIBUTIONS TO SUSTAINABLE DEVELOPMENT GOALS

Livestock CRP Uganda Priority Country Project aims at formalized and sustainable transactions in pig markets. Since pigs are both a consumption product and an asset for small-scale pig rearers in Rural Uganda, it contributes to a broad set of Sustainable Development Goals. In particular, the pig market arrangement framework in Uganda contributes to the Sustainable Development Goals 1.2 (reducing poverty), 2.3 (increasing small scale food producer income in particular women), 4.1 (increasing the proportion of children attending school), 4.3 (increasing equal access to vocational education) and 8.2 (achieving higher economic productivity through diversification, technological upgrading, and innovation) in Uganda. This diverse set can make the pig market arrangement framework interesting for Ugandans and international organizations investing in Ugandan agriculture.

ADVANTAGES AND DISADVANTAGES OF THE PIG MARKET ARRANGEMENT FRAMEWORK IN UGANDA

Compared to its conventional alternatives, the pig market arrangement framework reduces business time and transportation costs, enables long-term planning and efficiency gains, and develops business infrastructure. These advantages are significant for the Ugandan pig value chain and can raise interest and demand from multiple stakeholder groups in the Ugandan pig value chain. However, the framework is knowledge-intensive and requires coordination at scale. Knowledge intensity and large-scale coordination are challenging to achieve in low-income contexts in a short-term horizon and take at least a few years. Since the Livestock CRP Uganda Priority Country Project builds on long-standing ILRI and its partners' efforts, it is possible to achieve considerable scale coordination that would not be possible in many contexts.

NOVEL COMPONENTS OF PIG MARKET ARRANGEMENT FRAMEWORK IN UGANDA

The pig market arrangement framework has two components. Except for models, all the components are different types. There is an approach, a method, a technique, a principle, software, service, and two models. This indicates that the framework has a complex design. In addition, most of the components of the pig market arrangement framework are about know-how. This confirms that the Livestock CRP Uganda Priority Country Project operates in the knowledge domain of the pig value chain.

Scaling Readiness Assessment of pig market arrangement framework

The Scaling Readiness of innovation is the *first* metric used to assess the impact potential of the pig market arrangement framework in Uganda at scale. It focuses on the components of the framework and provides a holistic picture of Readiness and Use. Readiness measures how well the components of an innovation perform to achieve its desired objective. At the same time, Use is a measure that presents the type of people using the system and their numbers. More information about the Readiness and Use measures can be found in the Scaling Readiness Evidence Review (Part B).

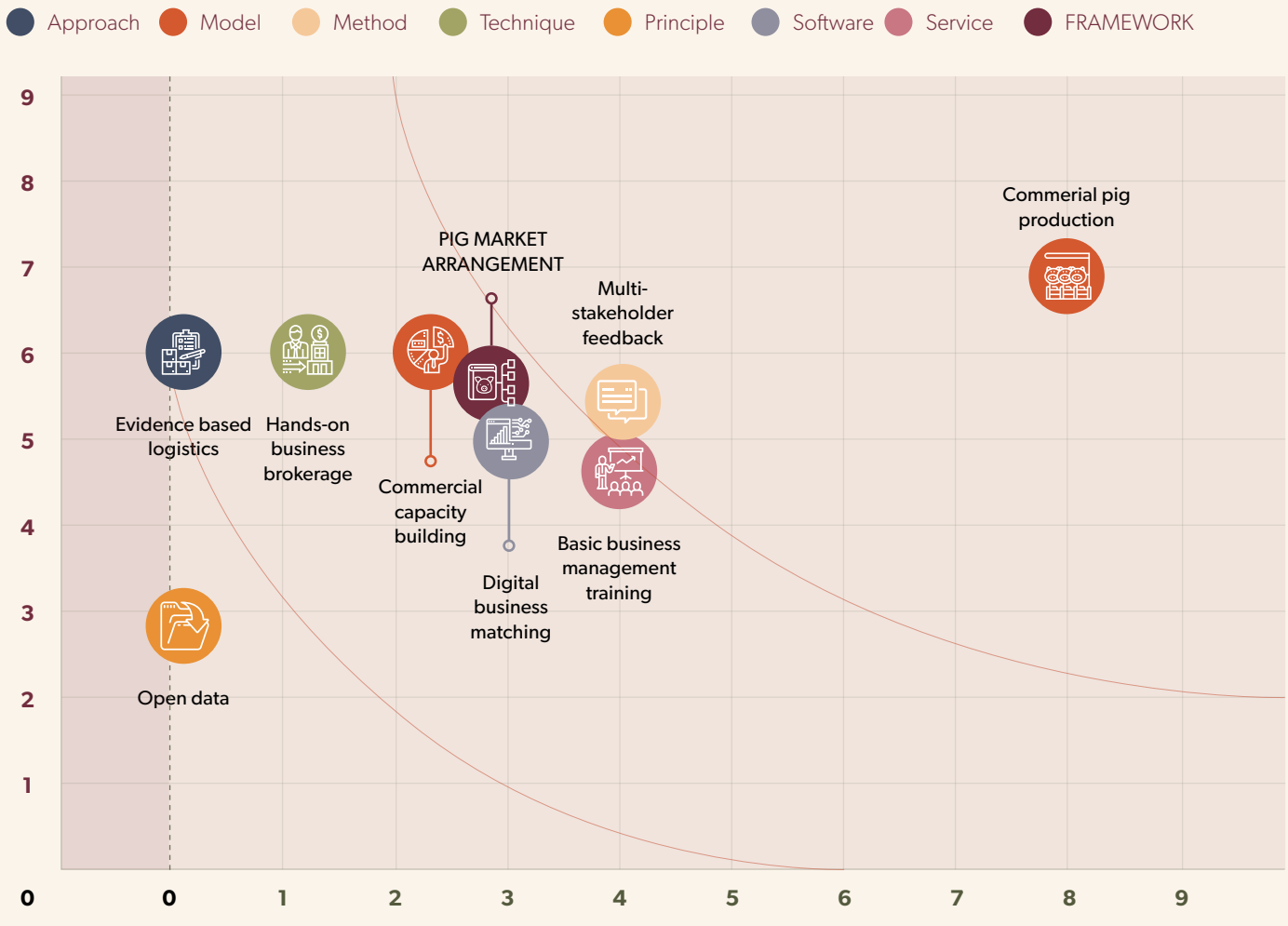
The Scaling Readiness Assessment team has prepared a Scaling Readiness assessment for the pig market arrangement framework using the published evidence provided in the Evidence Review and the bibliography. The assessment results are specific for Uganda in April 2021 for the contribution of the pig market arrangement framework to the formalized and sustainable transactions in pig markets in Uganda. It can differ for other countries, for other periods, and in achieving other goals.

Figure A1: Scaling Readiness Assessment of the pig market arrangement framework For Uganda - April 2021 - formalized and sustainable transactions in pig markets

Pig Market Arrangement Framework for Formalized and Sustainable Transaction in Pork/ Pig Markets in Uganda, April 2021

The pig market arrangement framework in Uganda has

5.38	2.75	14.80
Average Readiness Level	Average Use Level	Average Scaling Readiness Level



The Scaling Readiness assessment of the novel components of the pig market arrangement framework in April 2021 in Uganda for achieving formalized and sustainable transactions in pig markets indicates that the Average Scaling Readiness Level of the pig market arrangement framework components is about 15, and the Scaling Readiness Score is 0 (Figure A1). The big gap between the two measures is due to the open data principle being not part of the Livestock CRP Uganda Priority Country Project. Suppose the project starts using the principle and improves its Readiness and use. In that case, the Average Scaling Readiness Level will approach 20, which is an approximate milestone for completing the design phases of the pig market arrangement framework in Uganda.

Most of the pig value chain framework components are clustered at the Readiness Level of 5 (proven application model) and 6 (unproven application). These are the two levels in which non-experimental research plays a significant role. In these levels, data across the value chains are generated, synthesized, and used to develop the first versions of the applied solutions that fit the needs of Uganda for achieving formalized and sustainable transactions in the pig value chain. Since ILRI's significant capabilities and comparative advantage lie in these two domains, the Scaling Readiness assessment showed that the Livestock CRP Uganda Priority Country Project efforts on pig market arrangement framework are suitable to needs on the ground.

The Scaling Readiness assessment showed that a commercial value chain model is well established in pig value chains in Uganda. Although some of the interviews emphasized a lack of commercial understanding among pig farmers and aggregators, available evidence showed pig farmers and aggregators who are neither involved in research and development projects and nor supported by incentives and subsidies use pigs as short term investment assets that can finance the significant expenditures of a family such as school fees and marriages. This indicates a gap among some of the knowledge partners involved in the pig value chain about alternative commercial approaches used by the small-scale pig producers and aggregators.

Our study could not identify the use of an open market data approach in the Livestock CRP Uganda Priority Project Market Arrangement Component. Investments in the generation and sharing of market information and open access is a niche that can be addressed by the pig value chain's support service providers, including international organizations such as ILRI. Since open access market data will require digital technologies, organizations working on digitalization might be interested in this niche.

Innovation Package Profile for Pig Market Arrangement Framework

Scaling Readiness innovation package profile is a tool to describe other innovations necessary to use innovation at scale. Innovations can not be used at scale without other innovations complementing their use (Sartas et al., 2020a). For instance, a machine can not achieve use at scale without complementary energy infrastructure, the best practices for using it, etc. The Innovation Package Profile differs from the Innovation Profile presented in the previous section. While the Innovation Profile focuses on work on the elements that are in the control and high influence zone of the Livestock CRP Uganda Priority Project Market Arrangement Component, the Innovation Package Profile focuses on elements that are in the low influence or interest zone of the Livestock CRP Uganda Priority Project Market Arrangement Component.

Scaling Readiness innovation package profile aims to improve the performance of intervention through i) helping to identify other innovations systematically and ii) developing a shared understanding between the project managers, designer, developer, disseminators, and use partners about their complementary roles. An innovation package profile identifies other innovations necessary to use the "pig market arrangement framework" at scale in this document. In this section, the following items are provided:

i. the innovation package sheet,

ii. an overall diagnosis of the configuration of the innovation package sheet, and

iii. the Innovation Readiness and Use assessments of the innovation package are provided.

Pig Market Arrangement Framework Innovation Package

FORMAL BUSINESS SUPPORT INCENTIVES

tax and fee exemptions for newly formalized enterprises included in the local and national legislation

for convincement of pig market arrangement framework

PIG LOGISTIC AND TRADE MODELS

mathematical models for transport routes and schedules, location of market hubs, and other variables that optimize the total cost of logistics and markets

for availability and accessibility of pig market arrangement framework

PIG PURCHASE INSPECTION PRACTICES

set of practices that are used at the farm gate to quickly identify several problems decreasing the price of the pig at a slaughter house (such as drug burden, disease)

for effectiveness of pig market arrangement framework

STANDARDIZED PIG WEIGHT ESTIMATION PROCEDURE

standardized use of ratios and a formula for estimating the weight that can be obtained from a live pig

for effectiveness of pig market arrangement framework

DISEASE MONITORING SOFTWARE

a digital tool showing the disease incidence and risk at specific coordinates in real-time

for effectiveness of pig market arrangement framework

RAPID PIG HEALTH CHECK SOFTWARE

a smart phone/tablet-based software that uses image recognition to identify several diseases in pigs

for effectiveness of pig market arrangement framework

PIG TRANSPORTATION BEST PRACTICES

a set of practices that reduce the risk of damage and pig deaths during the multiple transportation steps from farm to the slaughterhouses

for effectiveness of pig market arrangement framework

Diagnosis of the Innovation Package Sheet

This section provides information about the diagnosis of the innovations presented in the innovation package sheet.

AWARENESS ABOUT THE PIG MARKET ARRANGEMENT FRAMEWORK AT SCALE

The majority of the small-scale producers and aggregators have a strong awareness of the commercial pig production, multi-stakeholder feedback methods implemented by the Livestock CRP Uganda Priority Project Market Arrangement Components, and other aspects of the pig market arrangements that concern them directly. Once the open data principles, evidence-based logistics approach, hands-on business brokerage techniques, and commercial capacity building activities are validated by applied research and developed as applications, it will be necessary to design awareness-raising activities. But for now, there are no major awareness innovations necessary to complement the pig market arrangement framework.

BEING CONVINCED ABOUT THE BENEFITS OF THE PIG MARKET ARRANGEMENT FRAMEWORK AT SCALE

The research done for this document showed that most of the pig market arrangement framework stakeholders were not convinced that it would benefit them. The interviews and several communication products indicated that most aggregators and middle traders see formalization of market transactions through the market arrangement as a reason for further red tape without clear benefits and resistance. Providing incentives such as tax and fee exemptions for newly formalized enterprises via national and local legislation has a significant potential to overcome the resistance of some stakeholders and convince the aggregators and traders.

AVAILABILITY AND ACCESSIBILITY OF THE PIG MARKET ARRANGEMENT FRAMEWORK

The locations the current pig market arrangement framework is implemented are limited to the areas where ILRI and other international organizations provide services and support. To increase the availability of the framework in Uganda at scale, it is necessary to identify the best locations that pig collection hubs, slaughterhouses, and other markets providing pig value chain products and services. Mathematical models can identify transport routes and schedules that use data on the location of market hubs and other variables that optimizes the total cost of logistics and markets. This also improves the accessibility of the framework automatically since the accessibility dimensions can easily be included in the models.

EFFECTIVENESS OF THE PIG MARKET ARRANGEMENT FRAMEWORK AT SCALE

Scaling Readiness Assessment showed that existing market arrangements in the pig value chain are functional but far from optimal. Many aspects can be improved to increase the effectiveness of the pig market arrangement framework.

The first complementary innovation that can increase the impact of the pig market arrangement framework includes pig purchase inspection practices. They are used at the farm gate to quickly identify several problems decreasing the price of the pig at a slaughterhouse, such as a drug burden or disease. Although aggregators and abattoirs use some practices to purchase the pigs, they are not standardized and fully informed by the best practices of production, health, and safety. Consolidating and improving some of the pig purchase inspection practices can improve the performance of the pig market arrangement at scale.

The second complementary innovation is the standardized pig weight estimation procedure. The literature on the pig value chain in Uganda and the interviews with the key stakeholders show that weight estimation varies significantly and is a continuous source of mistrust between small-scale producers,

aggregators, and final consumers. Consolidating and agreeing on standardized ratios and formulas for estimating the weight of pork obtained from a live pig with multiple stakeholder representatives have immense potential to improve the performance of the pig.

The third complementary innovation is the rapid pig health check software. It is a smartphone/tablet-based software that uses image recognition to identify several diseases in a pig. Literature showed a few studies in China (Qin et al., 2018) that used artificial intelligence and image recognition models to identify different pig diseases from photos. Combining the software elements that detect different diseases and adapting them for Uganda can dramatically improve the pricing estimates of pigs and help increase the pig market arrangement framework's effectiveness.

A fourth complementary innovation for the pig market arrangement framework is disease monitoring software. African Swine Fever (ASF), porcine cysticercosis, and other diseases have disrupted the pig value chains. They are considered a risk to consumer health in repeating outbreaks for more than two decades. The literature documented a few cases in which the pig price collapsed due to the expectation of ASF, although actual incidence rates were low. Therefore, a digital tool that shows the disease incidence and risk at specific coordinates in real-time would help reduce the incidence rates and prevent panic sales that significantly disrupt the pig markets. This would increase the impact of the pig market arrangement framework.

The fifth complementary innovation that increases the pig market arrangement framework effectiveness is pig transportation best practices. Interviews conducted Scaling Readiness Assessment showed that damage and death of pigs during the long transportation from the farm to slaughterhouse are common in Uganda. Work on the practices can reduce the risk of lowering the quality of pigs, even their death during the multiple transportation steps from farm to the slaughterhouses and make a significant positive contribution to the impact of the pig market arrangement framework.

Scaling Readiness of the pig market arrangement framework Package

The scaling Readiness of an innovation package is the *final* metric used to assess the impact at scale potential of the pig market arrangement framework. The scope of the Scaling Readiness of the innovation package goes beyond the pig market arrangement framework components, which were analyzed previously and include all the innovations included in the Innovation package sheet and following diagnosis sections.

The Scaling Readiness Assessment team has prepared an assessment for the pig market arrangement framework package using the published evidence provided in the evidence appendix and bibliography. The assessment results are specific for Uganda in April 2021 for the contribution of the pig market arrangement framework to the formalized and sustainable transactions in pig markets in Uganda. It can differ for other countries, for other periods, and in achieving other goals.

Scaling Readiness assessment of the pig market arrangement framework innovation package in April 2021 in Uganda for achieving formalized and sustainable transactions in pig markets indicates that the Average Scaling Readiness Level of the pig market arrangement framework components is about 11.4 and the Scaling Readiness Score is 0. The big gap between the two measures is two innovations, pig transportation practices and standardized pig weight estimation procedures, being not part of the Livestock CRP Uganda Priority Country Project. If the project co-develops practices and procedures and supports their use, the gap will be reduced significantly.

The Average Readiness Level of the innovation package (5.86) is much higher than the Average Use Level (1.89). This indicates that previous pig market arrangement innovation packages focused more on the research and development side than the utilization side. Considering that the framework has not

completed its design yet, (see the previous section), this focus is justified. However, as the framework reaches the completion milestone for the design phase in the near future, the weight of the utilization activities needs to increase to achieve a higher impact at scale.

The pig market arrangement innovation package consists of an incentive, a set of models, a procedure, two software, and two sets of practices (Figure A2). Most of these innovations are new and were not used outside of support interventions. Only pig logistics and trade models went beyond the designers and developers. They were used by some of the delivery and use support stakeholders. The Readiness of the innovations in the package varied from three to eight.

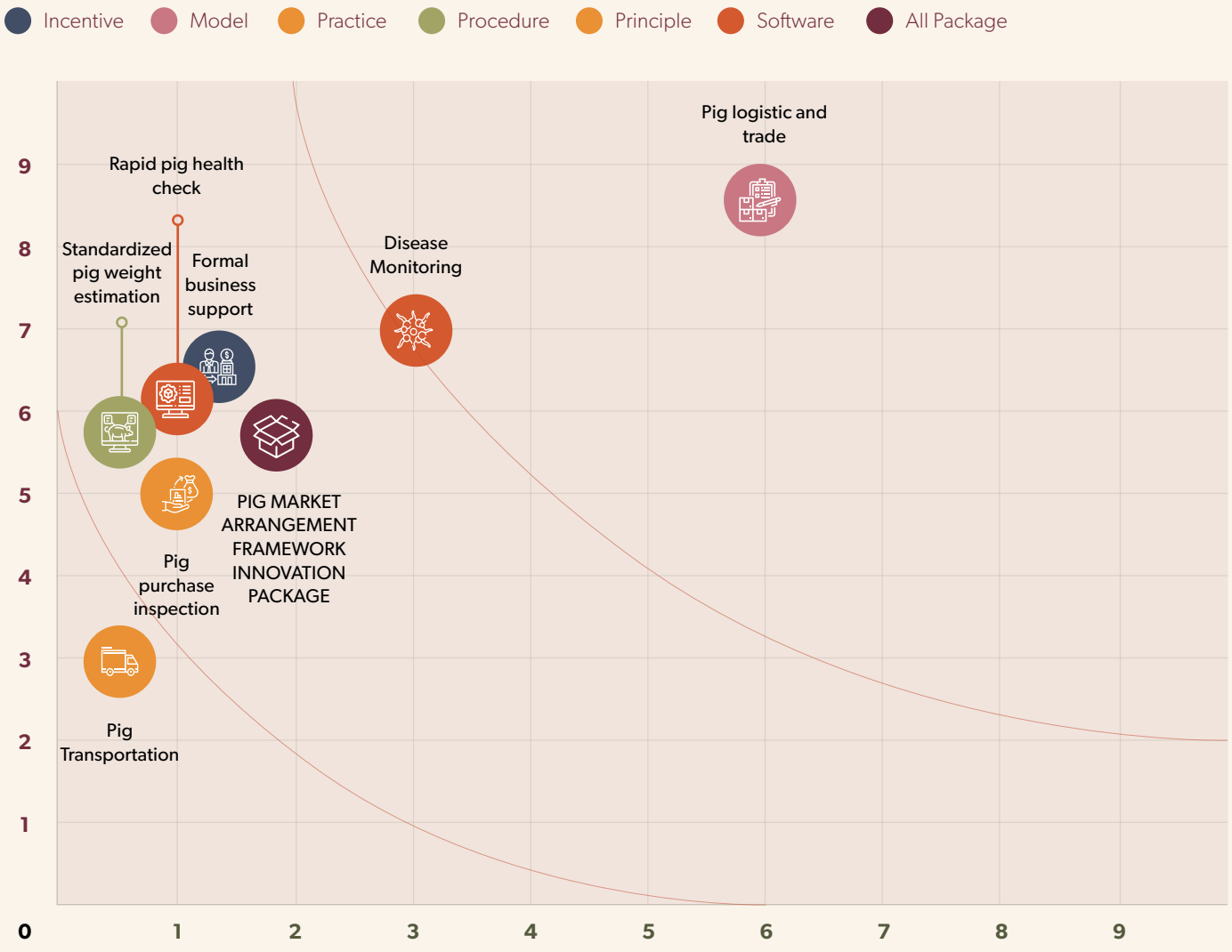
Practices were less ready and less used in comparison to other innovation types. This indicates that there is a big gap in implementation and action research and innovative practice designs in pig markets.

Figure A2: Scaling Readiness Assessment of the pig market arrangement framework Package For Uganda - 2021 April - formalized and sustainable transactions in pig markets

Pig Market Arrangement Framework for Formalized and Sustainable Transaction in Pork/ Pig Markets in Uganda, April 2021

The pig market arrangement framework package has

5.86	1.89	11.04
Average Readiness Level	Average Use Level	Average Scaling Readiness Level



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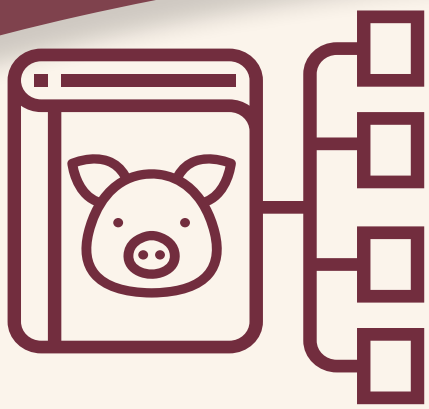


SCALING READINESS EVIDENCE REVIEW OF THE PIG MARKET ARRANGEMENT FRAMEWORK IN UGANDA

This Evidence Review provides a detailed explanation of the Readiness and Use Levels of each pig market arrangement framework component and the innovations included in the pig market arrangement framework innovation package. It also links the study to Scaling Readiness's broader science and technical documentation and the pig market literature in Uganda and globally. To support further inquiries about the quality of the Scaling Readiness assessment and contribute to the design of other research and management interventions, it provides a complete list of the resources used to carry out the assessment.

The Scaling Readiness Evidence Review is at the research and science level. It aims to systematically assess the evidence sources and technical information about using Scaling Readiness Metrics.

The Evidence Review is targeted at the following:

designers, developers, and managers of specific innovations and elements in the pig market arrangement frameworks

researchers who conduct applied research on pig market arrangement frameworks

practitioners who are interested to learn more about doing Scaling Readiness Assessment

The basic information about the novel components of the pig market arrangement framework and the descriptions of the pig market arrangement framework innovation package innovations are not presented in detail in the Evidence Review. This information is available in the Scaling Readiness Assessment (Part A). The Evidence Review also does not articulate the implications of the findings for designing and implementing Scaling projects, programs, and policies. A synthesis of the findings and recommendations are provided in the Scaling Readiness Guidelines (Part C)

Scaling Readiness Assessment of the Innovation

The core innovation of this document is the pig market arrangement framework in Uganda. It consists of the following eight novel components:

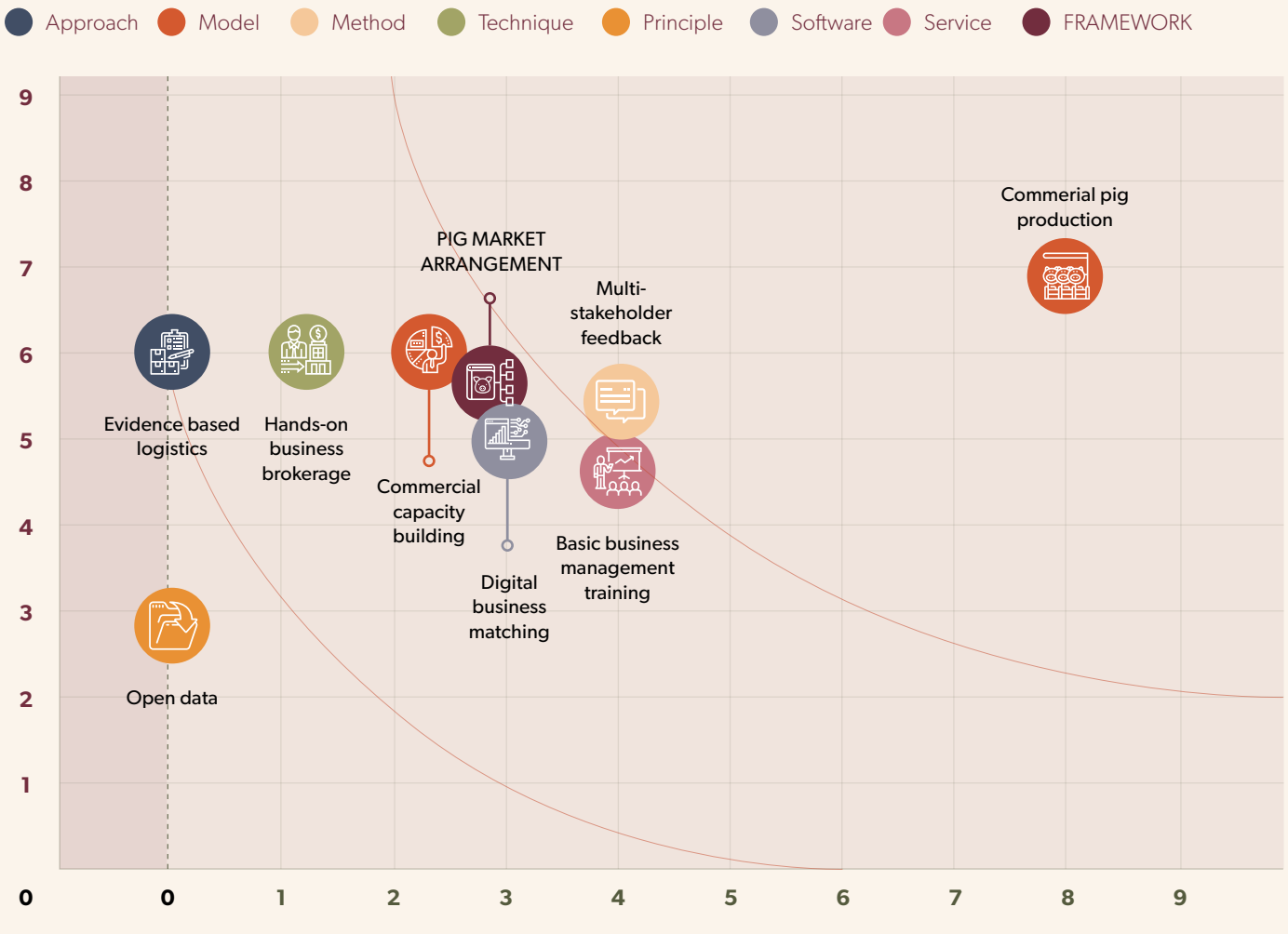
- evidence-based logistics approach
- commercial pig production model
- commercial capacity-building model
- multi-stakeholder feedback methods
- hands-on business brokerage techniques
- open data principle
- a digital business matching tool
- training on basics of business management

Figure B1: Scaling Readiness Assessment of the pig market arrangement framework For Uganda - April 2021 - formalized and sustainable transactions in pig markets

Pig Market Arrangement Framework for Formalized and Sustainable Transaction in Pork/ Pig Markets in Uganda, April 2021

The pig market arrangement framework in Uganda has

5.38	2.75	14.80
Average Readiness Level	Average Use Level	Average Scaling Readiness Level



These novel components were identified by assessing the available evidence base about Uganda's agriculture and rural sector and the key informant interviews with the experts working in various research and development organizations in Uganda. The components might change over time depending on the changes in Uganda or reorientation of the objective from formalized and sustainable transactions in pig markets to another objective. The components of the pig market arrangement framework have different Readiness and Use Levels (Figure B1). In this section, we articulate the basis for their Readiness and Use Levels.

Evidence-based logistics approach to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

The evidence-based logistics approach refers to the principle of using data and evidence on the supply chain and other logistical facts in designing, implementing, and regulating market arrangements. The contribution of the evidence-based logistics to the market arrangement was proposed as a conceptual model (Nabikyu & Kugonza, 2016), an application model designed and published (Dione et al., 2016; Ouma et al., 2017), and finally, an application was designed and being tested (Atherstone et al., 2019). Therefore, it has a Readiness Level of 6. However, there is no evidence that the application successfully improved market transactions in the Uganda pig value chain. The Scaling Readiness team could not find any reference to the use of the evidence-based logistics approach in the market arrangement efforts of the Livestock CRP Uganda Priority Country Project market arrangement component and/or related projects. Therefore, a Use Level of 0.

Commercial pig production model to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

The commercial pig production model uses commercial pig business models to design, implement, and regulate market arrangement activities. Nabikyu and Kugonza (Nabikyu & Kugonza, 2016) published a conceptual model. Several application model components for the commercial pig production model was published (Carter et al., 2018; Chenais et al., 2017; Ouma et al., 2017, 2018), and lately, some evidence on the use of the commercial pig production model was presented (Asindu et al., 2020). These publications made the commercial pig production model the highest Readiness component of the pig market arrangement framework. It has a Readiness Level of 8. The use of the commercial pig production model was documented in several publications. It was shown that commercial pig production models were used by designers and developers of market interventions not related to the intervention developing commercial components (Asindu et al., 2020; Chenais et al., 2017; Ouma et al., 2017, 2018) as well as some end-users who were neither involved in any projects nor receiving support (Okello et al., 2020; Thompson, 2021). Therefore, the Use Level of the commercial pig production model is 8.

Commercial capacity-building model to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

The commercial capacity building model refers to selecting the capacity development targets of the intervention based on the commercial viability of their products in the short and medium-term. An application model for using a commercial approach to training in the pig value chain in Uganda was proposed (Nabikyu & Kugonza, 2016), and such a curriculum was developed (ILRI, 2014). However, there is no clear evidence of

how the application of the commercial capacity development model benefited the transactions. Therefore, the commercial capacity-building model has a Readiness Level of 6. The curriculum was also implemented within the research for development projects (ILRI, 2014). Since there is no evidence about the participation of people who were not supported by a project in capacity-building events using the commercial capacity-building model, the Use Level is 2.

Multi-stakeholder feedback methods to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

Multi-stakeholder feedback methods refer to multi-stakeholder consultation and engagement methods to design and implement market arrangement activities and periodically update them based on the feedback from various value chain actors. The use of multi-stakeholder methods was proposed conceptually in 2013 (Ouma et al., 2013), and an application model was published (Ouma et al., 2017). However, the Scaling Readiness team could not identify any systematic evidence on the benefits driven from the implementation of the multi-stakeholder feedback methods. Therefore, multi-stakeholder feedback methods have a Readiness Level of 5. Multi-stakeholder feedback methods were implemented in market arrangement projects with the participation of project partners (Ouma et al., 2017), and it was shown that they were used by other projects (Ouma et al., 2013); corresponding to a Use Level of 4.

Hands-on business brokerage techniques to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

Hands-on business brokerage techniques refer to using customized best business brokerage techniques that fit the project sites' location to facilitate and improve the market arrangements. A basic model for the brokerage was published (Ouma et al., 2017), and an application of the hands-on business brokerage techniques was tested (Ouma et al., 2020). This implies that the technique has a Readiness Level of 6. The use of hands-on brokerage techniques was very well documented (Ouma et al., 2017, 2020). However, there is no evidence that the technique was used outside of the projects it was developed. This implies a Use Level of 1.

Open data principle to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

Open data principle refers to open access sharing all the market information generated during the activities and supporting generation and sharing of market information in the pig value chain. It was proposed by (Mulindwa et al., 2012) as a basic model. However, there was no explicit evidence referring to the development and use of the open data principles in pig value chains, although open data principles were considered critical components of market arrangements with formalized and sustainable transactions. Therefore, It has a Readiness Level of 2 and a Use Level of 0.

Digital business matching tool to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

A digital business matching tool refers to multi-platform software that matches pig real-time buyers and sellers in different locations. Conceptual models of how digital business matching tools can contribute to market arrangements in pig value chains were discussed (Atherstone et al., 2019; Lichoti et al., 2017; Nabikyu & Kugonza, 2016; Ouma et al., 2013), and an application model was shown to contribute to market arrangements (Bowman, 2019; Dione et al., 2016), This corresponds to a Readiness Level of 5. Bowman (2019) also showed that some project partners used them commonly, corresponding to a Use Level of 3.

Training on the basics of business management to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

Training on the basics of business management refers to providing a practical course on the basics of business management, such as accounting and contracting. A conceptual model of the business management training was validated (Dione et al., 2014), followed by application model testing (Nabikyu & Kugonza, 2016). There is no further evidence about the benefit of the training application; the Readiness Level is 5. It was shown that the training was provided to project partners (Dione et al., 2014; Ouma et al., 2017), corresponding to a Use Level of 4.

Scaling Readiness Assessment of the Innovation Package

The pig market arrangement framework alone is not enough to achieve impact at scale. It needs to be complemented by other compatible innovations that fit the conditions of Uganda to realize its full potential in improving formalized and sustainable transactions in pig markets in Uganda and achieve use at scale. The innovation package is a set of innovations including the pig market arrangement framework and other innovations needed to convince the framework's stakeholders about its benefits, ensuring that the pig market arrangement framework is available and effective.

The pig market arrangement framework innovation package has seven additional innovations:

FORMAL BUSINESS SUPPORT INCENTIVES

PIG LOGISTICS AND TRADE MODELS

PIG PURCHASE INSPECTION PRACTICES

STANDARDIZED PIG WEIGHT ESTIMATION

DISEASE MONITORING SOFTWARE

RAPID PIG HEALTH CHECK SOFTWARE

PIG TRANSPORTATION BEST PRACTICES

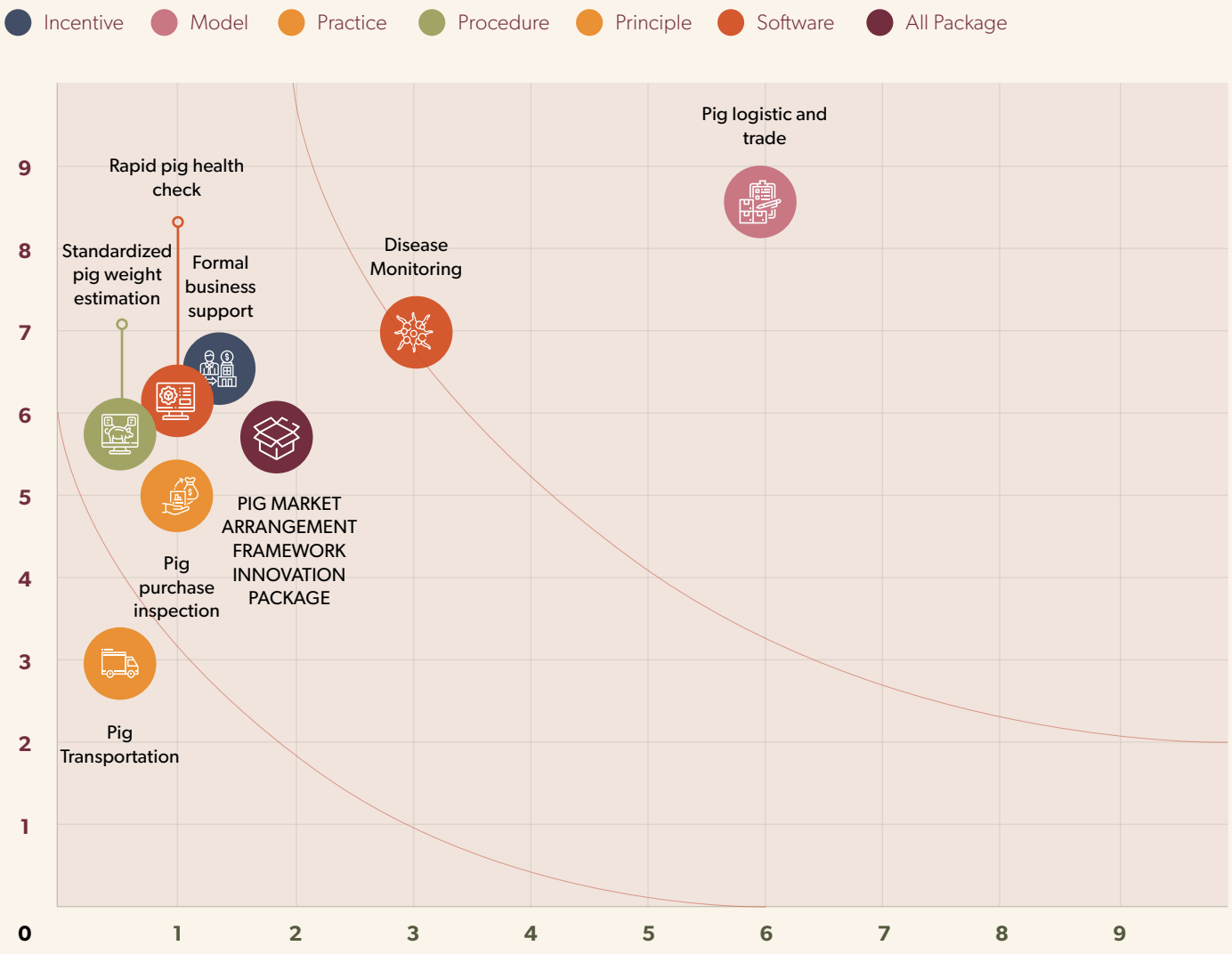
The Readiness and Use Levels of these seven innovations differ. Among them, practice types of innovations have lower Readiness and Use Levels, indicating that the practice domain in the pig market arrangement framework is less advanced than other domains (Figure B2). In the rest of the section, specific Levels of the innovations in the pig market arrangement framework package and the evidence sources that support these Levels are presented in detail.

Figure B2: Scaling Readiness Assessment of the the pig market arrangement framework Package For Uganda - 2021 April 2021- formalized and sustainable transactions in pig markets

Pig Market Arrangement Framework for Formalized and Sustainable Transaction in Pork/ Pig Markets in Uganda, April 2021

The pig market arrangement framework package has

5.86	1.89	11.08
Average Readiness Level	Average Use Level	Average Scaling Readiness Level



Formal business support incentives to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

Formal business support incentives refer to tax and fee exemptions for newly formalized enterprises included in the local and national legislation. An application model containing similar business support incentives was proposed (Lichoti et al., 2017; Ouma et al., 2018) and shown to have benefits (Ouma et al., 2017). Therefore, It has a Readiness Level of 6. It was also shown that several projects worked on developing the incentives (Lichoti et al., 2017; Oluka & Basheka, 2014). Since no use of such incentives was documented beyond projects, the Use Level of formal business support incentives is 1.

Pig logistics and trade models to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

Pig logistics and trade models refer to mathematical models for transport routes and schedules, location of market hubs, and other variables that optimize the total cost of logistics and markets. Several basic logistic and trade models were proposed for pig markets (Lichoti et al., 2017; Nabikyu & Kugonza, 2016; Odongo et al., 2018). Applications of them were shown to improve the pig market arrangements in controlled conditions (Atherstone et al., 2019; Atuhaire et al., 2013), and experimental studies were made to understand the use of logistics and trader models in uncontrolled conditions (Atherstone et al., 2019; Ouma et al., 2017). Therefore, pig logistics and trade models have a Readiness Level of 8. The literature has shown that the models were used by several delivery and use support stakeholders who were not part of research and development projects (Dione et al., 2016; Ouma et al., 2017), corresponding to a Use Level of 6.

Pig purchase inspection practices to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

Pig purchase inspection practices refer to a set of practices used at the farm gate to quickly identify several problems decreasing the price of the pig at a slaughter house (such as drug burden, disease). Basic models of pig purchase inspection practices were proposed and conceptually validated (Lichoti et al., 2017; Nabikyu & Kugonza, 2016), several applied models were reviewed (Lichoti et al., 2016, 2017). This corresponds to a Readiness Level of 5. Existing evidence on the use (Lichoti et al., 2017) showed the use of the practices only in a project setup. Therefore, the Use Level was 1.

Standardized pig weight estimation procedure to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

A standardized pig weight estimation procedure refers to the standardized use of ratios and a formula for estimating the weight obtained from the live feed (Walugembe et al., 2014). There was clear evidence on the standardized estimation procedure in Chinese and other East Asian pig value chains (Buayai et al., 2019; Kongsro, 2014; Liu et al., 2011), corresponding to a Readiness Level of 6. Since there was no evidence of it in Uganda, the Use Level is 0.

Disease monitoring software to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

Disease monitoring software refers to a digital tool showing the disease incidence and risk at specific coordinates in real-time. Several studies were reviewing the contribution of disease monitoring software conceptually (Dione et al., 2016; Lichoti et al., 2017; Muwonge et al., 2012) validating the conceptual model (Muwonge et al., 2012), presenting the validation of the applied model (Chenais et al., 2017; Muhanguzi et al., 2012) and showing the experimental evidence on the benefits of a specific disease monitoring software to pig market arrangements (MacMillan et al., 2011). Therefore, it has a Readiness Level of 7. There was also evidence that the disease monitoring software tools were commonly used by the partners of a project in Uganda. (Lichoti et al., 2014). This corresponds to a Use Level of 3.

Rapid pig health check software to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

Rapid pig health check software refers to a smartphone/tablet-based software that uses image recognition to identify several diseases in the pig. Literature proposed application models of health check software the market arrangements (Atherstone et al., 2019; Bowman, 2019; Chenais et al., 2019; Lichoti et al., 2017; Lumu et al., 2013; Muhangi et al., 2015) and validated different software tools (Feng et al., 2018; Gao et al., 2018; Hein, 2019; Kongsro, 2014; Matsumoto et al., 2020; Nantima et al., 2015). Therefore, rapid pig health check software has a Readiness Level of 6. Hein (2019) showed that there are projects using pig health check software corresponding to a Use Level of 1.

Pig transportation best practices to improve formalized and sustainable transactions in pig markets in Uganda, April 2021 onwards

Pig transportation best practices refer to practices that reduce the risk of damage and death of pigs during the multiple transportation steps from farm to slaughterhouses. A basic model for improving transportation practices was discussed (Dione et al., 2016; Lichoti et al., 2016); however, there was no application model. Therefore, It has a Readiness Level of 3. Since the Scaling Readiness team could not find any evidence of the use, the Use Level is 0.

PART

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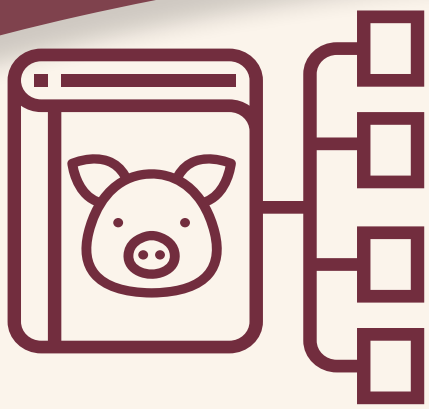


SCALING GUIDELINES FOR IMPROVING PIG MARKET ARRANGEMENT FRAMEWORK AT SCALE IN UGANDA

What are these Scaling Guidelines?

The scaling guidelines bridge the results of the Scaling Readiness diagnosis and assessments with the four major management questions vital for an intervention aiming to enhance the impact of the pig market arrangement framework at scale. Specifically, we reflect on the following:

1. what is meant by the pig market arrangement framework in Uganda, or what do the Livestock CRP Uganda Priority Country Project aim to scale,
2. what should interventions working on the pig market arrangement framework prioritize to achieve high impact,
3. which complementary innovations do the interventions need to prioritize for achieving formalized and sustainable transactions in pig markets at scale in Uganda, and
4. what competencies and capabilities should the intervention managers look for within their organizations and from other stakeholders operating in Uganda's agriculture for development landscape.

The scaling guidelines are positioned at the strategic level. They aim to be a first reference document for designing or adapting strategies and can be followed by a detailed action plan that can be integrated into the design and planning of the interventions to contribute to the pig market arrangement framework in Uganda. The guidelines are targeted at:

managers of the pig market arrangement framework projects, programs, and policies,

designers, developers, and managers of specific innovations and elements in pig market arrangement frameworks.

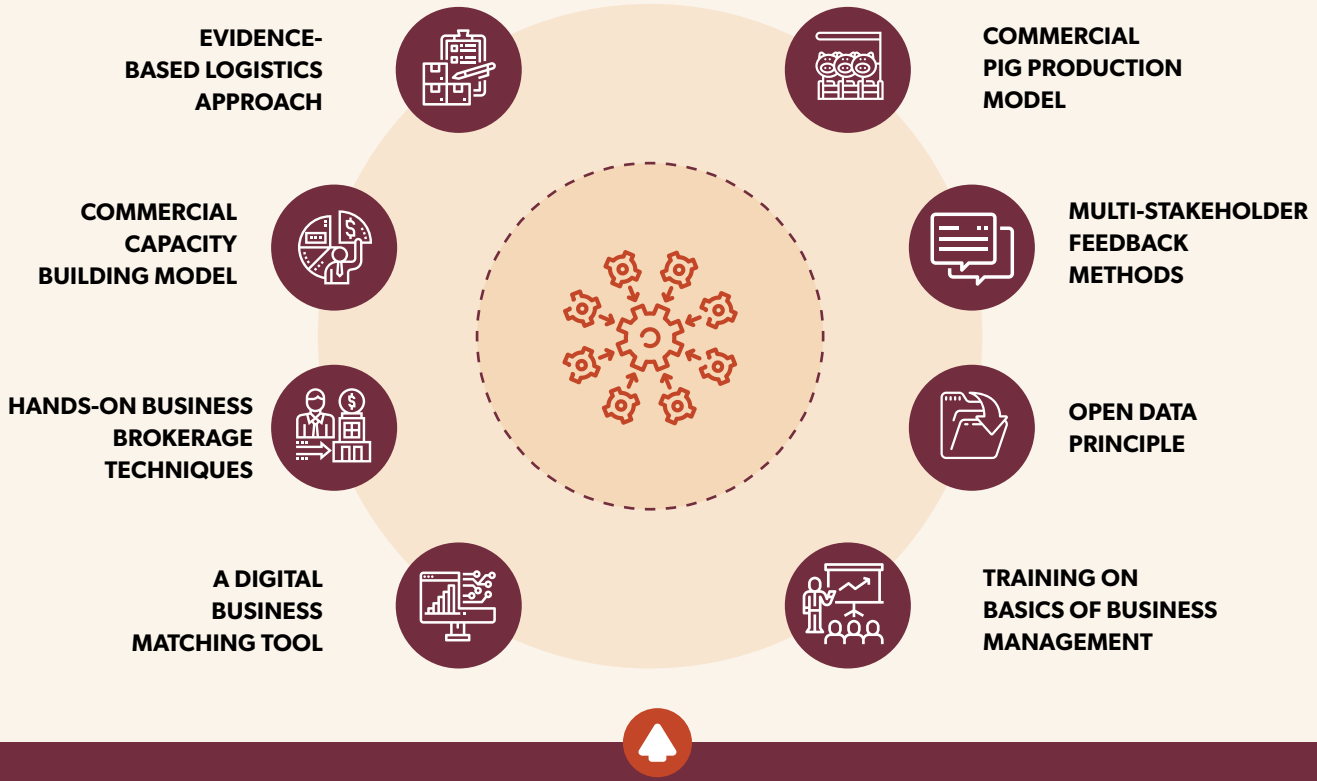
The Scaling Readiness measures and the evidence sources are presented but not articulated in this part. More information about the measures can be accessed from the Scaling Readiness Assessment (Part A). Detailed explanations about the measures and the evidence sources used to do the assessment can be accessed from the Scaling Readiness Evidence Review (Part B).

What is meant by the pig market arrangement framework in Uganda?

The pig market arrangement framework combines many different concepts, products, tools and other components. Among them, some are novel in Uganda. These novel components differentiate the pig market arrangement framework from other conventional agricultural systems in Uganda and make the pig market arrangement framework an innovation.

In other words, the pig market arrangement framework's innovation type is a framework since it is a model used to build or decide strategies and activities in Uganda. The pig market arrangement framework's novel components for Uganda might not be novel for other countries, and the system might not be considered an innovation in other countries.

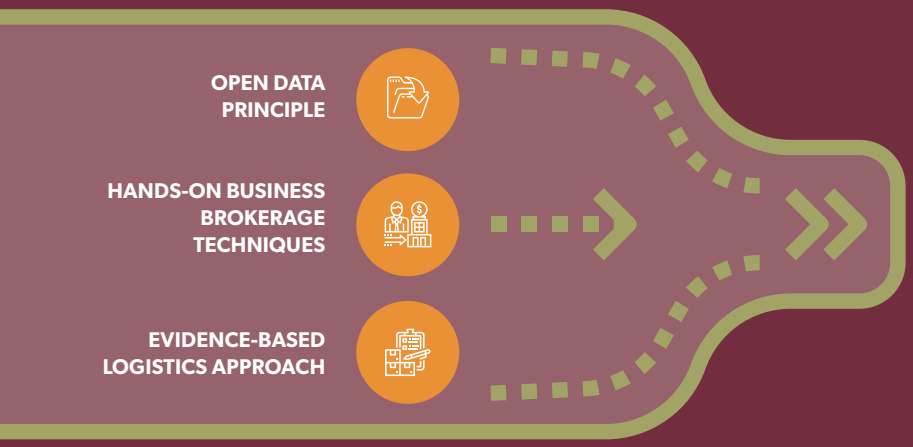
Specifically, the pig market arrangement framework in Uganda has the following eight novel components:



In brief, when an intervention mentions improving the use of the pig market arrangement framework at scale, it refers not only to increasing the use of an evidence-based logistics approach or commercial pig production model but the use of all the components listed above in an integrated way.

What can be done to improve the performance of the pig market arrangement framework in Uganda?

The pig market arrangement framework components have different Readiness and Use Levels to achieve formalized and sustainable transactions in pig markets. The Scaling Readiness assessment of the pig market arrangement framework showed that while some novel components are at the design stage, others are already tested and validated in Uganda. While some of the components are not known by small scale pig producers, pig aggregators, others implemented them without support from the government, civil society organizations and international organizations.



The Scaling Readiness Assessment showed that open data principle, evidence-based logistics approach, hands-on business brokerage techniques are the components that have the lowest maturity and use among all the novel components. In other words, they are the bottlenecks for achieving impact from using the pig market arrangement framework in Uganda to increase the formalized and sustainable transactions in pig markets.

Activities necessary to address the bottlenecks belong to two categories. The first category is the research and development (R&D) activities. R&D activities include all research, design, development activities that increase the Innovation Readiness of components. The second category is utilization activities. Utilization activities include all adoption, practice and implementation activities that increase the Innovation Use of the components. We recommend the following activities to address the bottlenecks that hinder the pig market arrangement framework's impact at scale.

Research and Development Activities

CONDUCT DESKTOP RESEARCH ON SUCCESSFUL IMPLEMENTATIONS OF OPENLY SHARING MARKET-RELATED INFORMATION IN LIVESTOCK VALUE CHAINS IN EAST AFRICA

The open data principle refers to open access sharing of all the market information generated during the activities and supporting generation and sharing of market information in the pig value chain such as government, pig producers, aggregators, associations. It is one of the least mature components of the pig market arrangement framework. Scaling Readiness research identified current conceptual desktop research activities on the role of the open data principle in the pig market arrangement framework. To improve the maturity of the open data principle, the Scaling Readiness team recommends communicating with the researchers conducting conceptual or theoretical research on the open data principle. This can lead to quick gains in developing insights about theories or frameworks that open data principle has the largest contribution to the pig market arrangement framework.

VALIDATE EXISTING EVIDENCE-BASED LOGISTICAL ARRANGEMENT APPROACHES IN PIG VALUE CHAINS AND TAILOR THEM FOR USE IN UGANDA AT SCALE

The evidence-based logistics approach is the principle of using data and evidence on the supply chain and other logistical facts in designing, implementing, regulating market arrangements . It is another component with relatively low maturity. Some interventions have been validating evidence-based logistics approaches in an experimental setup in similar conditions to Uganda. Increasing the maturity of the evidence-based logistics approach requires collaborating with the logistics researchers of these interventions and establishing cross-learning modalities. The collaboration on the evidence-based logistical arrangement approaches can save significant resources from the Livestock CRP Uganda Priority Country Project.

VALIDATE EXISTING EFFECTIVE HANDS-ON-BROKERAGE TECHNIQUES IN PIG VALUE CHAINS AND TAILOR THEM FOR IMPLEMENTATION AT SCALE IN UGANDA

Hands-on-business-brokerage techniques refer to using customized best business brokerage techniques that fit the location of the project sites to facilitate and improve the market arrangements. It has low maturity in comparison to other components. Some interventions have been working on validating hands-on-business-brokerage techniques in an experimental setup in similar conditions to Uganda. Improving the maturity of hands-on-business-brokerage techniques necessitates collaborating with the researchers of these interventions and establishing cross-learning modalities. The collaboration on hands-on business brokerage techniques can also save many resources from the Livestock CRP Uganda Priority Country Project.

Utilization Activities

PLAN HOW THE LIVESTOCK CRP AND OTHER INITIATIVES CAN SUPPORT STAKEHOLDERS IN THE UGANDAN PIG VALUE CHAIN TO PRODUCE, ACCESS AND USE RELIABLE AND AFFORDABLE MARKET INFORMATION AT SCALE

The open data principle is one of the least used components. The open data principle is new to the Livestock CRP Uganda Priority Country Project and pig value chain. Improving the maturity of the open data principle necessitates to ideate how Livestock CRP Uganda Priority Country Project and other interventions can work on the open data principle. Ideation, especially in collaboration with some key stakeholders, will be the first step to better utilize the open data principle in Uganda at scale.

PLAN HOW LOGISTICAL DATA AND CONDITIONS CAN GUIDE DESIGNING AND DETERMINING THE STRATEGIES AND RESEARCH AND DEVELOPMENT EFFORTS IN THE PIG VALUE CHAIN

The evidence-based logistics approach is one of the components with low use. The idea of an evidence-based logistics approach is new to the Livestock CRP Uganda Priority Country Project and pig value chain. The Scaling Readiness team recommends ideating how Livestock CRP Uganda Priority Country Project and other interventions can work on an evidence-based logistics approach to improve its utilization in pig value chains in Uganda. Ideation, especially in collaboration with some key stakeholders, will be the first step to better utilize the evidence-based logistics approach in Uganda at scale.

SENSITIZE AND CONVINCE LIVESTOCK CRP PARTNERS ABOUT THE BENEFITS OF IMPLEMENTING HANDS-ON-BROKERAGE TECHNIQUES TO ENHANCE THE MARKET TRANSACTIONS IN THE PIG VALUE CHAIN IN UGANDA

Hands-on business brokerage techniques is another one of the least used components. The Scaling Readiness team could not identify any use of hands-on business brokerage techniques in Uganda outside of the Livestock CRP Uganda Priority Country Project core team. We suggest organizing awareness-raising events with the intervention partners, developing a shared understanding, and implementing customized engagement options that can convince them to use or apply hands-on business brokerage techniques. Increased awareness, shared understanding and convinced intervention partners will minimize the loss of the messages of the Livestock CRP Uganda Priority Country Project about hands-on business brokerage techniques.

Which complementary innovations do the interventions need to prioritize for improving formalized and sustainable transactions in pig markets at scale in Uganda?

Achieving a high maturity pig market arrangement framework alone will not be sufficient to have a high positive impact on formalized and sustainable transactions in pig markets in Uganda. It is important to improve the other innovations that complement the pig market arrangement framework, i.e. complementary innovations, to ensure sufficient use of the framework at scale.

The Scaling Readiness assessment identified the following seven complementary innovations and assessed Readiness and Use Levels of each:

FORMAL BUSINESS SUPPORT INCENTIVES

PIG LOGISTICS AND TRADE MODELS

PIG PURCHASE INSPECTION PRACTICES

STANDARDIZED PIG WEIGHT ESTIMATION

DISEASE MONITORING SOFTWARE

RAPID PIG HEALTH CHECK SOFTWARE

PIG TRANSPORTATION BEST PRACTICES

The complementary innovations had different Readiness and Use Levels. Among them, the first two had relatively low Readiness and Use Levels and are the bottlenecks in the pig market arrangement framework package.

Research and Development Activities

COMPARE AND CONTRAST EXISTING CONCEPTUAL MODELS ON PIG TRANSPORTATION BEST PRACTICES AND SYNTHESIZE A MODEL APPLICABLE IN UGANDA

Pig transportation best practices refer to a set of practices that reduces the risk of damage and death of pigs during the multiple transportation steps from farms to the slaughterhouses. It is one of the least mature components of the pig market arrangement framework. There are studies presenting models of how pig transportation best practices function in market arrangements. However, they are broad and do not explain how pig transportation best practices can be an effective part of the pig market arrangement framework package. To improve the maturity of pig transportation best practices, we recommend comparing and contrasting existing conceptual models on pig transportation best practices and synthesizing a model applicable in Uganda. The synthesis will enable the design of an application model in which pig transportation best practices is an integral part of the pig market arrangement framework package for achieving formalized and sustainable transactions in pig markets.

DESIGN EXPERIMENTAL RESEARCH SETUP AND VALIDATE THE ROLE OF PIG PURCHASE INSPECTION PRACTICES IN IMPROVING THE PERFORMANCE OF THE PIG MARKET ARRANGEMENT FRAMEWORK

Pig purchase inspection practices refer to a set of practices used at the farm gate to quickly identify several problems decreasing the price of the pig at the slaughterhouse (such as drug burden, disease). It is one of the least mature components of the pig market arrangement framework. The Scaling Readiness team has identified literature resources presenting applied evidence on the use of pig purchase inspection practices together with pig market arrangement frameworks. However, the evidence is not based on experiments. To improve the maturity of pig purchase inspection practices, the Scaling Readiness team recommends designing an experimental research setup and validate the role of pig purchase inspection practices in improving the use. Experimental evidence will pave the way for more effective pig purchase inspection practices and enable major performance gains for the pig market arrangement framework.

Utilization Activities

IDEATE ABOUT HOW LIVESTOCK CRP UGANDA PRIORITY COUNTRY PROJECT AND OTHER INTERVENTIONS CAN WORK ON PIG TRANSPORTATION BEST PRACTICES

We could not identify any literature resource that presented the idea of pig transportation best practices explicitly. Improving the maturity of pig transportation best practices necessitates ideating how Livestock CRP Uganda Priority Country Project and other interventions can work on pig transportation best practices. Ideation, especially in collaboration with some key stakeholders, will be the first step to better utilize pig transportation best practices in Uganda at scale as a complementary innovation to the pig market arrangement package.

TO ORGANIZE AWARENESS-RAISING EVENTS WITH THE PARTNERS OF THE INTERVENTION, DEVELOP A SHARED UNDERSTANDING WITH THEM AND IMPLEMENT CUSTOMIZED ENGAGEMENT OPTIONS THAT CAN CONVINCE THEM TO USE OR APPLY PIG PURCHASE INSPECTION PRACTICES

Pig purchase inspection practices are one of the least used innovations in the innovation package. The Scaling Readiness team could not identify any use of pig purchase inspection practices in Uganda outside of the Livestock CRP Uganda Priority Country Project core team members. Improving the maturity of pig purchase inspection practices necessitates organizing awareness-raising events with the intervention partners, developing a shared understanding with them, and implementing customized engagement options that can convince them to use or apply pig purchase inspection practices. Increased awareness, shared understanding and convinced intervention partners will minimize the loss of the messages of the Livestock CRP Uganda Priority Country Project about pig purchase inspection practices.

Which competencies and capabilities should the intervention managers look for within their organizations and other stakeholders operating in the agriculture development landscape in Uganda?

Advancing the priority work on the pig market arrangement framework components and complementary innovations requires a specific set of competencies. The Livestock, CRP Uganda Priority Country Project, needs to access these competencies by including the people in the intervention teams or establishing collaboration mechanisms. The required competencies cuts across multiple disciplines such as market information specialists, data management experts, logistics and supply chain analysts, pig supply chain and purchase specialists, business negotiation specialists, livestock trading experts, local senior pig business people, transportation (value chain) researchers, transportation project managers, pig quality inspectors, quality control officers and trainers of pig quality and health in addition to pig market arrangement framework's subjects.

Priority	Type of science
Conduct desktop research on successful implementations of openly sharing market-related information in livestock value chains in East Africa	Market information systems, economics and business research, pig markets, value chain management
Validate existing evidence-based logistical arrangement approaches in pig value chains and tailor them for use in Uganda at scale	Logistics and supply chain research, pig markets, quantitative research
Validate existing effective hands-on-brokerage techniques in pig value chains and tailor them for implementing them at scale in Uganda	Market brokerage, pig markets, rural development, qualitative research
Brainstorm how the Livestock CRP and other initiatives can support stakeholders in the Uganda pig value chain to produce, access and use reliable and affordable market information at scale	SCRUM masters/project design facilitators, market information systems, knowledge management, ICT
Brainstorm how logistical data and conditions can guide designing and determining the strategies and research and development efforts in the pig value chain	SCRUM masters/project design facilitators, logistics and supply chain management, knowledge management, ICT, project management
Sensitize and convince Livestock CRP partners about the benefits of implementing hands-on-brokerage techniques to enhance the market transactions in the pig value chain in Uganda	Multi-stakeholder process facilitation and moderation, innovation brokers, pig traders
Compare and contrast existing conceptual models on pig transportation best practices and synthesize a model applicable in Uganda	Transportation research, systematic reviews
Design experimental research setup and validate the role of pig purchase inspection practices in improving the performance of the pig market arrangement framework	Experimental research, pig trade, food safety, market research
Ideate about how Livestock CRP Uganda Priority Country Project and other interventions can work on pig transportation best practices	Project management, livestock, transportation, effective communication
To organize awareness-raising events with the partners of the intervention, develop a shared understanding with them and implement customized engagement options that can convince them to use or apply pig purchase inspection practices	Multi-stakeholder process facilitation and moderation, pig inspection, food safety, pig trade

Annex-1: Innovation Readiness Levels (Adapted from Sartas et al., 2020)

Innovation Readiness Level	Innovation Readiness Category	Description
0	Idea	Thinking about a novelty's ability to solve a problem
1	Hypothesis (proven)	Cognitively validated idea: Hypothesis
2	Basic Model (unproven)	Desktop research on the hypotheses' ability to solve a problem using existing conceptual/theoretical evidence
3	Basic Model (proven)	Conceptual/theoretical validated set of interrelated hypotheses: basic model
4	Application Model (unproven)	Desktop research on the basic model's ability to solve a problem using existing applied evidence
5	Application Model (proven)	Validated basic model using applied evidence: applied model
6	Application (unproven)	Experimental research on application model's ability to solve a problem in the controlled conditions
7	Application (proven)	Validated applied model using experimental evidence: application
8	Innovation (unproven)	Testing the capacity of the application to generate value by solving a problem in a specific uncontrolled context
9	Innovation (proven)	Validated application using evidence on the value: innovation

Annex-2: Innovation Use Levels (Adapted from Sartas et al., 2020)

Innovation Use Level	Innovation Use Category	Description
0	None	The novelty is not used for achieving the objective of the intervention in the specific spatial-temporal context where the innovation is to contribute to achieving impact
1	Team	The novelty is only used by the intervention team
2	Partners (rare)	The novelty has some use by the intervention partners
3	Partners (common)	The novelty is commonly used by the intervention partners
4	Unconnected designers and developers (rare)	The novelty has some use by designers and developers who are not directly involved in the intervention
5	Unconnected designers and developers (common)	The novelty is commonly used by designers and developers who are not directly involved in the intervention
6	Unconnected delivery and use support stakeholders (rare)	The novelty has some use by delivery and use support stakeholders who are not directly involved in the intervention
7	Unconnected delivery and use support stakeholders (common)	The novelty is commonly used by delivery and use support stakeholders who are not directly involved in the intervention
8	Unconnected end-users (rare)	The novelty has some use by the end or final users who are not involved in the intervention
9	Unconnected end-users (common)	The novelty is commonly used by the end or final users who are not involved in the intervention

Annex-3: Evidence Sources Referred in the Evidence Review

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