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HIGH QUALITY CASSAVA PEEL PROJECT

Nigeria Scaling Scan Report 2021

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

CGIAR
RESEARCH PROGRAM ON Livestock

NIGERIA

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By 2026, the Livestock CRP[1] wants to facilitate increased transformation of fresh cassava peels and its use as HQCP mash in animal feed from 30,000 tons per year by 200 small and medium scale enterprises (SMEs) in Nigeria to 500,000 tons per year by 500 SMEs in Nigeria, Ghana, DRC, Rwanda, and Tanzania for additional income, creating employment, mitigating feed scarcity, and cleaning the environment.

This ambition was developed via a consultative process with the project team, government stakeholders, private partners, farmers, and their communities.

1.The Livestock CRP program will end at the end of 2021, this work will continue under the new entity working on livestock

Acknowledgement

We take this opportunity to thank the HQCP project team led by Tunde Amole and including Alan Duncan, Iheanacho Okike, and Chris Jones who provided great insights on the project and the technology.

We appreciate the funding support from the CGIAR Research Program on Livestock that enabled this study, as well as past support from the CGIAR Research Program on Roots, Tubers and Bananas (RTB). In particular, we wish to thank the respective CRP leaders, Tom Randolph and Graham Thiele, for being early supporters of the scaling approaches and of HQCP work.

We also extend our gratitude to the passionate private stakeholders who remained committed and engaged in the whole process to provide inputs on their industry experiences and all who have provided inputs since the inception of the innovation. They included Synergos Nigeria, Deep Launch Ltd, Sledge Agro Ltd, Aquada Development Corporation, Terudee Farms Ltd, Tosi farms & Agric Ventures Ltd, All Farmers Association of Nigeria Oyo State, Nine Stars Farms & Integrated Services Limited, Samaab Farms and Flour Mills of Nigeria Plc.

Figures

Acronyms and abbreviations

CBBPs	Community-based breeding programs
CGIAR	Consultative Group on International Agricultural Research
CIMMYT	International Maize and Wheat Improvement Center
CLEANED	Comprehensive Livestock Environmental Assessment for Improved Nutrition, a Secured Environment and Sustainable Development along livestock value chains
COVID-19	2019 novel coronavirus disease
CRP	CGIAR Research Program on Livestock
GHG	Greenhouse gases
I@S	Impact at Scale
ILRI	International Livestock Research Institute
NARI	National Agricultural Research Institutes
NGO	Non-governmental organization
PPP	Public-private partnerships
HQCP	High Quality Cassava Peel

Executive Summary

CGIAR has been working to improve food and nutritional security and reduce poverty in developing countries through research and development activities on efficient, safe, and sustainable livestock use. However, translating research outputs into products that can be adopted at scale has been a significant challenge for researchers in ILRI and other CGIAR centres. To address this, ILRI's Impact at Scale (I@S) program has curated and synthesized a set of scaling tools and approaches to help researchers address this enduring challenge in their work. ILRI's evolving I@S approach, initially summarized in the 'Scaling better, together' scaling framework, is a modular approach with three 'tracks': light, standard, and an extended track. The light track builds on an adapted version of the Scaling Scan tool by the Public-Private Partnerships (PPP) Lab and the International Maize and Wheat Improvement Center (CIMMYT)[2], and the Agricultural Scalability Assessment Tool (ASAT) by the United States Agency for International Development (USAID). It leads to an agreed scaling ambition from a stakeholder consultative process, a review of the scaling ambition against ten Scaling Ingredients, and identifying potential opportunities and threats to reaching the stated Scaling ambition.

The Cassava Peel Transformation project, hereafter the HQCP Project, worked on the significant problem of cassava peel waste. Cassava is primarily grown for human consumption with various food products processed from the tuber. Cassava generates a high-volume of waste in the form of cassava wet peels, which have been a cause of significant environmental problems as the waste peels are disposed of as heap piles left to rot. These rotting piles cause pollution of the air, soil, and groundwater. The rotting cassava wet peels also produce bioethanol greenhouse gas emissions. The project came with an innovation that converted these wet cassava peels into energy and starch animal feed ingredients. The process involves grating the wet cassava peels three times, pressing to express the excess water and fermenting to detoxify the product after which it is ready for use as a feed ingredient. Upon drying, the product, now referred to as high quality cassava peel (HQCP), mashes can make up to two-thirds of feed products for fish, cattle, pigs, and poultry.

This report examines the project using the Light Track of ILRI's Scaling Framework[3]. It highlights ILRI's adapted Scaling Scan Approach, *hereafter referred to as the Scaling Scan*, and its significant outcomes for the project team and its stakeholders to:

Comprehend the multiple dimensions of scaling

Identify threats for scaling and find recommendations to mitigate them

Develop a realistic scaling ambition for the project to refer and monitor continuously

Develop a scaling mind-set

Understand the role non-technical factors play in scaling through their interaction with the Scaling Ingredients

2. Jacobs, F., Ubels, J., Woltering, L., 2018. The Scaling Scan – A practical tool to determine the strengths and weaknesses of your scaling ambition. Published by the PPPlab and CIMMYT.
3. ILRI's Scaling Scan Approach and Tools were designed based on the Original Scaling Scan Approach developed by PPP Lab and CGIAR CIMMYT, and the Agricultural Scalability Assessment Tool (ASAT) by the United States Agency for International Development (USAID). They include tools and practices that enable the implementation of ILRI adapted Scaling Scan remotely and increase the user friendliness of the new approach.

PROCESS AND METHODOLOGY

This Scaling Scan followed a facilitated participatory process involving key project partners and stakeholders[4]. These included the core project team and key – mostly private – partners from the project who are processing the HQCP mash as a feed ingredient. The participants were engaged in developing a realistic scaling ambition for the HQCP Mash, assessing the adequacy of the scaling approach against ten Scaling Ingredients to identify opportunities and threats, and coming up with action points suggesting on exploiting the opportunities and mitigating the threats.

This Scaling Scan analysis is part of a series of scaling studies conducted in 2021 across ILRI and the CGIAR Research Program on Livestock (Livestock CRP) portfolio. The report is organized into four sections, starting with a section that highlights the scaling approach adopted for the analysis. The second section gives an overview of the project under study. It is followed by the actual Scaling Scan process section that provides details about the methods and approaches, including the results for the various sub-sections - scaling ambition, Scaling Ingredients discussion, critical analysis of the Scaling Ingredients, opportunities, and potential threats. Finally, the report concludes by summarizing findings and making recommendations.

SCALING AMBITION

The following scaling ambition was created by the project team and validated by stakeholders.

> *"By 2026, the Livestock CRP[5] wants to facilitate increased transformation of fresh cassava peels and its use as HQCP mash in animal feed from 30,000 tons per year by 200 small and medium scale enterprises (SMEs) in Nigeria to 500,000 tons per year by 500 SMEs in Nigeria, Ghana, DRC, Rwanda, and Tanzania for additional income, creating employment, mitigating feed scarcity and cleaning the environment.*

The HQCP mash innovation is the process for converting the wet cassava peel waste into a high value livestock feed ingredient. It is a technical innovation that requires establishment of small-scale processing factories and marketing systems with high potential of going to scale as it is already being adopted by several medium level feed processors in Nigeria.

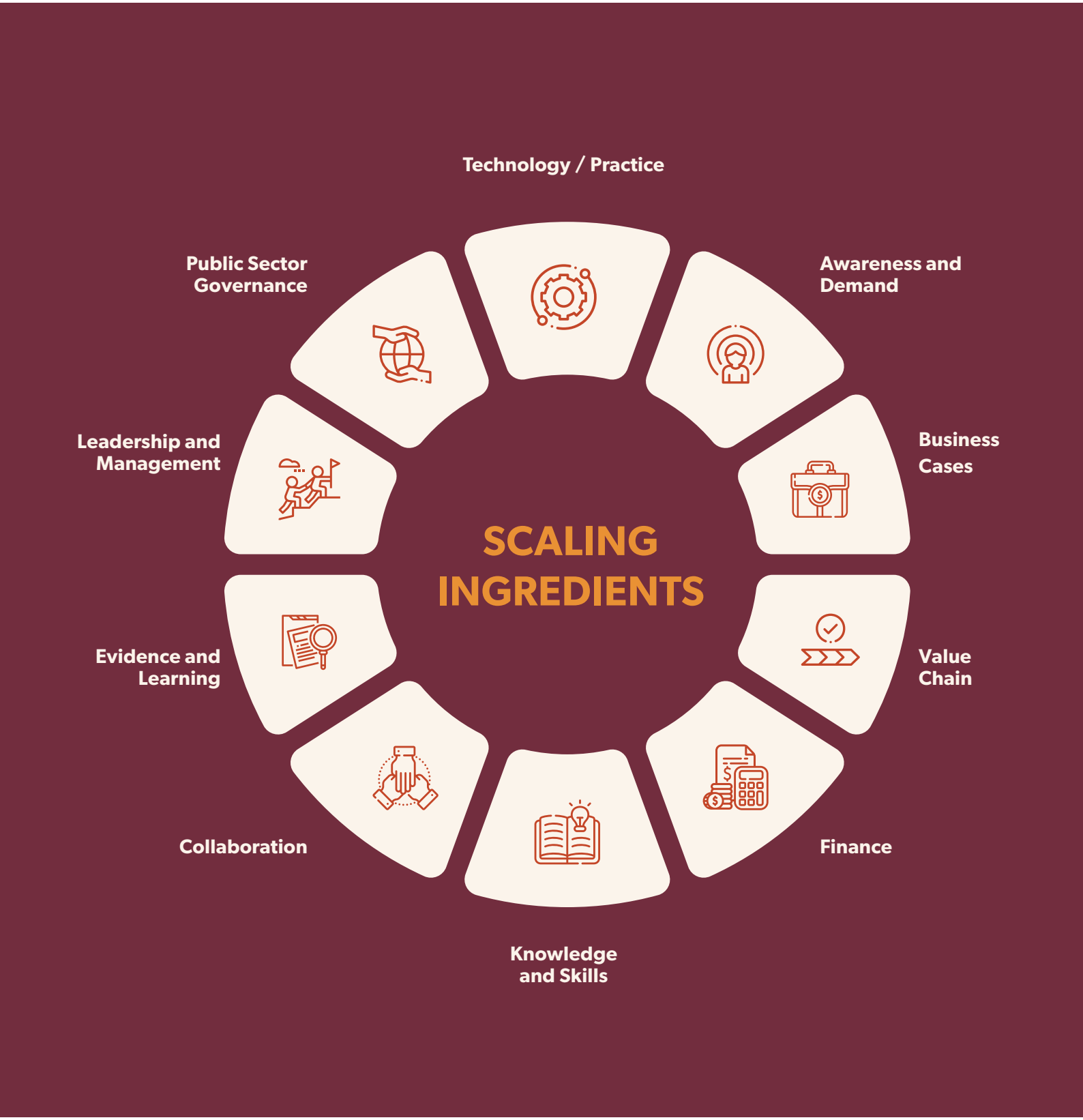
The primary targets of the innovation are small-scale entrepreneurs with the ability to establish processing facilities and then market HQCP to livestock producers. Currently, the scaling ambition targets the Nigerian market.

The scaling study involved a group that has been with the project since the onset, which includes CGIAR scientists, private feed processors and other actors. These groups are organized into a community of practice referred to as Cassava Peel First Users and provide the leadership to scale. A 10-year timeline is targeted as the scaling phase, 5 of which will continue having CGIAR support. The expected outcomes are to have a new income source for value chain actors, increased animal feed availability, a healthier environment, and cheaper animal food source.

4. The workshops took place between January 25, 2021 and March 23, 2021.
5. Ibid., p.4

Scaling Ingredients Analysis

Figure 1: Scaling Ingredients[4]



The survey results revealed several opportunities and potential threats for the ingredients to reach the Scaling ambition.

As a technology advancement, the HQCP mash is a relevant innovation for the target group as there is early private sector driven adoption of the value chain. The conversion of the waste peel to high value feed ingredient is backed by sound scientific research and it is already a registered trademark in Nigeria as a feed ingredient. The value chain actors already appreciate the significance of replacing maize – which has higher cost implications – with the HQCP mash as the main animal feed ingredient for energy; the mash is already in high demand, more than the supply can meet.

Cassava peels have different logistical needs than maize, which raises the cost of adoption and represents a significant threat to reaching the scaling ambition. Cassava peels are sold as wet peels, with 75% being water that is not required for the final HQCP mash, which only increases the costs of transportation.

The project has put out all the necessary information for adopting the innovation and is free for access. However, adoption of the innovation requires significant investment in processing equipment. Collecting wet peels for processing similarly requires significant transport investment. Therefore, the innovation is easier to adopt in cassava production regions.

Awareness and Demand. Actors in the value chain appreciate the innovation because of the awareness of the innovation raised by CGIAR partners involved in the research. There is information ready on the innovation, including training materials for those who want to adopt it. The government is aware of the innovation and supports the mash as a feed ingredient. The demand for the HQCP mash includes farmers using the technology as a feed ingredient, and millers using the mash as component in feed compounding.

Supply is threatened by the willingness to pay for a fair price for the HQCP mash which threatens the processors' business cases on the mash and further slows down the growth of the value chain.

Business Cases. There are several business cases that have arisen from the HQCP mash such as animal feed ingredient- feed component, processors, collection centers and peel cake production. It is also being used as a source of energy for commercial biogas generation.

The absence of adequate governance structures, especially in the market, is preventing the value chain from realizing its full potential. Lack of governance has led to lack of standardization, inconsistency, low quality, and volatile pricing of the mash. The pricing of the mash was initially thought to be half that of maize. Buyers on the other hand offer to buy way less than half the price of maize which disadvantages the processors. However, maize is not a like for like comparison with the mash in terms of costs and therefore, process. The cost of the mash is also influenced by the overpricing of the cassava tuber due to fluctuating availablity of the tuber throughout the year.

Value Chain. Relations among actors are adequately developed with no real power imbalance. Governance in the value chain is largely informal. There is a conducive environment for performance in the value chain characterized by the interest of private sector investors in the value chain as processors, and a lack of any significant trade barriers. However, the value chain is threatened by a lack of standardization and certification frameworks for the HQCP mash, resulting in poor and inconsistent quality of mash.

Finance. The value chain has largely been funded by processors, who fund their own processing plants. There is no specific funding to support scaling, which represents a significant risk for exploding the adoption for the different use cases of the mash processing especially for aggregation, cake production, and transport.

Knowledge and Skills. The early adopters are experienced feed millers with the necessary knowledge and skills to use the innovation in the intended way. They have adopted and used training materials.

The roles and responsibilities of key actors are clear and complementary. However, there are no accountability mechanisms to enforce the roles which ultimately affect the quality of the products and timelines; due to the lack of contractual arrangements, cassava farmers do not have to produce in order to meet the demand.

The value chain actors are organized informally through the social media platform WhatsApp, as opposed to formally in associations like cooperatives. Due to the informality, these grouping has not benefited the value chain in terms of providing strategic direction and joint priority setting.

Public sector governance. The role of the government in supporting the scaling ambition is majorly for providing a standardization and certification framework for the sub-sector.

CONCLUSION

The HQCP mash technology has resulted in new income opportunities for actors in the cassava value chain in Nigeria. These include farmers who in addition to selling cassava tubers can now also sell the cassava peels, new investors who are processing the HQCP mash, and feed compounders who are now using a cheaper ingredient for animal feed. Benefiting from the new value chain has come at different costs for the different actors, with processors bearing the highest out of the need to buy equipment and investing in processing operations. HQCP mash being an alternative to maize as an animal feed ingredient, having different logistical challenges to maize due to the high-water content of the wet cassava peel which can be up to 70% of the total weight. This increases the cost of production for the mash. Investors who produce the HQCP mash in addition to other cassava products like garri have found it easier to recoup this initial high cost of investment compared to those that only produce the mash. To reduce this high production costs, it is imperative that the value chain reduces this high transport cost of the wet cassava peels by exploring opportunities of pre-processing the peels before transportation.

For the HQCP to sustainably replace maize as an animal feed ingredient, the wet cassava peels must be available all year round and across the country. This means there must be an increase in farm production of cassava from the current quantities that have proven inadequate to fulfill the new value chain leading to high cost of the processed HQCP mash.

One of the key challenges that feed compounders are experiencing in using the HQCP mash as an ingredient is inconsistency in quality from the various processors. This is because the subsector lacks a quality assurance system to control quality. This lack of standardization has a negative impact on the perception of the technology and increases the cost for feed compounders who must invest in quality assessment for every batch they receive. The development of a quality assurance system is therefore urgent for the scaling phase of the technology.

To resolve some of the issues and challenges identified in this report, the value chain needs to approach the issues in a stakeholder consultative process. To do this, there is a need to organize stakeholders beyond the current format of using social media platform WhatsApp into a more purposeful platform better suited for organization, collaboration, and documentation.

In the discussion with processors and feed compounders, the HQCP was consistently compared to maize for protein content. This notwithstanding the fact that HQCP mash is marketed as a good source of energy in feed ingredients. Such narrative could be a threat to uptake for actors who are not experts in nutrition and therefore need to be addressed with awareness.

RECOMMENDATIONS

Strengthen the HQCP mash business case by developing a cassava wet peel cake production sub-sector to reduce the water content of the wet peels, thus significantly reducing the costs of transportation to the HQCP mash processing.

Explore the development of a quality assurance system for the HQCP mash value chain by doing or commissioning a high-level needs analysis of a HQCP mash quality assurance system.

Further develop existing stakeholder collaboration mainly from a communicating platform into a more purposeful platform better suited towards strategic direction setting and implementation.

Reconcile the initial HQCP mash project findings with the current practitioner experiences for the key issues that come up, such as the proportional part of the mash that can be used in compounded feed for different animal feeds.

ILRI's I@S scaling framework

Scaling in projects is when an innovation (technology, product, process, or structure) reaches more people, creates greater efficiency per person, and achieves system change and sustainability.

ILRI'S I@S FRAMEWORK DIFFERENTIATES THREE MAIN INTERDEPENDENT TYPES OF SCALING:

Scaling out Focuses on larger numbers, such as replicating or rolling out a successful solution or model to new clients, beneficiaries, or geographies.

Scaling up This involves influencing institutional conditions. Significant scale can frequently only be achieved by addressing the enabling environment on the institutional level. Some examples are policies, regulations, laws affecting resource allocation to enable innovation's performance, expansion, and sustainability.

Scaling deep Is changing cultural norms, changing the 'hearts and minds' of people within an organization, system, or community in terms of narrative, values or beliefs to implement the successful solution.

ILRI's scaling work has adopted a working definition where scaling includes increasing the following:

number of individual users of an innovation (novel products, services, technologies)

the organizations the user is working for

the disciplines the users belong to

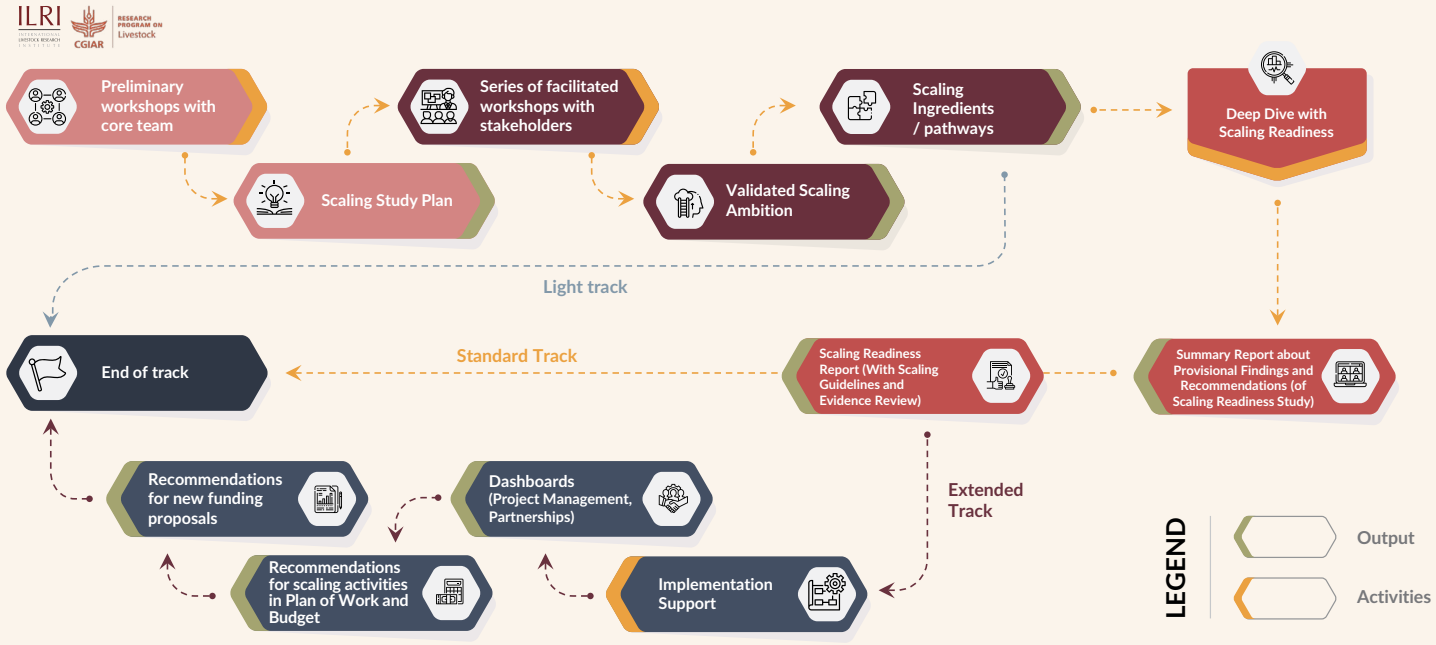
the changes the innovation contributes to

the locations where the innovations are used

and any other areas or fields where innovations are used

To make scaling concepts and tools more accessible to ILRI researchers and their partners, ILRI's I@S program reviewed the landscape of scaling to summarize relevant approaches and tools that livestock projects can benefit from. The objective is to provide those projects with a detailed process on how they can scale more effectively. The resulting ILRI framework offers an overview of the steps and short summaries and assessments of nine tools related to the scalability assessment. Figure 2 below shows the various scaling tracks (light, standard, extended) available to a project depending on the different project circumstances and preferences.

Figure 2: ILRI I@S framework



The light track is the focus of this report. The light track is an adapted application of the Scaling Scan tool by the PPPLab, and the International Maize and Wheat Improvement Center (CIMMYT)[6] , and the Agricultural Scalability Assessment Tool (ASAT) by the United States Agency for International Development (USAID). It's a three-part process that (1) begins with developing a scaling ambition, (2) scoring a ten scaling ingredients survey of 40 questions, and (3) working on the Points of Attention focused on emerging opportunities and threats. All three parts involve external project stakeholders and partners. The outputs from this track are a Scaling Study plan, a realistic project scaling ambition, and a Scaling Scan report.

6. Jacobs, F., Ubels, J., Woltering, L., 2018. The Scaling Scan – A practical tool to determine the strengths and weaknesses of your scaling ambition. Published by the PPPlab and CIMMYT.

Approach: Virtual Scaling Scan workshop series

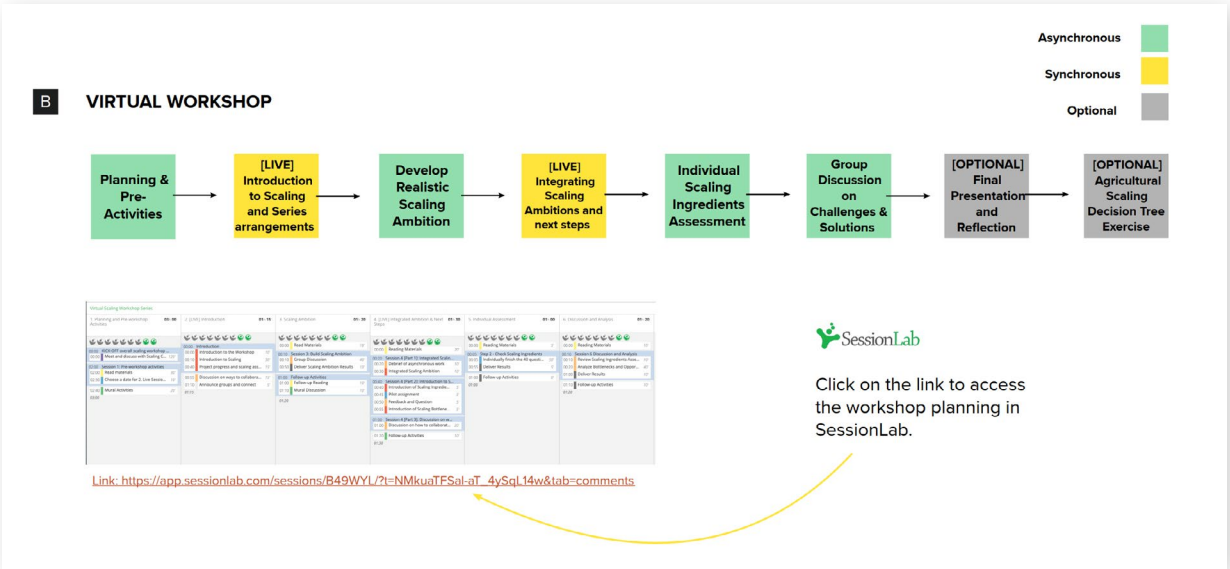
CONVERTING TOOLS TO ONLINE / DIGITAL DELIVERY

With the COVID-19 pandemic spread across the globe, ILRI adopted a blended approach of engaging scaling teams in a virtual workshops series that included synchronous and asynchronous engagements in a Scaling Scan workshop series to deliver the scaling assessment work.

TIME AND LOGISTICS OF THE SCALING PARTICIPANTS

The scaling participants comprise the scaling coordinator, core scaling project team, scaling champion and the partners and stakeholders. The scaling coordinator is the overall scaling facilitator assigned to the participants from ILRI'S I@S program. The core scaling project team comprises the critical project staff who shall participate in the Scaling Scan and are led by their project leader, who, in this process, is the scaling champion. Finally, the participants are completed by project partners and stakeholders relevant to the work and whose inputs and participation are critical to scaling the project's target innovation or technology.

Figure 3: I@S hybrid workshop series



IN THIS CASE, THE WORK BEGAN IN JANUARY 2020 AND CONCLUDED IN MARCH 2021.

- **(Session 0)** - One week workshop - Planning
- **(Session 1-3)** - 3 weeks - Implementation + 1 week (optional sessions, flexible)
- **(Sessions 4–5)** - 2-weeks - Summary and reporting period

TOTAL TIME INVESTMENTS:

- Workshop participants: 7-9 hours in total from the beginning of the Scaling Scan process to the end
- The core project team and the scaling champion: 15-20 hours

MAIN CHANNEL: MS Teams and Zoom

DIGITAL TOOLS: Smartsheet for project management and Session Lab for workflow planning

Overview of the HQCP mash Innovation

Nigeria has been the largest producer of cassava in the world, harvesting over 57 million tons in a year. This cassava is primarily grown for human consumption; however, the process generates a high volume of waste, in the form of cassava peels. The cassava peel has been a cause of significant environmental problems, causing health problems for people living in the surrounding high cassava production areas, especially those close to the processing factories. This is because the common disposal place of the heaps is burnt or left to rot, which pollutes the air, soil, and groundwater. Additionally, these cassava peel heaps yielded significant quantities of bioethanol, therefore transforming them into HQCP mash reduced the negative environmental impact of greenhouse gas emissions. In 2015, the International Livestock Research Institute (ILRI) and the International Institute of Tropical Agriculture (IITA), supported by the CGIAR Research Program on Roots, Tubers and Bananas (RTB), launched the Cassava Peel Transformation Project to work on this environmental problem of cassava peel waste.

The project had an innovation which converted the wet cassava peel into energy and starch animal feed; creating a component that could be used in different livestock value chains - fish, poultry, pigs.

This innovation involved grating the wet cassava peels three times to reduce the particle size, pressed to express excess water, and left to ferment about 8 hours to initiate the cyanide detoxification. At this point, the resultant wet cake is ready to be included in the animal feed. To further increase the shelf life of the wet cakes from a week to six months, the cake can be grated to finer particles, dried under the sun or industrially, to produce the final product: high-quality cassava peel (HQCP) mashes that could make up to two-thirds of animal feed products.

Earlier on, the project has worked on scaling this innovation through training of adopters, facilitating access to credit for entrepreneurs interested in processing HQCP Mash, developing ICT solutions to enhance efficiency in the new value chain.

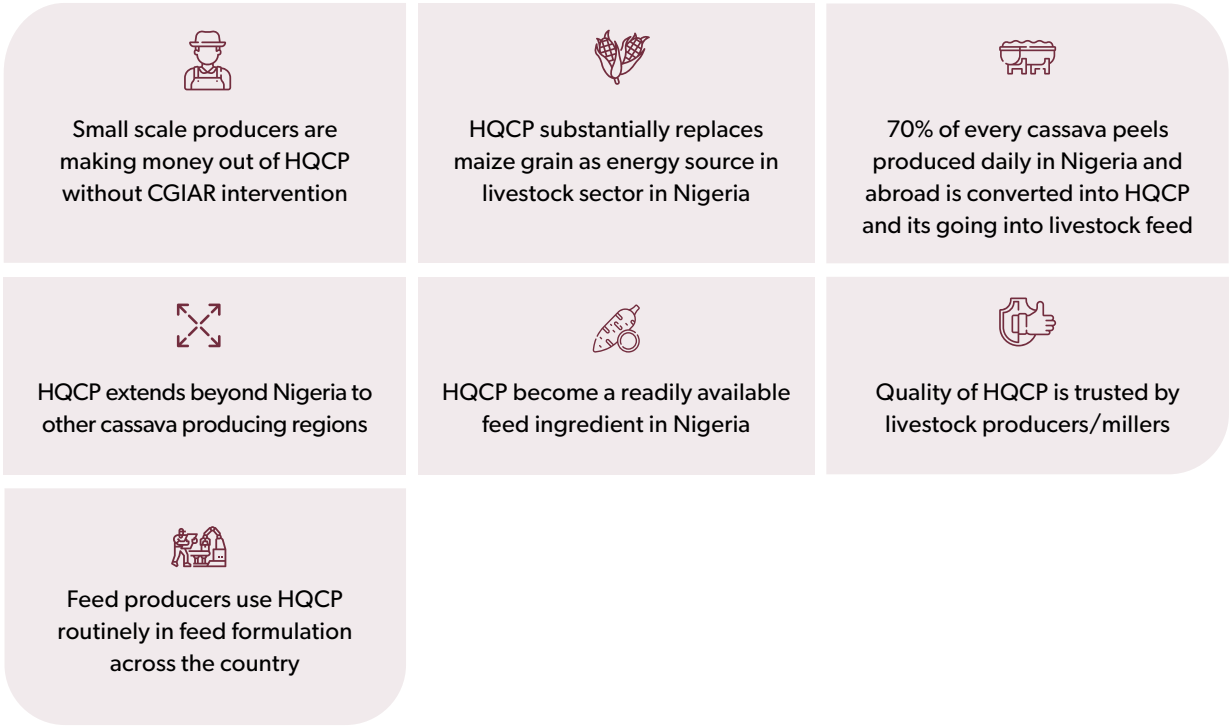
Scaling Scan

The Visioning

In the first stakeholders' workshop, the project team was taken through a visioning exercise to help stakeholders converge on the project's scaling vision before working on the Scaling Ambition. The exercise involved asking the participants to explain what success for the project looked like for the future, which actors were essential to this success and what roles they would be expected to play.

Figure 4: Vision of success

YOUR VISION OF SUCCESS



VISION OF SUCCESS

- Having HQCP as a common place accepted and available feed ingredient in Nigeria and beyond
- HQCP quality being consistent and trusted by livestock value chain actors
- Small scale producers make profit from HQCP without external support
- HQCP is adopted as a routine ingredient in feed formulation across the country
- HQCP substitutes maize grain as the main energy source in livestock feed in the country
- That cassava peels are no longer waste but circulated into livestock feed as HQCP

WHOSE SUCCESS, AND HOW DOES IT LOOK LIKE?

- Women get involved in HQCP production and derive stable livelihoods from the enterprises
- HQCP producers make good business from the processing and sustain the innovation
- Livestock keepers get cheaper alternatives to maize grain as an animal feed ingredient

KEY ACTORS, AND THEIR ROLE?

Key actors expected to play key roles were:

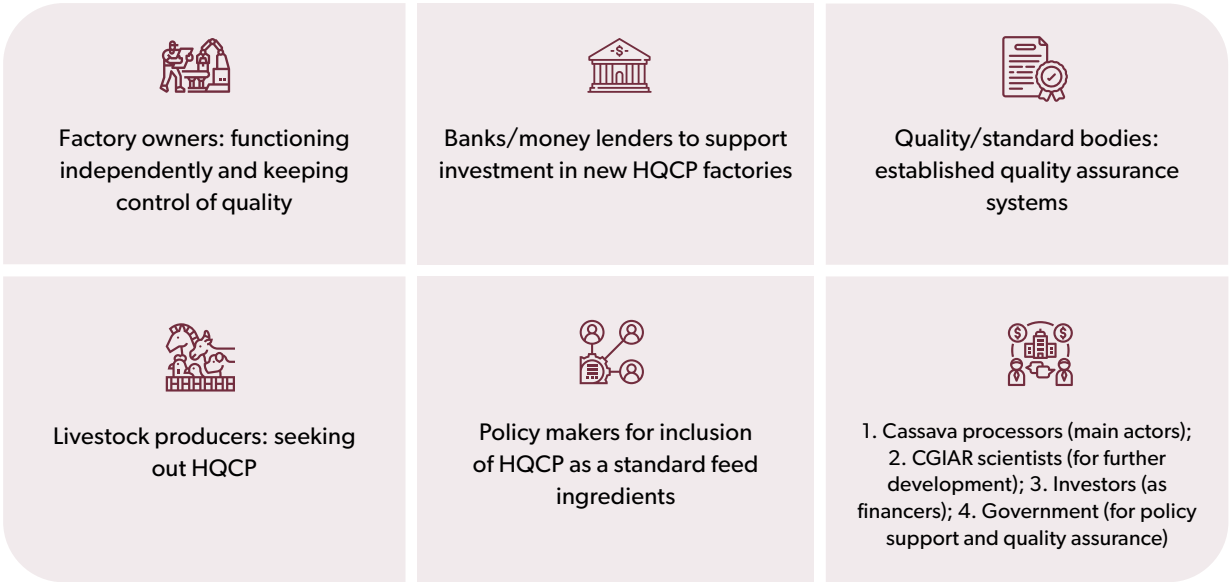
- Private owned HQCP factory proprietors producing quality mash
- Livestock keepers, associations seeking out HQCP as feed ingredients
- Government relevant agencies to make policy on HQCP to reassure the public and precipitate standardization
- Standardization bodies establish HQCP mash production quality assurance framework
- Financial institutions provide funding and credit to the HQCP value chain actors

Figure 5: Whose success is it, and what does it look like?

WHOSE SUCCESS IS IT, AND WHAT DOES IT LOOK LIKE?

Figure 6: Key actors and their roles

WHO WILL BE THE KEY ACTORS THAT WILL NEED TO PLAY A ROLE FOR US TO SUCCEED?



Introduction to Scaling

The group was taken through different scaling concepts to converge their outlook on scaling in relation to the HQCP innovation.

INTRODUCTION TO SCALING

- Why scaling
- Current scaling interpretations
- Dimensions of scaling
- ILRI's I@S scaling framework

SCALING SCAN OVERVIEW

- Virtual workshop series
- Goals of the scan
- Tools and processes of the scan
- Outputs from the scan
- Time and logistics demand by the scan

SCALING READINESS

- Background of Scaling Readiness
- Scaling Readiness Deep Dive in I@S Framework
- Livestock Case Examples

Constructing the Scaling Ambition

Scaling ambition is a target statement by the project based on a technical framework. The I@S team works with the project team to develop a statement that defines what is being scaled, for whom, where, when, and why. In addition to this statement, additional elements include performing a system and responsibility check to reflect on the impact of the innovation on the overall system and other social aspects like gender, age, inclusiveness, and the environment.

The Scaling ambition construction followed the following process:

1. The project team developed a scaling ambition draft
2. I@S reviewed and shared inputs
3. The project team considered suggestions and iterated where necessary
4. The Scaling ambition was presented to stakeholders for inputs and validation
5. The project team published a consolidated Scaling ambition

The innovation is a process for rapid conversion of waste cassava peel into a high value livestock feed called HQCP. It is a technical innovation requiring scaling of the use of the innovation itself but also organizational elements such as establishment of small-scale processing factories and marketing systems. There is evidence that it can go to scale. In fact, it has gone beyond the pilot phase with initial scaling efforts at the regional level within Nigeria with enough published evidence.

The primary targets the effort targets small-scale entrepreneurs who can establish processing facilities and then market HQCP to livestock producers. As well as cassava processors, the innovation targets intermediaries such as traders and other actors in the value chain. Businesses, women, and men, young and old people are the main target population.

The Intervention's geographic area focused to cassava growing areas. At first instance we targeted Nigeria but in the longer term the scaling could extend to other cassava producing countries like Ghana, DRC, Rwanda, and Tanzania

The Size of the target group aimed for is as follows:

Maximum: cassava processors, compound feed millers, livestock & fish farmers producing their own feed, and animal feed traders in cassava growing countries of West, East and Central Africa.

Minimum: Same group in Southwest Nigeria.

Realistic target: Specific countries are Nigeria in the current phase, and Ghana, DRC, Rwanda, Tanzania in future phases. The adoption rate is less than 10%.

The leading organization for scaling includes people experienced in scaling the innovation that now includes the first adaptors organized into a community of practice around the innovation - 'Cassava Peel First Users'. The consist of committed private sector individuals and enterprises who are well-suited to provide leadership to scale the innovation.

For research input along the scaling process, CGIAR possesses the required experience and skills to continuously provide research services to continue advancement of the technology.

The **time** to reach the desired scale is a 10-year timeline with leadership support for a 5-year phase before handing over seems realistic. The system change we contribute to is a new source of income from new products that contribute to animal feed availability, and a healthier environment. We aim to reduce feed costs by substituting HQCP mash for imported maize thus benefiting HQCP processors and livestock producers who will be able to increase their profits. Consumers will also benefit through cheaper animal food sources because of reduced feed costs for livestock farmers.

System check

Cassava peels that were usually dumped as waste products from cassava tuber processing into food industrial products like garri are not useful raw materials for feed production.

Achieving the scaling ambition is expected to drastically reduce the cost of feeding in the livestock sector by making feed available at a cheaper price and reduce unemployment as more households go into the sub-sector. The technology is self-sustaining as the raw material is available almost throughout the year at a low cost. The technology contributes to a healthy environment through contributing to circular economy.

Responsibility check

Gender: Initially, women would hold the advantage as people involved in processing and generating the peels but may lose the initiative to men if investment requirements increase due to higher cost of machinery, or as a result need to expand business to produce at a higher scale.

Power equity: It is possible that men will gain a higher proportion of the total production against women. People who are already in the business of processing fresh tubers into food and other products enjoy an advantage if they wish to go into HQCP mash production, but the advantage is not exclusive because of the current abundance of fresh cassava peels. At a certain value, cassava peelers (women) could have a monopoly. Good!

A physically challenged person is not able to fulfill the benefits from processing cassava peels to HQCP, but he/she can offtake the product.

Resilience: It is possible to reverse adoption. The processing equipment is adaptable to other uses. This is part of the reason why people who are already in the cassava processing business have an advantage when they enter peel processing. The cost of failure, in a case where the entrepreneur quits processing entirely, is the depreciated value (loss due to resell) of the equipment, borne by the entrepreneur.

Environment

Resources use: Yes, especially in the wet season when sun drying is not continuously feasible and the use of fuelwood as a source of heat for drying is necessitated, depletion of forest resources will become a consequence for people not able to afford coal - which is available.

Scaling this innovation could have a positive effect on the environment by removing potential pollutants. However, if standard operations are compromised during scaling, it could result in cleaning a part of the environment to pollute another part.

Quality of resources: Scaling would rather result in the improvement of underground water currently being polluted by lactic acid laden effluent from cassava peel refuse heaps.

Climate change: Rotting heaps of cassava peels produce methane gas which contributes to global warming. This will be obviated when the peels are transformed to feed rather than left to rot on the surface. Scaling the innovation would contribute to reducing CO2 and other gases

Points of attention- responsibility check: Facilitators of scaling should be responsive to the needs of women and ready to offer support to enable them to remain in the business

Point of attention – system check: It is important to note that with smallholder adopters, the risk of 'deforestation' is higher when compared to medium to large scale adopters who would likely use flash driers instead of toasting pans.

By 2026, the Livestock CRP[7] wants to facilitate increased transformation of fresh cassava peels and its use as HQCP mash in animal feed from 30,000 tons per year by 200 small and medium scale enterprises (SMEs) in Nigeria to 500,000 tons per year by 500 SMEs in Nigeria, Ghana, DRC, Rwanda, and Tanzania for additional income, creating employment, mitigating feed scarcity, and cleaning the environment.

Scaling Ingredients Analysis

Assessing the adequacy of the Scaling Scan approach: Opportunities and threats discussion

Technology

The HQCP mash as an innovation is highly relevant to the target groups. There is a high adoption rate of the value chain. Farmers now realize the value in the cassava peel and have since moved from discarding wet cassava peels as waste and for free, to treating the peels as a commodity. The HQCP project has demonstrated, through science, the technical and economic feasibility of transforming cassava peels into a HQCP mash and is now a registered trademark in Nigeria as a feed ingredient - High Quality Cassava Peel® mash (HQCP®).

Adoption of the HQCP mash and subsequent investment in the necessary processing equipment validates the market need to substitute maize with a cheaper source of near equivalent energy sources in animal feeds.

The HQCP mash technology and its comparative advantages of availability, and lower pound for pound price compared to maize are appreciated by feed manufactures, and end users as can be observed from the high demand of HQCP which often is more than the supply can meet.

However, cassava peels have different logistical needs compared to maize, which raises the cost of adoption and could represent a significant threat to scaling. Cassava peels are often sold as wet products containing about 75% water which is not required to produce the mash. Therefore, transporting the peels in this form increases the logistics' cost of the mash.

7. Ibid., 3

At ease of adoption, all the information necessary to adopt the innovation is freely available from the project outputs. However, HQCP cannot be said to be easy to adopt, as it requires investment in processing equipment by the processors. Collecting wet peels for processing requires investment in aggregation infrastructure and transport from collection, as the peels are not readily available in adequate quantities for the processors. Processors have found it difficult to recoup the investments due to the low prices that the mash fetches. The innovation is easier to adopt for processors if they are close to cassava plantation farms, as the cost of transportation is lower.

Awareness and Demand

In general, actors involved in animal feeds, either as producers or end users, recognize that this innovation is necessary and desirable. The government supported the technology innovation during the project active years and private stakeholders have continued to implement the technology beyond the project active period.

There is ready information about the HQCP innovation including training modules accessible to those who wish to adopt and refresh on the innovation. Local opinion leaders, including government, support the innovation.

Demand can be distinguished into segments of the target users to include farmers who use the mash for energy sources and feed millers who use the mash as a feed component for poultry, fish, pig feeds. The relevance of each segment is clear to the adopters and have designed the necessary marketing channels for their segments of interest. However, the potential growth is not being realized due to the lack of corresponding supply of wet cassava peels to the processors. There is adequate growth by processors but there is no equivalent growth in cassava plantation, thus affecting the supply of peels and the overall sub-sector growth.

Related to the issue of demand and supply, there was not reference in the scaling scan process to the Cassava Peel Tracker by IITA that worked on easing this pressure which suggests the current first adaptors might not be aware of the tracker and are therefore not using the application.

Business Cases

There are different business cases for the HQCP mash as feed component – processors, collection centers and peel cake production. HQCP is also being used as a source of energy for commercial biogas generation. These different actors identify the risks associated with their individual use cases. For example, the risk associated in working with out-growers' schemes to ramp up cassava plantation production to ensure the demand for the peels is met.

There is genuine interest in continuing improving the supply and use of HQCP Mash, as there is an observable intensification of the mash supply in the market, as well as continued application of the value chain which is independent from the project support. Current actors have invested their own resources in implementing the technology for their use cases. The business cases have been in operation for over 5 years now and can be said to be past the initial enthusiasm period.

One threat to the growth of this sub-sector is the absence of adequate governance structure in the market for the value chain actors to pursue their business cases well. Consequently, there is a significant problem of standardization, quality, and pricing of the HQCP mash that goes to the market. Inconsistent and low quality HQCP is associated with low prices for the mash.

At the onset, the pricing of HQCP was thought to be half that of maize. But HQCP mash buyers demand to buy at a price that is less than half the price of maize; this is a disadvantage for the producers. Maize prices are volatile and therefore anchoring the price of the mash on maize prices (half of the maize) exposes the HQCP prices to unrelated forces.

Value Chain

There is no power imbalance amongst actors in the value chain albeit governance is largely informal. The overall performance of the value chain can be said to be conducive because (1) the value chain seems to have good potential and is attracting private investors as processors, and (2) the development of the value chain is not limited by any significate trade barriers, or contextual factors.

However, the value chain is facing challenges that could threaten the achievement of the scaling ambition. Firstly, lack of standardization and certification framework for the HQCP mash is resulting in inconsistent HQCP mash quality to the market. Secondly, the available wet cassava peels cannot meet the demand of processors, and thirdly, the wet cassava peels are not available all year round.

Finance

The value chain has made inroads in financing investments required to adopt the innovation through private investments, as the current adopters are largely private businesses on their own financing initiatives.

Currently, there is no secured funding to support scaling at this stage. The innovation has now largely been driven by the private sector adoption, although financing would still help to further develop the sub-sector.

Inadequate cassava farm production is a significant threat to achieving the scaling ambition as it has a direct impact on availability of the raw cassava peels raw material needed to produce HQCP mash. Financial institutions are currently not interested in financing the technology.

Knowledge and Skills

The current early adopters have the necessary knowledge and skills to use the innovation in the intended way. There are training materials and methods to help actors with adoption and promotion. Also, there is a mix of profit and not for profit actors supporting capacity building activities like trainings on the innovation and its practical application for the new adopters. The CGIAR partners involved (ILRI, IITA) have remained relevant and provided leadership in the development and improvement of the technology.

Collaboration

The combination of actors is sufficiently complementary with no major capacity gaps to achieve the scaling ambition. The current combination enables sustainability but does not assure the expected growth of the value chain to scale. Government support for providing a conducive environment is lacking, especially in quality standards and certification.

The roles and responsibilities of key actors are clear, and complementary. However, there are no accountability mechanisms to enforce the roles. Affecting the quality of products and timelines as cassava farmers do not have to produce to meet the demand for lack of contractual arrangements.

The value chain actors are currently organized informally through WhatsApp, as opposed to formally in an association like a cooperative. While the platform is a good platform to raise awareness, and a marketplace for the actors its informality denies the actors ability to forge strategic direction and joint priority setting that would benefit the value chain as a whole and enhance bargaining power.

Public sector governance

The technology received good support from government in the piloting phase and was encouraged as a new feed ingredient that culminated the HQCP mash being registered as a patent in Nigeria. The focus of the value chain on government is to facilitate the Development of a quality assurance system and standardization of the HQCP mash technology. The new value chain benefits from support received from the government on the cassava value chain as most actors are the same.

Conclusions

The HQCP mash technology - as a new value chain - brought a new revenue stream to both existing and new players in the cassava value chain. This includes farmers now selling cassava peelings in addition to the cassava tuber, processors selling HQCP mash, and transporters transporting wet cassava peels. The HQCP mash processors have the highest capital cost for all stakeholders in the new value chain. This has happened without the banks or co-ops in the new value chain, offering easy financing solutions resulting in the use of own savings to setup processing plants by investors. To recover these investment costs, processors who produce HQCP mash along with other products such as garri, found this easier than processors who produce HQCP mash as a primary product. This is due to the high operating costs of transportating wet peels, the lack of guaranteed supply of wet peels around the year, and the poor prices of HQCP mash on the market.

The high cost of transporting wet cassava peels is one of the most significant operational costs for processing HQCP mash, therefore it is a potential threat to scaling. It is imperative that the value chain find a solution to reduce these high transportation costs by pre-processing the cassava wet peels before transporting them to processing plants.

The quality of HQCP mash being produced across Nigeria is inconsistent and could negatively affect the uptake of the feed as an ingredient. That is because the value chain has no quality assurance framework from which processors can work and be evaluated.

The lack of quality standards, allows processors to produce HQCP mash at their own discretion , with negative consequences on efforts to scale the technology.

This inconsistency makes feed compounders - using HQCP mash- difficult to rely on the mash, as it requires additional quality-control processes to determine its quality . The implications of inconsistent HQCP mash quality in the market, is a potential threat to scaling as it negatively impacts uptake, and perception of reliability of the product as a feed ingredient. The value chain needs to address this problem and offer legislative solutions to the government to formalize it.

For actors to lead the way in coming up with a solution on such a significant problem (I.e., as a quality assurance framework) the current organization of actors in a social media platform (WhatsApp) is not sufficient. While the platform has about 200 actors and is good for bringing different actors together and raising collective value chain issues, it is not a suitable arena to provide strategic direction setting. Thus, a more purposeful platform is necessary.

From the processors' perspective, HQCP mash is currently well known as a good energy source alternative to maize in animal feed compound. However, the HQCP mash does not have the equivalent amount of protein that is found in maize. Although the differences are small and HQCP is not marketed as a good source of protein, this comparison was consistently brought up by processors, and therefore requires intervention to prevent it becoming a significant threat to adoption.

Recommendations

These recommendations are generated from discussions with processors who were involved in the scaling scan.

STRENGTHEN THE HQCP MASH BUSINESS CASE

1 The potential issues and challenges that negatively impact on the viability of HQCP mash value chain have been highlighted in this report. Based on these, it is recommended that the value chain develops the production of wet cassava peels cake as a symbiotic subsector to HQCP mash to help lower the prohibitive transportation costs of wet cassava peels by reducing the water content of the wet casssava peels by upto 50% before transporting to HQCP mash processing plants. This could be done through designing a youth and women led value chain on the pre-processing of wet cassava peels. Off-takers can be invited to collaborate with these cake making enterprises as co-investors. The value chain could also explore support from NGOs to aid youth, women in establishing these cake making enterprises.

DEVELOPMENT OF A QUALITY ASSURANCE SYSTEM FOR THE HQCP MASH VALUE CHAIN

2 The need for quality assurance and quality control of HQCP mash has been discussed in this report. To begin work towards a quality assurance system, the value chain should conduct a high-level needs analysis of an HQCP mash value chain quality assurance system. This will provide the value chain with the necessary information to facilitate the development of a quality assurance system of the HQCP mash that is now critical for a scaling phase of the technology.

DEVELOP DEEP STAKEHOLDER COLLABORATION

3 To scale the technology and achieve the stated scaling ambition, there is a need for effective stakeholders' engagement to understand their experiences and opinions, get buy-in on issues proposed and move the focus from mere communication to goal setting and achievement. To do this, the value chain should morph the existing WhatsApp stakeholder's platform into a better-suited platform that will allow for joint lobbying, strategic direction setting, better moderation, and documentation.

CIRCULAR ECONOMY BENEFITS

4 One of most significant contributions of the HQCP mash value chain is its positive impact on environment. The value chain gets rid of a nuisance waste product in cassava wet peels, thus it is recommended to quantify this environmental impact since cassava peel reduces environmental footprint.

RECONCILE HQCP MASH FINDINGS WITH PRACTITIONER EXPERIENCE

5 From the engagement with processors arose a few issues that need to be re-evaluated with practitioners' experience. While the HQCP mash is marketed as to be used up to 30 percent ingredient in feeds, a processor and an expert in animal nutrition equivocally insisted that this could only go up to 10 percent from their experience. There is also the challenge of comparing the HQCP mash protein content with that of maize which needs addressing through awareness as the HQCP is not marketed as a protein source but rather as an energy source.

Limitations of this light scan

To ensure representation beyond the project team, the Scaling Scan solicited participation from external stakeholders working in the value chain, ensuring that both public and private actors are part of the process and contribute to the key sessions of the process as experts. This approach, therefore, relies majorly on evidence from the opinions of experts, which ranks lowest on the hierarchy of evidence ratings.

ILRI's scaling framework includes a light track, standard track, and extended track. This report is limited in that it only accounts for the light track. The project has also undertaken a Scaling Readiness Study, the extended track, and additional insights can be found there.

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