

AYUTE AFRICA PROGRAMME ASSESSMENT

2023 Report

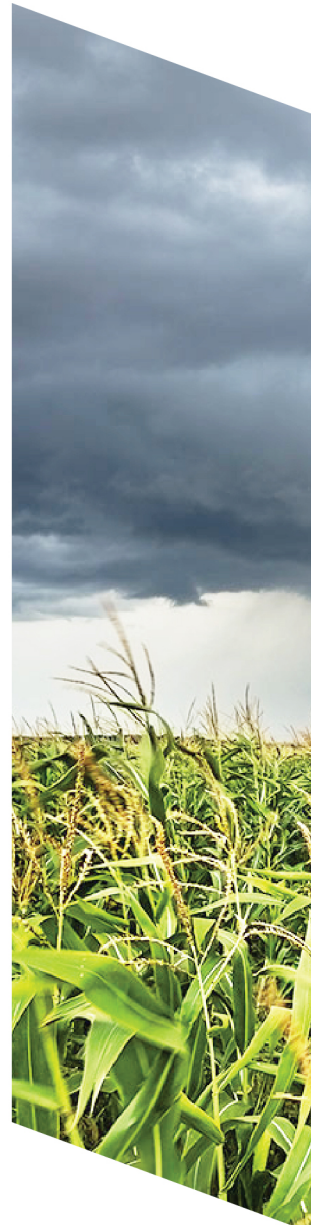
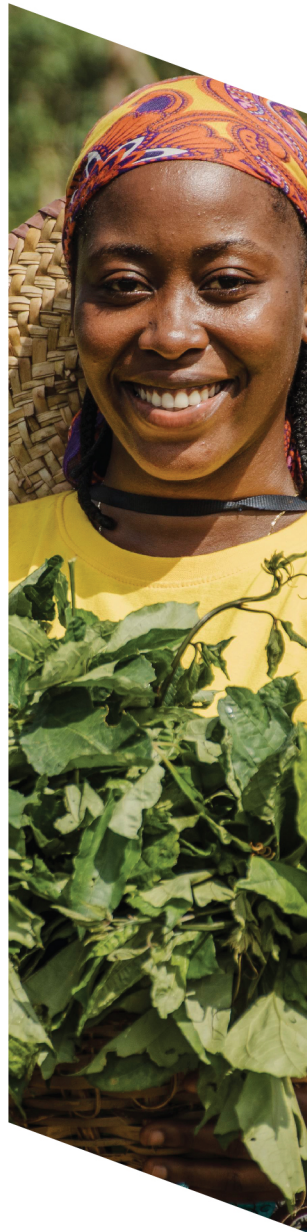
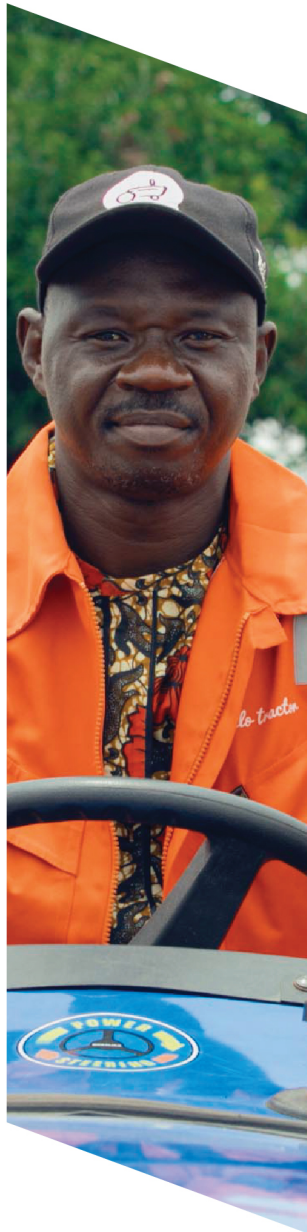


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List of Acronyms and Abbreviations

AEZPAH	Agro Ecological Zones
ANACIM	Agence Nationale de l'Aviation Civile et de la Météorologie
PAH	Pay-at-harvest
PAYG	Pay-as-you-go
PAYS	Pay-as-you-store
SROI	Social return on investment
T4A	Tractor for Africa
WCS	Weather Climate Services

Executive Summary

The importance of innovation in bringing the smallholder farmer into the twenty-first century is widely acknowledged and no longer in question. However, ensuring that these Agri-tech innovations supports farmers based on their literacy and socioeconomic levels is in question. Agri-tech innovations must be fit for purpose, scalable, affordable, and provide immediate and long-term benefits to farmers in terms of financial, social, and environmental impact. The growing concerns about the devastating impact of climate change were echoed across the project countries by the beneficiaries, ranging from tractor owners unable to begin ploughing farmland due to late rains to rice farmers experiencing complete harvest loss due to unfavourable weather conditions.

In 2021, Heifer International launched the Agriculture, Youth and, Technology (AYuTe) Africa Challenge fund. This is an initiative that empowers young entrepreneurs across Africa to forge paths to agricultural transformation in Africa. The AYuTe Africa Challenge is an annual competition that awards cash grants to promising young agritech innovators and firms across the continent – professionals who are using technology to reimagine farming and food production in Africa. The competition is a catalyst for growth, combining a cash grant with business development initiatives to translate

the energy and ideas of young African innovators into meaningful impact for African farmers. Through AYuTe, Heifer International identified and supported five African Innovators (Pula, Hello Tractor, ColdHub, Kuza and Ignitia) to support smallholder farmers with their respective technological innovations to solve some of the problems affecting agricultural production and productivity in the region.

Small holder farmers reported that the innovations contributed to their overall progress and in some cases,



demand was not sufficiently met. Some Key findings from this assessment are highlighted below.

Hello Tractor has effectively fulfilled its objective of enhancing farmers' income by facilitating increased acreage through improved access to tractors. This accomplishment demonstrates the project's efficiency, relevance, and effectiveness, resulting in an impressive 227% boost in farmers' income. The intervention also showed a positive Social Return on Investment and a 90% loan repayment rate. In addition, all the tractor owners and farmers surveyed gave positive feedback on the intervention.

ColdHubs: The majority of the smallholder farmers and retailers surveyed are satisfied with the services provided by coldhubs indicating that the cold room storage is very relevant to the retailers. Post harvest losses have significantly reduced according to the beneficiaries and farmers are encouraged to produce more. The cold storage facilities were recently commissioned and usage is under six months, therefore social return on investment could not be calculated.

Pula: All the farmers surveyed acknowledge the importance and relevance of the intervention (agricultural insurance) and are willing to continue their subscription with Pula. In addition, some of the farmers received training on risk management, financial management and record keeping.

Ignitia: The majority of the smallholder farmers surveyed acknowledged the importance of the intervention and agreed that Weather Climate Services (WCS) supports their planning for the farming season.

This research focuses not only on the projects in view, but also on the innovators and how their organisational capacity as well as their project model benefits the

smallholder farmer, in order for us to address the key evaluation questions regarding the relevance, effectiveness, efficiency, impact, and sustainability of AYuTe.

1.1 Goal & Objectives of the Assessment:

The overall objective of the assessment was to evaluate the activities implemented in the first 2 years of the AYuTe Africa Program towards achieving the expected outcomes and to make recommendations on further replication or continuation of the project.

The study looked closely at the following specific objectives:

- Assessed the relevance of the AYuTe program in terms of the priorities, objectives, implementation plan and beneficiaries' (smallholder farmers and youth) needs as defined by the program (usefulness, alignment)
- Assessed the results and progress of the program in terms of effectiveness (achieved outcomes versus planned outcomes) and the efficiency of implementation (output achieved against inputs and budgets used)
- Assessed the feasibility and sustainability in terms of design, scope, implementation, partnerships, management and steering of the project.
- Identified evidence of programming strengths, weaknesses, emerging opportunities and lessons learned.

Methodology and Approach

The impact assessment was conducted in selected countries, states, regions and communities where AYuTe partner organisations are supporting smallholder farmers. The study area reflects the overall characteristics of the population and was selected with inputs from all organisations.

Organisation	Country	State/Region/County	Study community
ColdHubs	Nigeria	Lagos	Ibeju-Lekki
Hello Tractor	Nigeria Kenya	Nassarawa state Kisumu County	Awe, Nassarawa Toto Rahuor, Ahero
Pula	Nigeria	Nassarawa state	Awe, Azara
Ignitia	Senegal	Kaolack, Sedhiou, Thies	Kaolack, Sedhiou, and Thies

2.2 Population and Sampling Frame

The beneficiary population of each AYuTe implementing organisation is as follows:

ColdHubs

ColdHubs is a social enterprise that provides solar energy powered cold storage and value-added services to smallholder farmers in Nigeria. The organization's key customer segment is vegetable and fruit retailers, wholesalers, and farmers in Ekiti, Ondo, Osun, Ogun, Oyo, and Lagos. ColdHubs has a total beneficiary population of 512.

Hello Tractor

Hello Tractor is a technology-enabled agricultural solutions company that provides access to tractors to smallholder farmers in Africa. The organization's key customer segment is smallholder farmers in Nigeria, Kenya, and Uganda. As at January 2023, Hello

Tractor had a total direct beneficiary population of 21,520, these include tractor owners, smallholder farmers, technicians and tractor drivers.

Pula

Pula is an agricultural insurance and technology company that designs and delivers innovative agricultural insurance and digital products to assist smallholder farmers in coping with yield risks. The organization's key customer segment is smallholder farmers in Northern Nigeria. Pula farmers are predominantly rice farmers in the core farming communities of Nasarawa, Benue, Jigawa, Kano, and Kaduna states. Pula has 24,259 beneficiaries.

Kuza

Kuza is a technology company that uses OneNetwork, its digital marketplace to empower youths and smallholder farmers by providing opportunities for them to learn,

connect, and grow on their own terms and at their own pace. The organization's key customer segment is farmers in Kenya, Rwanda and Uganda. As at the time of compiling this report, Kuza has not rolled out the digital resource to farmers. Hence no data collection for Kuza beneficiaries.

Ignitia

Ignitia is a weather forecasting company that uses SMS to deliver weather forecasts to West African farmers in partnership with mobile network operators and other bulk SMS providers. The organization's key customer segment is farmers in Senegal. We carried out an impact assessment of the weather advisory service in February 2022, hence we adopted the reports and did a comparative analysis with Ignitia's final evaluation report.

2.3 Sample size

Below is the sample size based on our statistical inference.

The sample size calculation of organizations with more than 10,000 beneficiaries will be estimated at 95% confidence interval and 5% margin of error. For other organisations with lesser number of beneficiaries, convenience sampling of 10% of beneficiaries will be sampled.

ColdHubs:

The beneficiaries are fruit and vegetable farmers or retailers.

$n = 10\%$ of $N = 10\%$ of 512

Sample size = 51 farmers

Hello Tractor:

There are four levels of beneficiaries, tractor owners, farmers, booking agents and tractor technicians. In total, we have 21,520 beneficiary farmers.

$N = 21,520$

$n = [z^2 * p * (1 - p) / e^2] / [1 + (z^2 * p * (1 - p) / (e^2 * N))]$

where: $N = 24000$ (population size)

$p = 0.5$ (estimated proportion of population with the characteristic of interest)

$E = 0.05$ (desired margin of error)

$Z = 1.96$ (for a 95% confidence level)

$n = 377.952$

Rounding up to the nearest whole number, we get a required sample size of **378 beneficiaries**.

Pula:

The PAYG insurance has reached 24,259 farmers.

$N = 24,259$

$n = [z^2 * p * (1 - p) / e^2] / [1 + (z^2 * p * (1 - p) / (e^2 * N))]$

where: $N = 24,259$ (population size)

$p = 0.5$ (estimated proportion of population with the characteristic of interest)

$E = 0.05$ (desired margin of error)

$Z = 1.96$ (for a 95% confidence level)

sample size = 377 farmers

Rounding up to the nearest whole number, we get a required sample size of **378 beneficiaries**.

2.4 Method of Data Collection

Quantitative and qualitative data were collected using various data collection tools namely, survey questionnaire, beneficiary profiling, focus group discussion, photography, and observations.

2.4.1 Primary data collection instruments Surveys



Surveys

This instrument provided us with a bird's eye view of the benefit/impact of AYuTe on smallholder farmers and youths. The small-holder farmer's survey targeted a representative sample out of the total beneficiaries with at least 95% confidence from the feedback. The survey was administered by enumerators in the two project countries (Nigeria and Kenya). Please note that a convenience sampling technique was explored when the beneficiary population is less than 10,000.



Focus Group Discussions (FGD)

This method of data collection further gave us an in-depth analysis of current opportunities/gaps, efficiency, and effectiveness of project delivery. One focus group discussion was organized for each partner organization where applicable.



Beneficiary profiling

This tool was used to interview beneficiaries with interesting impact stories. Furthermore, it provided information on how effective and efficient AYuTe implementing partners have been and what form of improvements they look forward to.



Implementing organization questionnaire (Key Informant Interviews)

This tool was used to understand the state of play of the project, the project outcomes, and shed more light on challenges/opportunities/sustainability of the project.

2.4.2 Secondary Data Instrument

Desk Review of Resources

This entailed a review of Tractor for Africa project documents, literature, and organization reports.

2.5 Methodology to evaluate Social Return on Investment (SROI):

- Desktop review (project reports, project financials & project data)
- Project beneficiary Interviews
- Direct observation

Project benefits (mostly intangible) will be evaluated and monetary estimates provided in relation to the outcome indicators and weighted index. Each indicator will have a scorecard of between 1 (low)–5 (high), with the following weighted index.

Weight 1 -	0%
Weight 2 -	25%
Weight 3 -	50%
Weight 4 -	75%
Weight 5 -	100%

For example, in a tractor mechanization project where one of the outcomes is the increase in family savings of smallholder farmers. It is expected that the beneficiary should show evidence of increased income. This indicator should certify that the outcome has been achieved or not achieved.

Each project outcome indicator must score a minimum of 50% weighted index. Each weighted index will be assigned a monetary value based on the level of satisfaction for each project outcome, such as not satisfied, averagely satisfied, and very satisfied. Thereafter, the SROI and Net SROI are calculated with the following formula.

$$\text{SROI} = \frac{\text{(Total value of benefits)}}{\text{(Total project cost)}}$$

$$\text{Net SROI} = \frac{\text{(Total value of benefits - Total project cost)}}{\text{(Total project cost)}}$$

2.6 Validity and Reliability of Instrument

The data collection instruments were tested and a pilot was conducted before rollout. Survey Monkey (paid version) was used for survey administration. This has been a reliable and affordable tool for our clients, including Heifer.

The FGDs were led in pairs: one field supervisor facilitated the discussion and one enumerator took notes. Where applicable, one FGD was conducted for each implementing organization. The FGDs comprised 8–10 participants on average and the discussions lasted for about 1 hour at a convenient venue which was identified by the community members and the research team. The FGDs were conducted in a relaxed and conducive environment to allow full participation of men, women and youth.

2.7 Data quality was ensured by:

- Enumerators were engaged locally.
- Enumerators were adequately trained on the content of the instruments and purpose of the study.

- The instruments were pretested and ensured that all enumerators were familiar with both the terrain and the tools.
- Using technology to collect data
- Supervising the data collection process

2.8 Limitations of the Survey

The limitations of the survey include:

- Lack of baseline data from organizations on AYuTe
- Developing indicators after projects have started and grants awarded
- Unavailability of farmers or retailers for the survey
- Non-functional cold rooms in most locations
- Unresponsiveness of some organizations

2.9 Assessment Phases

The assessment was structured into phases as highlighted below:

2.9.1 Project Inception and Preparatory Phase

Desk reviews were conducted to document existing work and obtain the needed background for the full implementation of the research. This is key and important to the overall success of the research. Consultations were organized with the client to build consensus on our understanding of the assignment, survey instruments, support required such as administrative approvals, sampling methodology, selection of respondents, work plan, timelines and deliverables.

2.9.2 Preparation of Study Tools and Validations

We developed draft study tools and instruments based on the above to streamline the research protocol for smallholder farmers selected with the approval of the project lead. A pilot of the research was conducted to pre-test the data collection tools in the field for validation to ensure standardization of tools before data collection began. Kasher's field supervisors and selected team members recorded and documented the findings of the pilot which was then used to modify data collection tools as required. Validation and pre-tests were done in partnership with M & E departments at Heifer.

2.9.3 Execution Phase: Field Team Deployment and Data Collection

Data collection for this study was for a total of nine days in the selected areas. Data were collected through face to face interviews, focus group discussions, key informant interviews and prior consent of the respondents were obtained. The trained enumerators conducted the interviews, probed the respondents where necessary and recorded data taking maximum care for data quality. Kasher's field supervisors supervised the entire process, crosschecked completed questionnaires and conduct data cleaning to prepare the responses for analysis.

2.9.4 Finalization Phase: Data Analysis and Report Finalization

Qualitative Data Analysis:

In-depth interviews and notes/transcripts were subjected to analysis after translation. A qualitative analysis expert performed qualitative content analysis using a thematic analysis approach.

We worked closely with the client and our project advisors during the preparation of the final report. We participated in rounds of reviews and revisions: an initial review by the client and a second round of consultation with partner stakeholders.

Hello Tractor (Implementing Partner)

3.1 Brief Introduction

Hello Tractor is an agricultural technology company that connects tractor owners to smallholder farmers in need of tractor services and supports tractor owners to improve the management of their businesses.

The AYuTe intervention aims to provide affordable farm mechanization through a digital tractor-sharing model. The overall goal is to support entrepreneurs who will employ tractor operators and booking agents to create direct jobs, give smallholder farmers mechanization access, increase their yield, and provide additional yearly income to the farmers.

The AYuTe intervention is called PAYG (Pay-as-you-go) and it is part of the Tractor for Africa (T4A) initiative. The PAYG tractor financing product was launched on January 14, 2022, in Kisumu, Kenya with six (6) tractors distributed to booking agents who had booked the required demand for clearing farmland of a total of five hundred hectares (500ha) using the Hello Tractor App to qualify for the financing. Between March and September 2022, six (6) additional launches were held in Kenya, Nigeria, and Uganda.

According to the report from Hello Tractor, as at December 2022, the T4A/PAYG program had purchased





and successfully handed over 104 tractors across Nigeria, Kenya, and Uganda, surpassing the period's target. They have also provided service to 21,048 smallholder farmers in need of mechanization services and created opportunities for over 250 youth to earn an income serving as booking agents and tractor operators. Furthermore, they have been able to train the project beneficiaries to be able to book through their platform and to properly operate and maintain tractors while in the field.

In addition, they have secured partnerships with 5 manufacturers and dealers to supply tractors, implements, and after-sales support. The project is currently in an active phase in which it

is providing beneficiaries with round-the-clock hands-on support, monitoring data trends, and repayment activities, and incorporating lessons learned into the project's value chain.

As at December 2022, a total of 104 beneficiaries had become tractor owners, and 208 booking agents, 157 tractor operators and 3 tractor technicians have been employed. The beneficiaries are located in Nigeria, Kenya and Uganda. The assessment was conducted among smallholder farmers and tractor owners in Ahero, Rabuor, and Kisumu counties in Kenya, as well as Awe and Nassarawa Toto local government areas in Nassarawa state in Nigeria.

3.2 Key Findings

3.2.1 Tractor Owners

All the tractor owners surveyed gave positive feedback on the intervention. The majority of them stated that they received their tractors after the planting season ended last year, so they were unable to service many farms. Currently, they haven't been able to service the vast majority of farmers due to the lack of rainfall. However, due to the high demand for tractor services by farmers, they are all optimistic about being able to complete the tractor payment before the end of the five-year period provided by Hello Tractor.

The tractor owners also stated that Hello Tractor provides them with an app that enables them to track their work, activities, and progress. They also provide them with a hub of engineers from which they can request the services of those in close proximity. The main challenges mentioned were the high cost of diesel, lack of rainfall, and security issues in some areas, which limit where they can go to provide services to farmers.

3.2.2 Farmers (Nigeria)

The majority of farmers in Awe local government area in Nassarawa state are rice farmers, while those in Nasarawa Toto are maize and sesame seed farmers. According to the farmers, having access to tractors has enabled them to expand the size of their farms and lands cultivated. They stated that they prefer the use of tractors to manual labour because it saves time and money, pointing out that the estimated cost of labour is twice that of using tractors for land preparation activities.

The farmers further stated that Hello Tractor rental fees are significantly lower than those of other commercial tractors. However, they requested a price reduction so that more farmers could afford to pay for tractor services.

Challenges



Few tractors available to farmers:

The farmers' main challenge is the long waiting period (of about three to four weeks) before they can access the tractors because there are not enough tractors to service all of the farmers, and when the tractor needs repairs, they have to wait for the technical team to come from Abuja to carry out repairs.

3.2.3 Farmers (Kenya)

The majority of farmers in Kisumu County are rice farmers, with a few intercropping maize, sorghum, vegetables, and sugarcane. According to the farmers' feedback, the introduction of Hello Tractor services in their communities has significantly increased their yields and acreage. Most farmers are very optimistic about the transformation that the technology is bringing to the area, and they believe that the service should be expanded to other areas across Kenya, to spur agricultural growth.

Challenges

Despite the success attributed to the intervention, the farmers highlighted a few challenges they are experiencing.



Few tractors available to farmers:

Similar to farmers in Nigeria, farmers in Kisumu



The use of tractors made land clearing much easier, ultimately leading to a significant increase in farm size from 3 to 6 hectares. Their income skyrocketed from \$1,084 to \$3,251, bringing about a substantial improvement in their financial situation.

County must wait several days before it is their turn for the tractors to cultivate their farms due to the increased number of farmers in the area serviced by Hello Tractor.



High tractor rental fee:

In addition to the long waiting period, most farmers in Kenya stated that the cost of hiring the tractors is relatively high, resulting in little or no difference with other private tractor owners and county government tractors. Currently, the cost of hiring tractors is about \$40 per acre and the difference in the cost with other private tractor owners is \$5 or less.



Lack of farming training:

The majority of the farmers stated that they lack the necessary skills and knowledge on farming techniques and tractor use, and that simply providing tractors is insufficient to spur the much-needed increase in yields. It should be noted that this is not a component of Hello Tractor's value add, it could however be integrated into future work.



Lack of sensitization on Hello Tractor services:

Most of the farmers in Kenya stated that there is little or no sensitization on the services provided by Hello Tractor. Only a few of the farmers were aware that Hello Tractor Hub provides fertilizer and seedlings to farmers.



Lack of markets for the farmers' produce: The majority of the farmers stated that they have difficulty finding markets for their produce and that the available buyers buy the produce at low

prices, resulting in losses. It should be noted that this is not a component of Hello Tractor's value add, it could be integrated into future work.

3.3 Analysis

Overview



The survey was conducted across Nigeria and Kenya with a total of 324 farmers and 26 tractor owners.

3.3.1 Nigeria

In Nigeria, an average Hello Tractor customer is a male farmer between 25 to 40 years. This demographic accounted for 60% of respondents interviewed. In line with empirical data, there are more male farmers than female farmers in Nigeria. Regardless of cultural and land ownership limitations, there were many female outliers who are successful farmers, supporting their families and communities.

An inspiring example is Doris Joshua, a 27-year-old female farmer residing in Toto, Nasarawa. The use of tractors made land clearing much easier, ultimately leading to a significant increase in farm size from 3 to 6 hectares. Their income skyrocketed from \$1,084 to \$3,251, bringing about a substantial improvement in their financial situation.

In Doris' own words

“When we didn't have access to tractors, things were quite challenging. However, once we started utilizing tractors, our income grew exponentially, surpassing our expectations. We can now afford to provide our children with quality education, and we've been able to invest our savings in securing additional land.”

Farmer's demographics:

At least 90% of the farmers who were surveyed have been involved in farming activities for 10 to 20 years. Moreover, a significant proportion of the farmers, 74% of them, are household heads who are responsible for supporting a family of 3 to 10 individuals. Their long-standing involvement in agriculture suggests that the farmers are likely to have encountered various challenges and opportunities in the past, which may have shaped their farming practices and decision-making processes. The data also highlights the importance of farming activities in the region, particularly in supporting the livelihoods of households, and their dependence on this sector for income and sustenance.

Farmers are primarily engaged in crop farming as it is the most dominant agricultural value chain in the region. The most commonly cultivated crops were maize, rice, cowpea, sesame, melon and groundnut. This suggests that these crops are the most profitable and viable options for the farmers in the area, and they have a competitive advantage in terms of demand and supply. The farmers have significant expertise and experience in growing these crops, which may have been passed down through generations. The focus on crop farming

also suggests that the region has a favourable climate and soil conditions for growing these crops, which may have led to the specialization in this value chain.

Land size under cultivation:



The survey also revealed that before the intervention, the average land size cultivated by the farmers was 4.8 hectares. However, after the intervention, the average land size cultivated increased to 7.4 hectares, indicating a 54% increase. This suggests that the intervention was successful in improving the productivity and efficiency of the farmers, allowing them to expand their cultivation activities and potentially improve their income and livelihoods. The forecast from interacting with farmers is that land size under cultivation will continue to increase partly due to access to tractors.



Hectares requested to be serviced:

Based on the survey data provided, Hello Tractor serviced 95% of the total hectares requested to be serviced. On average, each farmer requested 7.2 hectares to be serviced but only 6.81 hectares were serviced. This suggests that Hello tractor is operating at optimum efficiency, as they were able to meet the needs of each farmer to a certain extent. There are several reasons for the shortfall in the number requested

to the numbers actually serviced, this can be traced to the fact that Hello Tractor did not have enough tractors or manpower to service all the requested hectares within the planting season, or that there were logistical challenges in reaching certain farms. Alternatively, some farmers may have requested more hectares than they actually needed or could afford to pay for, which could also contribute to the difference between requested and serviced hectares.

According to the farmers interviewed, there is a shortage of tractors and the waiting time during the planting season is between three to four weeks.

This was reechoed by Shekwolo Abu, who said that “we do not have access to tractors on time. It takes three to four weeks of waiting time during the planting season.”

Overall, while Hello Tractor was able to service a majority of the requested hectares, there are still some areas for improvement in their operations to increase efficiency and ensure that their customers’ needs are met.



Rental cost per hectare:

Hello Tractor’s current rental cost in Awe and Toto, Nasarawa, is between \$54.31 to \$65.17, while other commercial service providers charge between \$65.17 to \$86.9 for their rental services.

This suggests that Hello Tractor is competitively priced compared to other service providers in the area. It could be a factor in their ability to attract and retain customers who may be looking for more affordable tractor rental options. However, it is important to note that there may be other factors that customers

consider besides price, such as the quality of service, availability of tractors, and ease of use, which may also impact their choice of service provider.



Comparative analysis of tractor and labour cost:

77% of the farmers surveyed agreed that tractor cost per hectare is more cost-effective than labour cost per hectare. This suggests that the farmers perceive tractor rental as a more efficient and cost-saving option for their farming activities. Manual labour cost per hectare is approximately double the cost of tractor rental, which implies that the use of tractors is significantly more economical than relying on manual labour.

In rare cases where family labour is used, manual labour cost is lower. This implies that the cost of using family labour may be lower than hiring manual labour from outside sources.

The choice between using tractors or manual labour may depend on various factors, such as the availability of family labour, the size of the farm, financial capacity, and the type of crops being cultivated.



Provision of other value-added services:

Currently in Nigeria, farmers have access only to tractors, while tractor owners have access to additional value-added services such as tractor technicians and spare parts services. Farmers will soon have access to other value-added services with the setting up of a Hub in Toto, Nasarawa, in May 2023.



Farmers identified that renting a tractor has helped improve farming practices and agribusiness.

Figure 1

Nigeria: How renting a tractor improved farming practices/agribusiness



Challenges identified by farmers:

Two key challenges for farmers are inadequate tractors and pricing. Farmers suggested 8 to 20% rental cost reduction to enable them to service more hectares and increase the number of tractors to cut down on waiting time and accessibility.



Others include maintenance downtime, and inaccessibility of their farms due to the fact that farmland is divided by a river.

Figure 2

Nigeria: Challenges in the use/access to the tractor rental service





How farmers request for a tractor:

Farmers in the surveyed area have access to multiple channels for booking tractors, including booking agents, farmers' hubs/cooperatives, and direct communication with tractor rental companies. Most of the farmers surveyed prefer to book tractors through booking agents. 7 out of 10 farmers surveyed have used this method, which suggests that it is a popular choice among farmers.

The popularity of booking agents among farmers indicates that these intermediaries play an important role in facilitating access to tractor services in the area.

Figure 3:

Nigeria: How do you book or request a tractor when in need of the service



Income of farmers

Improved farming practices, including increased farm size, increase in commodity prices, and access to tractors, have led to a significant increase in the income of farmers, the income of female farmers increased by 380% and 138% for male farmers. This suggests an impressive improvement in productivity and efficiency in the agricultural sector.

3.3.2 Kenya

The survey results indicate that 51% of respondents in Kenya are female farmers, and most of them farm to feed their families, while men are more predisposed to farming on a larger scale primarily for business. This suggests that women are more likely to engage in subsistence farming while men are more likely to engage in commercial farming. The results also show that 69% of the women surveyed are household heads while 98% of female respondents support between 1-10 people, indicating that women play a critical role in supporting their families.



The benefit of tractors and Hello Tractor Hub service: The use of tractors has improved agricultural practices for farmers as observed by Zaccheaus Okoth, a 40-year-old rice farmer, who previously relied on manual labour for harvesting and experienced low yields.

Furthermore, 33% of the female farmers have more than 5 years of experience in farming, while the rest have less than 5 years of experience. The women farmers have an average farm size of 0.75 hectares, which is relatively smaller compared to male farmers. Conversely, 90% of the men surveyed are household heads while 86% support between 1–10 people, with 10% supporting more than 10 people. 53% of the male farmers have more than 5 years in farming, while the rest have less than 5 years of experience. The male farmers have an average farm size of 1.25 hectares, which is larger than that of women.

The results suggest that gender differences in farming practices in Kenya are driven by socio-economic and cultural factors. Women are more likely to engage in subsistence farming due to limited access to resources and markets, while men are more likely to engage in commercial farming due to their economic and social status. The smaller farm sizes of women also reflect their limited access to land and other resources.

The benefit of tractors and Hello Tractor Hub service: The use of tractors has improved agricultural practices for farmers as observed by Zaccheaus Okoth, a 40-year-old rice farmer, who previously relied on manual labour for harvesting and experienced low yields. She says,

“ We used to use our hands in harvesting and we could not harvest well so most of the produce remained in the farm. As of now, harvesting has been made easy.”

Farmers in Kisumu also have access to a suite of services through the Hub. These include subsidized fertilizers, seeds provided by Hello Tractor, and extension services. Joshua Ochieng, a 45-year-old rice farmer, notes that

“ Back then, there were no fertilizers but as of now, we have access to quality fertilizers and pesticides.”

Other factors that led to an increase in income: In general, the income of farmers has increased significantly, with male farmers experiencing a 102% increase and female farmers experiencing a 42% increase. However, according to the survey respondents, this increase can be attributed to various factors such as improved access to resources like tractors, fertilizers, herbicides or pesticides, improved seedlings, access to irrigation, and stabilisation of commodity prices by the national cereals and produce board in Kenya.

Moses Onyango, a 41-year-old farmer who cultivates rice and maize, believes that farmers could do even better if they had access to better markets. According to Onyango,

“ Farmers can do a lot better if they have access to the market; we produce and sell our rice at a giveaway price.”

Table 1: Beneficiaries' yield data

Yield (kg)	Maize	Rice	Groundnut	Bean	Melon	Millet	Tomatoes
Before intervention (kg)	62,745	513,183	24,800	9,360	109,730	2,600	4,050
After intervention (kg)	118,040	711,635	35,550	13,470	155,790	3,300	4,410
Percentage increase (%)	88%	39%	43%	44%	42%	27%	9%

The primary challenges reported by farmers include insufficient tractor availability, as indicated by 9 out of 10 farmers, and pricing concerns, as mentioned by 5 out of 10 farmers.

Moreover, the assessment has revealed additional challenges specific to the sample population in Kisumu and Ahero. These challenges predominantly arise from climate change, pest infestations, and diseases. Farmers highlighted the need for increased support to combat these issues. Additionally, inadequate access to capital was identified as a barrier to utilizing tractor services effectively, with some farmers requesting for the flexibility of paying tractor rental costs after the harvest.

“ The use of tractors is good however, we need to have water pumps. This is the main challenge we have around more so for small-scale farmers, ”

Leah Akoth – a 27-year-old rice farmer.

The assessment has also underscored the significance of environmental factors. Sherine Omondi, a 40-year-old maize farmer, emphasized the heavy reliance on rainfall for farming activities, rendering farmers vulnerable to losses during periods of insufficient rainfall. Furthermore, Anthony Onyugi, a 45-year-old farmer cultivating maize, rice, and tomatoes, highlighted the detrimental impact of birds that often consume a substantial portion of the crops, leading to significant yield losses.

Table 2: Comparison between Nigeria and Kenya beneficiaries

Yield (kg)	Maize	Rice	Groundnut	Bean
	Female	Male	Female	Male
Total respondents	85 farmers (51%)	84 farmers (49%)	44 farmers (28%)	111 farmers (72%)
Location surveyed	Kisumu; Rabuor, Nyando and Ahero		Toto and Awe, Nasarawa	
Household heads	59% are household head	76% are household head	80% are household heads	95% are household heads
Average hectare per farmer	0.75 hectare	1.25 hectare	5.4 hectares	8.2 hectares
Income in 2021 (before intervention)	\$825	\$892	\$424	\$2,594
The average income in 2022 (after intervention)	\$1,166	\$1,802	\$2,035	\$6,183
Percentage increase in income	41%	102%	380%	138%
Mobile phone ownership	Basic phone-72% Smartphone-40% None-4%	Basic phone-58% Smartphone-57%	Basic phone-79% Smartphone-16% None-7%	Basic phone-76% Smartphone-25% None-3%
Farming experience	33% have more than 5years of experience	53% have more than 5years of experience	82% have more than 5years of experience	94% have more than 5years of experience
Predominant crops	Rice (87%) and Maize (38%)		Maize (74%) and Rice (41%)	
Comparative analysis of tractor and labour cost	9 out of 10 farmers surveyed agreed that tractor cost per hectare is more cost-effective than labour cost per hectare.		8 out of 10 farmers surveyed agreed that tractor cost per hectare is more cost-effective than labour cost per hectare.	
Method of booking tractors	9 out of 10 farmers book tractors through booking agents		7 out of 10 farmers book tractors through booking agents	
Hectares requested to be serviced	9 out of 10 farmers book tractors through booking agents		7 out of 10 farmers book tractors through booking agents	
How financing impacted the tractor owner's ability to purchase a tractor	5 out of 10 tractor owners would never have been able to purchase a tractor		9 out of 10 tractor owners would never have been able to purchase a tractor	
Average rental cost compared with other commercial rentals	Hello, Tractor's current rental cost in (Kisumu-Kenya) is between \$87.5 to \$100 per hectare while other commercial service providers charge between \$150 to \$175 for their rental services.		Hello Tractor's current rental cost in Awe and Toto, Nasarawa, is between \$54.31 to \$65.17 per hectare, while other commercial service providers charge between \$65.17 to \$86.9 for their rental services	
Challenges	Two key challenges faced by farmers are inadequate tractors (9 out of 10 farmers) and pricing (5 out of 10 farmers).		Two key challenges faced by farmers are inadequate tractors (9 out of 10 farmers) and pricing (4 out of 10 farmers)	

Overall,

- 87% of the farmers surveyed believed that renting tractors is a more cost-effective option compared to manual labour involving the use of workers or animals.
- 76% of the farmers reported a decrease in their labour costs since they began renting tractors. This indicates that utilising tractors has helped them save on labour expenses.
- A significant number of farmers, 76% of the respondents, have been able to expand their farm operations since they started renting tractors. This suggests that access to tractors has facilitated the growth and scalability of their farming activities.
- The primary challenge faced by 88% of the surveyed farmers is the inadequate availability of tractors. This shortage hinders their ability to access and utilise tractors effectively.
- In terms of rental prices, 46% of the farmers expressed a desire for a reduction in rental fees.
- Data showed that 59% of the farmers surveyed were able to make bookings independently without any assistance, utilising their phones directly. On the other hand, 31% of the farmers required some assistance while booking, whereas 11% experienced issues and could not book tractors at all.
- Tractor owners serviced an average of 92.9 hectares monthly during the planting season. However, their service volume decreases during the off-peak season, suggesting a correlation between tractor usage and seasonal agricultural activities.
- The surveyed tractor owners have an average monthly income of \$4,610. This indicates that tractor ownership is a lucrative venture, as these owners are earning a substantial income from their services. Furthermore, 88% of tractor owners surveyed currently employ one to two tractor drivers and at least 70% support between 1 to 10 people.
- 58% of tractor owners are working with 1 to 2 booking agents, 27% work with 3–4 booking agents and 15% work with more than 5 booking agents.
- The repayment of tractor financing in Nigeria, Kenya, and Uganda has been exceptional with a 90% repayment rate.
- The availability of tractor financing has had a significant impact on tractor owners. 73% of tractor owners stated that they would never have been able to purchase a tractor without financing options. This demonstrates the critical role that financing plays in enabling tractor ownership, empowering a substantial portion of tractor owners who would otherwise not have the means to make such a purchase.

Figure 4: Comparison between tractor and labour costs per hectare, which is more cost-effective?

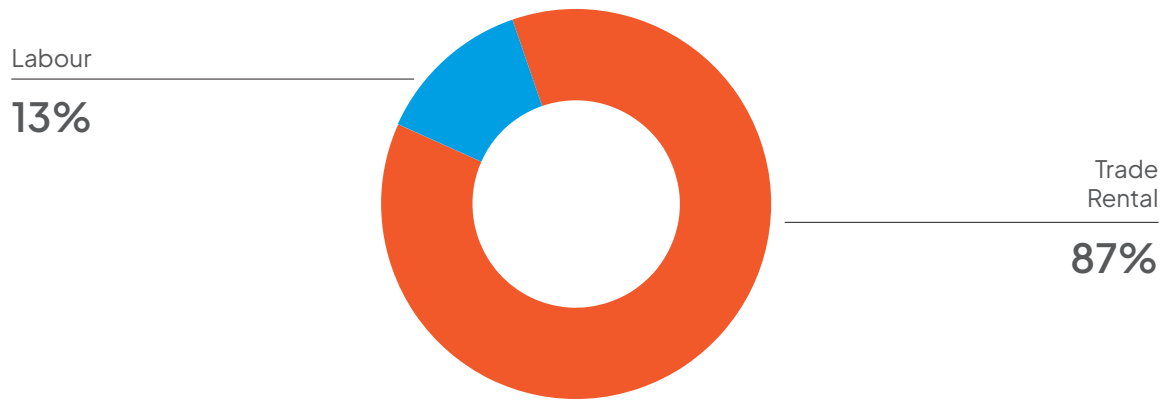


Figure 5 :How renting a tractor improved farming practices/agribusiness



Figure 6 : Challenges in access and use of Hello tractor services

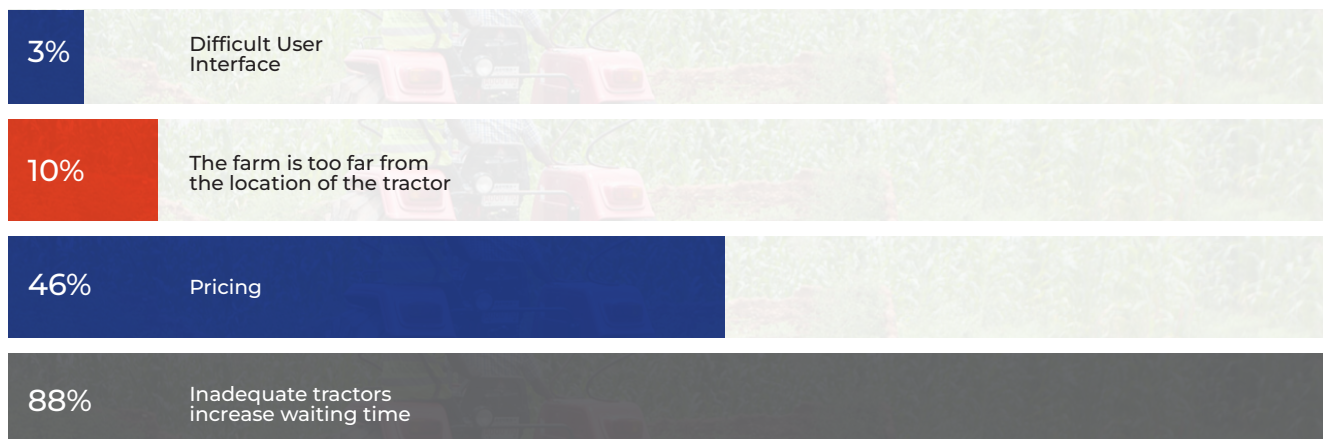
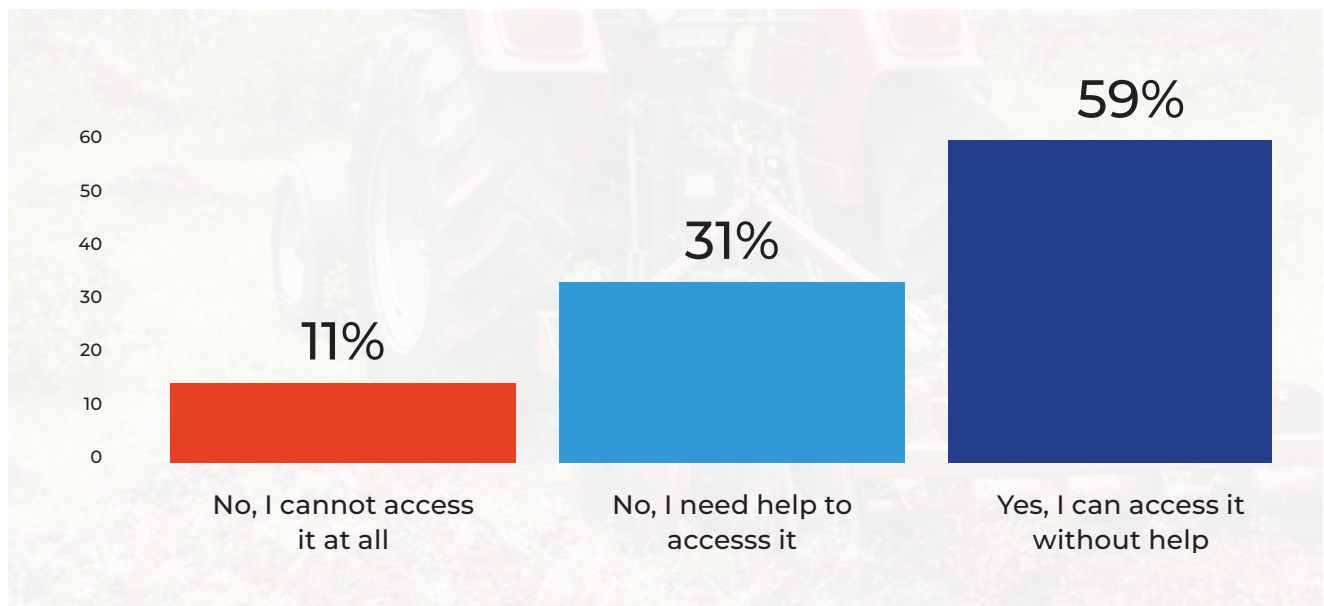


Figure 7 : Challenges in access and use of Hello tractor services



3.3.4 Recommendations

Increasing the number of tractor owners:

The demand for tractor services exceeds the number of tractors available to serve farmers. As a result, by increasing the number of tractors, farmers will not have to wait as long to access this service, allowing planting and other farming activities to be completed on time.

Introducing the use of USSD code:

The farmers believe that introducing USSD code will allow farmers who use basic phones

to easily access booking services rather than relying solely on booking agents. This will also make the tractor service accessible to farmers in areas where booking agents are unable to reach.

Introducing credit/loan services:

The farmers suggested that loans and credit services be made available at the hub. The majority of them stated that this will allow them to increase the number of acres cultivated each season and then they can pay after harvest because most of them do not have

enough money to pay for the tractor services during land preparation.

The farmers also suggested that Hello Tractor expand their services to meet some of their farming needs. Some of the recommended services are listed below:

1. Availability of extension officers to provide necessary information to the farmers.
2. Availability of quality fertilizers and seedlings at subsidized prices to the farmers.
3. **Availability of combined harvesters:** According to the farmers, the tractors provided by Hello Tractor are mainly used to cultivate and rotavate. They suggested that adding combined harvesters would help speed up the entire farming process.
4. Availability of pricing information and soliciting of markets: Most of the farmers suggested that Hello Tractor helps them solicit for markets and provides them with information on the best prices for their produce.

3.4 Social Return on Investment (SROI) | Hello Tractor

3.4.1 Overview

One of the key objective of this study is to evaluate the social value of Heifer's investment in Hello tractors T4A and AYuTe projects. Both projects provide financing for tractor ownership and access to tractors for smallholder farmers in Nigeria, Kenya and Uganda.

The social return on investment component of the study is focused on measuring the tangible and intangible value (financial) of the projects' impact using clearly defined outcome indicators.

The overarching objectives for SROI evaluation are:

- Establish the SROI of projects to beneficiaries (direct & indirect) and the community. For example, "A \$1 investment in providing farmers with access to tractors has generated an SROI of \$2.4; this translates to an increase in farmers' income and an improvement in health and economic outcomes."
- Recommendations for the extended long-term impact of social investment. For example, "an investment in a tractor mechanization project in Nigeria, Kenya and Uganda gives a 140% net SROI, through a sustained increase in farmers' income, health and economic outcomes, development of self-esteem and an opportunity to contribute to the immediate economy (community/state)."

Table 3: Project benefits

Indicators	Success rate No of beneficiaries	Monetary	Groundnut
Increase in family savings	76% 16,355	\$480	\$7,850,400
Healthy living habits	76% 98,124	\$10	\$981,240
Increase in productive hours because of good health	76% 16,355	%10	\$163,550
Increase in school enrolment	64,560 (at least 3 children enrolled in each family)	\$20	\$1,291,200
New business opened	104	\$100	\$10,400
Increased self-esteem	21,520	\$10	\$215,200
Capacity development for tractor operators	157	\$100	\$15,700
		Total value of benefits	\$10,527,690

*Success rate: 76% of farmers surveyed have been able to expand their farm operations and consequently increased income.

Table 4
Direct and Indirect beneficiaries as at January 2023

	Direct beneficiaries	Indirect beneficiaries
Farmers serviced	21,048	126,288
Tractor owners	104	624
Booking agents	208	1,248
Tractor operators	157	942
Tractor technician	3	9
Total	21,520	129,111
Total direct+indirect beneficiaries	150,631	

** assumption: each direct beneficiary supports at least 5 to 6 people. This is supported by the survey data.

Table 5: SROI table

	Values
Project Cost	\$4,400,000
Benefits (in numbers)	10,527,690
SROI	2.4
Net SROI	1.4
Net SROI (%)	140%

- The SROI ratio of 2.4 indicates that the project was able to generate \$2.4 of social value for every dollar invested in providing tractors to smallholder farmers. This means that the project was highly efficient in creating social impact and yielded a significant return in terms of social value.
- The Net SROI value of 1.4 indicates that the project produced a positive return on investment. It means that the social value generated was 1.4 times greater than the resources initially invested. This outcome suggests that the project was not only successful in achieving its intended social goals but also exceeded expectations by delivering additional value to society.
- Overall, these values paint a positive picture of the project's benefits. The SROI ratio of 2.4 demonstrates the project's ability to leverage resources effectively and create substantial social value. This is significant given that the project benefits are just unravelling and the project has just crossed the one-year mark. This indicates a promising potential for even greater social value creation as the project continues to progress and expand its reach.
- **Financial return on investment:**
The loan repayment rate represents the financial return on investment. This indicates how successful the financing initiative has been in terms of recouping the funds invested. The 90% repayment rate as indicated in the table below suggests that the project is financially viable and sustainable, ensuring the availability of funds for future tractor financing.

Table 6
PAYG repayment report

PAYG Cumulative Repayment Report													
Country	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	Overall Cumulative
Kenya	130%	130%	96%	102%	99%	85%	85%	94%	103%	63%	89%	89%	97%
Nigeria	114%	114%	102%	124%	99%	110%	114%	15%	57%	86%	96%	94%	94%
Uganda			100%	94%	100%	71%	37%	49%	61%	55%	64%	64%	70%
Average	122%	122%	99%	107%	99%	89%	79%	53%	74%	68%	83%	82%	90%

3.5 Quotes from Beneficiaries

“Access to tractors and inputs has contributed to my increase in income. Before when using cows, the process was tedious and slow as it can take one or two weeks to cultivate my farm but with a tractor, I can do the job within a day.”

Jane Atieno, a female farmer in Rabuor Kenya.

“Hello Tractor provides a sophisticated mobile app which allows me to track my tractors’ location, carry out routine maintenance, know the number of hectares done and also know the amount of fuel consumed which has helped my business a lot and helps it to run smoothly.”

Samson Enesi, Abuja, a civil servant and a tractor owner.

“Being a female in the agric field, there are some discriminations from male farmers but consistency has helped me, and being a booking agent earlier has helped me. The female farmers trust me more and prefer to work with me and some male farmers prefer to work with me because they think I’m more empathetic.”

Blessing Agu –Abuja, a female farmer and tractor owner.

“It has improved my business as I have been able to improve the acreage I do every year. From the profits, I am able to improve my productivity to buy quality farm inputs for my farm. I am able to keep my family in a stable financial position.”

Samsung Opiyo, Muhoroni, Kisumu , Kenya, a farmer and tractor owner.

“I have been looking at mechanisation for a long time but building capital was a problem. If I can get more on the same terms, I'll get up to 50 tractors because the opportunities are enormous. We get about 5 calls every week and we haven't even been able to satisfy our customers. So the demand is high, even though it's a seasonal business, you can succeed at it with proper planning.”

Munza Ambima, serviced up to 625 hectares to date. (He services Nassarawa, Abuja, Kogi, Delta and Taraba)



ColdHubs

4.1 Brief Introduction

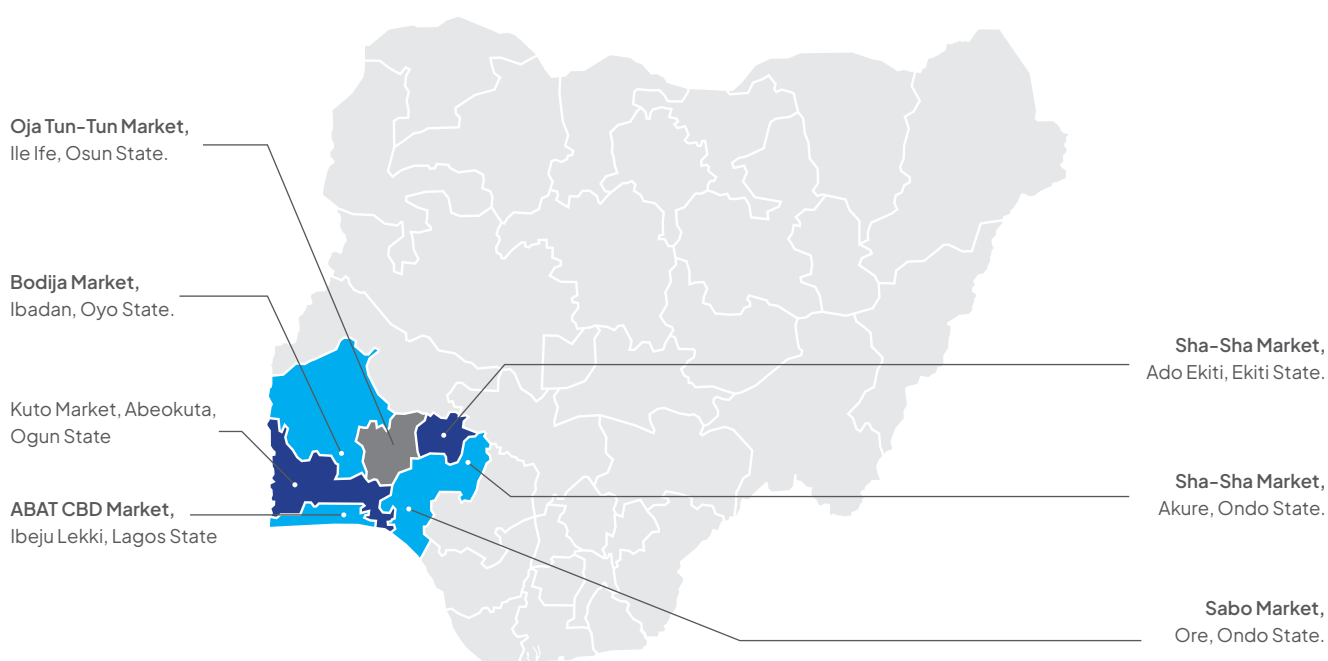
ColdHubs is an agri-tech innovation that provides solar-powered walk-in cold storage facilities for 24-hour storage and preservation of perishable foods. This innovation addresses the problem of post-harvest losses in fruits, vegetables and other perishable food. They offer farmers a flexible pay-as-you-store (PAYS) subscription model.

The farmers transfer their perishable foods into reusable crates/trays, which are then placed on the shelves and they pay a daily flat fee for each crate of food they store.

The overall objective of the AYuTe intervention was to strategically deploy solar-powered walk-in cold rooms in 10 locations for the storage, and preservation of fresh fruits and vegetables and to increase the income of growers and retailers in Nigeria. The total number of beneficiaries to be reached by the intervention is 10,000.

According to the report from ColdHubs, a total of 512 smallholder farmers, retailers and wholesalers have been impacted and 700 farmers, retailers and wholesalers have been trained in post-harvest management. Also, a total of 14 jobs have been created during the course of the implementation of the project. Currently, ColdHubs has a total of 512 paying customers.

As at December 2022, 7 out of the 10 proposed ColdHubs facilities had been commissioned and fully opened for business operations. The 7 ColdHubs fully operating are of 3 tons capacity and their locations are:



At the time of this assessment, only the ColdHubs facility located in Lagos have been commissioned and fully functioning. The other locations were undergoing repair or routine maintenance and so the assessment was conducted for the beneficiaries in the ABAT CBD Market, Ibeju Lekki, Lagos State.

4.2 Key Findings

The ABAT CBD market's ColdHubs facility has a capacity of 150 crates of vegetables and 25 trays of meat. The market is low-density, however, the hub is also being used by farmers in Epe who sell wholesale items. Record keeping is done manually and all payments are made in cash and the hub attendants deposit the money into the bank every Monday. The average monthly income is between N200,000–N500,000.

4.3 Analysis

- The data analysis revealed that the average customer of ColdHubs in the ABAT CBD market is a male retailer in his early 30s to mid-40s, with seven years of retail experience from either the Northern Nigeria

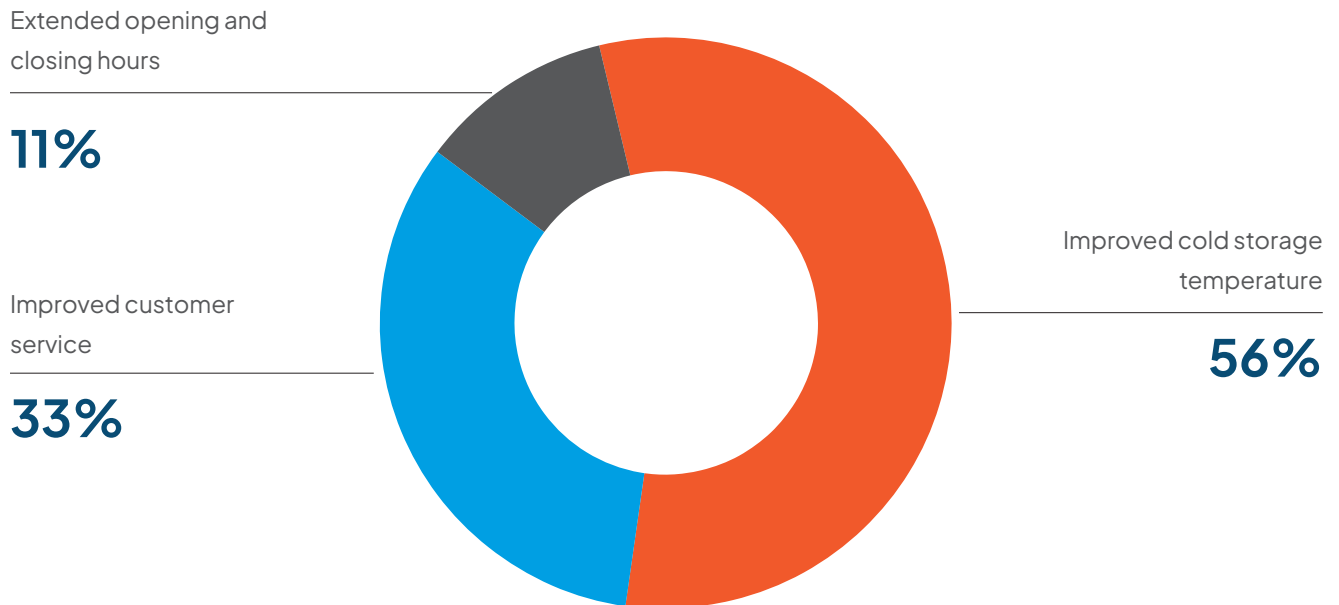
or the popular Mile 12 market in Ketu Lagos. The primary source of livelihood for these customers is the sale of vegetables and fruits, and they support between five to six people with their income. Most of them have been using the facility for less than three months. The ColdHubs facility utilizes refrigeration technology to extend the shelf life of vegetables and fruits, reducing spoilage and minimizing post-harvest losses. This enables retailers to store fresh produce for a longer time, attracting more customers and increasing sales. By minimizing losses, the customers' income significantly improves as this directly leads to higher revenue and profit margins.

- Retailers in the ABAT CBD market lost between \$4.3 to \$8.7 weekly to poor storage prior to utilizing cold room storage. Most of the retailers have been using the ColdHubs facility for more than three months, demonstrating a significant level of familiarity with the benefits of the technology, Abdulsalam Sanni stated that "I will continue to pay for the cold room service because it is affordable, and my vegetables won't spoil."

Figure 9
ColdHubs: gaps noticed with the agri-tech innovation



Figure 10: Improvements you like to see with ColdHubs



4.4 Recommendations

- There needs to be an overhaul of the operations and remote monitoring of the hub.
- There should be increased ongoing customer awareness and education.
- A shift system with two hub operators should be implemented to address human resource issues with hub management.

4.5 Social Return on Investment SROI | Cold Hubs

The cold storage facilities were recently commissioned and usage is under six months, therefore social return on investment could not be calculated.

Pula

5.1 Brief Introduction

Pula is an agricultural insurance and technology company that designs and delivers innovative agricultural insurance and digital products to assist smallholder farmers in coping with yield risks, improving their farming practices and increasing their income over time. Crop Insurance has proven to be an efficient and effective adaptation solution for smallholder farmers, providing them with financial resilience during difficult times, and keeping them from going into a downward spiral because of one bad harvest resulting from either drought, pests, plant and human diseases, hail and windstorms, flood, heat waves, and other acts of nature. Crop Insurance addresses the challenge by offering insurance coverage against poor harvests.

The overall objective of the AYuTe intervention was to pre-finance crop insurance premiums and to pilot Pay-At-Harvest Area Yield Index Insurance (AYII) solution for smallholder rice farmers in Nigeria. This will enable smallholder farmers effectively and sustainably respond to climate change by adopting and subscribing to crop insurance as a climate smart practice and for resilience building. The intended benefit is to significantly increase their financial resilience to shocks by providing financial services to smallholder farmers. The intervention was divided into two phases, the first phase which was the pilot phase reached a total of 4,358 farmers and the second phase reached a total of 19,901 farmers.

The farmers lands are insured. Pula provides insurance to smallholder farmers in group or clusters. Under the insurance program, the farmers are further grouped into areas that have the same climatic conditions referred to as Agro-Ecological Zones (AEZ) and when they experience loss, the insurance compensates them for the value of lost yields in that AEZ.

According to the information received from Pula, a total of 14,258 hectares have been insured and 1010 farmers have received payout. The insured farmers are located in Benue, Nassarawa, Kano, Kaduna, Kebbi and Jigawa States. The assessment was conducted among rice

farmers in Azara and Awe local government areas in Nassarawa State.

5.2 Key Findings

Pula's insurance only covers one hectare per farmer who subscribes. The premium payment per hectare is between 14,050 to N16,500 per farmer. Some of the farmers received training on risk management, financial management and record keeping. Most of the female farmers are limited to farming between 1–2 hectares because their husbands are also farmers.

The rice farmers surveyed in Azara and Awe local government areas in Nassarawa state, Nigeria all experienced low yields in 2022 which was attributed to flooding, a short rainfall cycle, rat infestation and grasshopper infestation. As of the time of this assessment, none of the farmers had received any compensation for yield loss in 2022. This is however due to defaulting in payment of premium by the farmers concerned and efforts are ongoing by Pula and the insurance company to address the issue.

According to the farmers, there was a 70–80% loss in yield in 2022 when compared to the

previous year. All the farmers who are currently subscribed to Pula have stated that they are willing to continue their subscription in the hope that their loss for 2022 will be duly compensated.

Also, there seems to be a communication gap between Pula and the farmers regarding the methodology for claims payment as most of them are unaware that Pula uses the Area Yield Index Insurance (AYII) methodology. A few farmers also mentioned another insurance service provider called the Nigerian Agricultural Insurance Corporation (NAIC), which insures more than one hectare of land. In this model, farmers pay a premium of 2% of the total cost expended at the start of farming and receive 75% of the expected yield in the event of a loss.

Generally, majority of the smallholder farmers are enjoying the insurance services and willing to continue with the program.

5.3 Analysis

The survey captured 69 farmers in Azara and Awe in Nasarawara State. There was a large-scale loss of harvest caused by flooding, a short rainfall cycle, rat infestation, and grasshopper infestation. Farmers had fairly good knowledge about insurance and its benefits, however, none of the 69 surveyed nor any farmer in Azara or Awe have received any form of compensation for the last growing season.

Prior to subscribing to Pula, 88% of farmers had suffered crop losses in previous seasons.

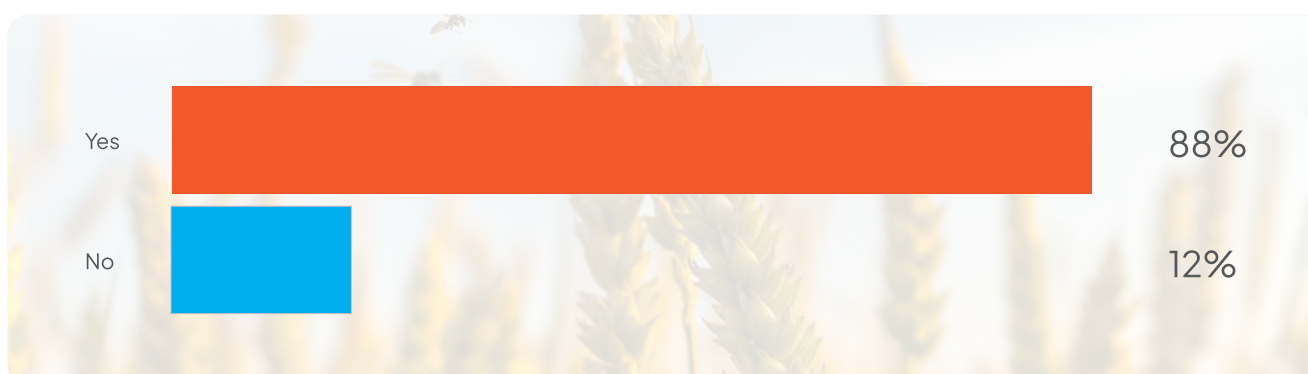
Table 7: Premium payment and claims (figures culled from project document)

S/N	Description	Number of farmers	Amount (N)
1	Total number of farmers who were pre financed by Heifer International at the beginning of the 2021 wet season	4,358	67,186,627.80
2	Total number of farmers who suffered losses due to soil moisture stress and have claim pay-out from the insurance company (Leadway Assurance)	3,110	111,398,894
3	Total number of farmers who were entitled to claim pay-out after deducting the premium amount for insurance.	1,970	72,478,350.58
4	Total number of farmers who were paid their claims for yield losses	1,316	48,100,000

The table 6 above highlights the summary of the PAH-AYII project for 2021. The Insurance firm (Leadway Assurance) has successfully disbursed 48.1 million Naira to 1,316 smallholder farmers who suffered losses in the 2021 wet season. The outstanding balance of 24.4 million Naira is yet to be disbursed to 644 smallholder farmers whose account details were incorrect through the cash disbursement strategy. Planned to disburse the outstanding funds using a physical “Help Desk” at the Olam office (Benue State) with the support of Heifer State Facilitators, Community Facilitators, and cooperative leadership.

S/N	Description	Number of farmers	Amount (N)
1	Total number of farmers who were pre-financed by Heifer International at the beginning of the 2022 wet season	19,901	205,936,071
2	Total number of farmers who suffered losses due to flood and have received claim pay-outs from the insurance company (Leadway Assurance)	9,884	121,370,035
3	Total number of farmers who were entitled to claim pay-out after deducting the premium amount for insurance. Each farmer was paid according to the percentage of loss experienced as described above. Farmers were paid between N18,000 to N40,000	1,876	46,066,399

Figure 11: Have you ever experienced crop losses due to natural disasters or other unexpected events before subscribing to Pula?



Demographics:

82% of the farmers surveyed are men, overall 41% of the farmers are supporting more than 10 people financially while 59% support between 1 to 10 people. 89% of the farmers have more than 5 years of farming experience. However, it is worth noting that a significant proportion of the farmers had limited education, as evidenced by 76% of them relying on basic phones and traditional farming methods.

Another noteworthy observation is that most farmers do not maintain records or track their expenses, which can hinder their ability to have a comprehensive understanding of their yields and financial performance.



Number of hectares insured:

Most of the farmers do not have information on how many hectares they are insured. However, from Pula's report, Pula has the capacity to insure one to two hectares. Since the majority of farmers paid the premium for one hectare, it can be inferred that 90% of the surveyed farmers insured only one hectare.



Income:

Farmers lost their harvest hence there was a 8% loss in income compared with the 2021 season. The average income decreased from \$3,374 in 2021 to \$3,114 in 2022. However, it is important to consider the context that farmers actually increased their farm size from 5.89 hectares in 2021 to 6.43 hectares in 2022. This suggests that even though the farmers had increased their farm size, they still experienced a reduction in income, indicating the significant impact of crop losses on their financial stability. This further show that the farmers' income would have been far more depleted than it is now if the insurance intervention was not available to them.



Payment of premium:

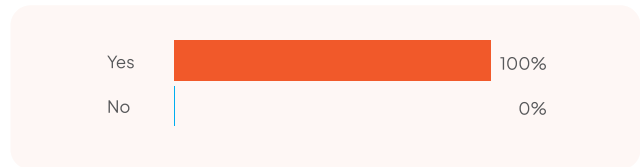
79% of farmers prefer the current model of payment of premium at harvest. Though none of the farmers interviewed have been paid for the loss of the last planting season, this was due to default paying premium and misunderstanding of the insurance model by the smallholder farmers. The project document however show that majority of the beneficiaries in other implementing communities within the Pula project have paid back their premium and also well compensated for their farm yield losses.



Willingness to continue subscription:

Farmer's willingness to continue subscription is borne out of the fear of the unknown, that if they fail to subscribe going forward, they may miss out if Pula decides to make claims payment for the 2022 planting season. All the farmers surveyed are willing to continue the subscription.

Farmers willingness to continue to subscribe and pay for crop insurance



Challenges



68% of farmers surveyed raised concerns over poor communication from Pula; Ikwugonye Ada, 56 years, rice and maize farmer says, "There is a lack of clarity in Pula's communication, as Pula's communication model has been very poor and they have not visited any farms to ascertain the level of flooding or loss to farms. They only visited some selected farms during land preparation last planting season."



Farmers do not really understand how payment of claims works and farmers have started to doubt Pula whether they will fulfil their part of the bargain.

5.5 Recommendations

- The Area Yield Index Insurance (AYII) methodology used by Pula for payment of claims should be properly explained to the farmers.
- Farmers should be compensated within a reasonable time frame within the net growing season for their losses in order to encourage other farmers to enrol for insurance.
- The project plan should be modified to accommodate those that want to insure more hectares of land.

The total number of beneficiaries intended to be reached by the intervention is 15,000 smallholder farmers and at the end of the project, 15,077 farmers were reached.



6.1 Brief Introduction

Ignitia is a weather forecasting company that uses SMS to deliver weather forecasts to West African farmers in partnership with mobile network operators and other bulk SMS providers.

The AYuTe project “Building Farmer Resilience Through Digital Weather and Extension Services in Senegal” was designed to assist smallholder farmers in Senegal to optimize decision-making and mitigate weather-related risks. The overall goal of this project is to strengthen the resilience of 15,000 families through access to SMS-based climate-smart agronomic advisory and rainfall forecasts, which will in the long run support smallholder farmers with increased yield and living income as a result of behavioural changes in farming activities based on received messages.

The total number of beneficiaries intended to be reached by the intervention is 15,000 smallholder farmers and at the end of the project, 15,077 farmers were reached. The beneficiaries are located in regions of Bambey, Bounkiling, Fatick, Kaffrine, Kebemer, Matam, Ranerou Ferlo, Kaolack, Thies, Diourbel, Louga, Kougheul, Kolda and Sedihou in Senegal.

According to information received from Ignitia and the Heifer team in Senegal, Ignitia stopped providing services to farmers in June 2022, indicating that farmers did not use the information from Ignitia for another growing season after we conducted an end-line

assessment in February 2022, and thus there was no need to conduct another assessment. As a result, we reviewed the information they provided from the end-line assessment conducted in July 2022 and highlighted key points from the report.

6.2 Key Findings (from the end-line survey report by Ignitia)

A total of 372 smallholder farmers were surveyed of which 185 were male farmers and 187 were female farmers. Six key performance indicators were used to assess the impact of the project: Reach, Yield, Living Income, Behaviour change, Comprehension, and Affordability.

- **Reach:**
A total of 15,077 smallholder farmers were reached by the intervention.
- **Yield:**
According to the report, farmers experienced a 78% increase in yield and this was measured by the average output per hectare for rainy-season crops.
- **Living income:**
According to the report, farmers experienced a 29% increase in income and this was measured by the average farm income from the sale of rainy-season crops.
- **Behaviour change:**
The proportion of farmers who made farming decisions (such as when to harvest, apply fertilizers, dry their crops, how to store their crops, and so on) based on the weather forecast and advisories received was

measured, and according to the report, 81% of farmers harvested their crops, 57% applied fertilizers, 66% dried their crops, and 71% decided on when to store their crops based on the information they received.

- **Comprehension:**

This indicator was measured by the proportion of smallholder farmers who understood the SMS messages sent, and according to the report, 83% of the farmers surveyed stated that they found the message easy to understand despite the fact that the majority of them are illiterate.

- **Affordability:**

This was measured by the proportion of farmers willing to pay for the service, and according to the report, 56% of farmers surveyed are willing to pay for the service with their own funds, but only 46% can pay 60 CFA or more per SMS.

Other notable variables measured in the survey include delivery rate, training farmers on how to interpret the messages, and the accuracy of the daily rainfall forecast.

- **Delivery rate:**

According to the report, 75% of the farmers surveyed stated that they received the daily rainfall forecast message, while only 32% received the advisory messages.

- **Training farmers on how to interpret the messages:**

According to the report, 56% of the farmers surveyed did not receive training on how to interpret the messages sent to them, which is critical to their understanding and use of these messages.

- **Accuracy of the daily rainfall forecast:**

According to the report, 74% of the farmers surveyed stated that the daily rainfall forecast messages they received were accurate.

Table 8: Comparison between findings from the evaluation conducted by Kasher and Ignitia

Indicators	Findings from Ignitia	Findings from Kasher
Number of farmers surveyed	372 farmers (2.2% of beneficiaries)	2,338 farmers (15.5% of beneficiaries)
Yield (Average yield per hectare for rainy season crops)	78% increase in yield	This was not measured as there was no baseline information provided. However, information received from farmers indicated that there was a significant decrease in yield when compared to the last two planting seasons due to the effects of reduced and haphazard rainfall.

Living income (Average farm income from sale of rainy season crops)	29% increase in income	This was not measured as there was no baseline information provided. However, information received from farmers indicated that there was a 24% decrease in income when compared to the last two planting seasons due to the effects of reduced and haphazard rainfall. Farmers had an average income of \$1,036 in 2021 while farmers' income in 2020 was \$1,360.
Behaviour change (Proportion of farmers making at least one decision based on received messages)	81% of farmers surveyed use weather forecast to plan harvesting dates	83% of farmers surveyed use weather forecasts to plan planting dates. However, most of the farmers were receiving more detailed WCS messages from ANACIM/Jokalante which they rely on.
Comprehension (Proportion of farmers that understand the message)	83% of farmers surveyed understand the message they receive	Farmers prefer WCS messages in local languages as against French used by Ignitia. Also, the farmers stated that they prefer voiced-based messages that included bundled services such as (market price information).
Affordability (Proportion of farmers that are willing to pay for the service)	56% of farmers surveyed are willing to pay for the service with their own funds, but only 46% can pay 60 CFA (\$0.1) or more per SMS.	57% of the farmers surveyed are willing to pay for weather forecast messaging. 43% are not willing to pay because they cannot afford it and require further engagements on its benefits and correlation with yield and income. 37% of surveyed farmers can afford a monthly subscription between \$0.8 to \$1, and others (20%) can afford between \$1.1 to \$1.8.
Delivery rate	75% of the farmers surveyed stated that they received the daily rainfall forecast message, while only 32% received the advisory messages.	Although the farmers surveyed received daily rainfall forecasts from Ignitia, findings from the survey indicated that 70% (1,576) of farmers received WCS information prior to receiving ISKA/ Ignitia weather forecast messages.
Training farmers on how to interpret messages and advisories	56% of the farmers surveyed did not receive training on how to interpret the messages sent to them.	Most of the farmers gave positive feedback on the training they received on Iska messaging. However, some of the extension officers trained on how to use the Ojo platform did not know how to use it and some of the extension officers also stated that they preferred physical training to virtual training.
Accuracy of the daily rainfall forecast	74% of the farmers surveyed stated that the daily rainfall forecast messages they received were accurate.	Farmers preferred to use weather information received from ANACIM than the message from Ignitia, due to the accuracy of ANACIM's forecasts.

Recommendations

- The language preferences of the farmers must be taken into account as well as a feedback mechanism established to ensure that farmers can interpret and use the information. Senegal has a variety of languages, the most common are French and Wolof. However, at least six local languages are spoken in the project locations. Wolof is preferred over French; however, farmers prefer voice-over SMS messages in their local languages which include (and are not limited to Wolof) Pulaar, Mandinka, Balanta-Ganja, Mandjak, Hassaniya Arabic, Noon, Jola-Fonyi, Serer, Soninke, and Mankanya.
- There is the need for a detailed and robust plan to monitor and evaluate the project. In-depth training of extension workers is critical. As the primary contact for farmers, they can help them determine how climate-smart agriculture impacts the yields of farmers and how to support farmers to make better use of climate-smart information.
- The project's sustainability is hinged on farmers' willingness to pay for the services in the future. It is therefore imperative that engagement is strengthened through the producer organizations and that discussions about pricing options are negotiated at the earliest opportunity.

6.4 Social Return on Investment SROI | Ignitia

The data used for the SROI was culled from project document
SROI table

	Number of beneficiaries that experienced the indicators	Monetary	Estimate(\$)
Improved decision-making (planting and harvesting timing, irrigation practices, pest management strategies)	12,212	\$50	\$610,600
Risk-reduction (assessing the reduction in losses due to crop damage, resource wastage, or financial setbacks resulting from improved preparedness and timely decision-making facilitated by the advisory service)	5,880	\$40	\$235,200
Increase in farmers yield and income	6,031	\$350	\$2,110.850

Improved decision making (planting and harvesting timing, irrigation practices, pest management strategies)	12,212	\$100	\$122,120
		Total value of benefits	\$970,031
		Adjusted value with success rate	\$ 388,012

***Success rate:** 40% of beneficiaries that experienced increased income as a result of access to weather advisory services

	Values
Project Cost	\$150,000
Benefits (in numbers)	\$388,012
SROI	2.6
Net SROI	1.6
Net SROI (%)	160%

- The SROI ratio of 2.6 indicates that the project was able to generate \$2.6 of social value for every dollar invested in providing weather information and advisory services to smallholder farmers. Such a high SROI ratio suggests that the project has been highly efficient in creating a positive social impact and has yielded a significant return in terms of social value.
- The Net SROI value of 1.6 further reinforces the positive impact of the weather advisory service. A Net SROI of 1.6 means that the social value generated by the project exceeds the initial investment by 1.6 times. In other words, the benefits derived from the service outweigh the resources allocated to it, resulting in a positive return on investment.
- The high SROI and Net SROI values indicate that the weather information and advisory service has not only achieved its intended social goals but has also surpassed expectations by delivering substantial additional value to the society. This positive outcome highlights the importance of investing in services that empower and support farmers, as it can lead to transformative impacts on agricultural productivity, food systems, and the well-being of rural communities.



7.1 Brief Introduction

Kuza is a technology company that uses OneNetwork, its digital marketplace to empower youths and smallholder farmers by providing opportunities for them to learn, connect, and grow on their own terms and at their own pace, as individuals, communities, and networks, resulting in collective prosperity.

Through its Rural Entrepreneur Development Incubators (REDI), Kuza adopts a holistic, long-term systemic approach to recruit rural youth as Agri-entrepreneurs, to become members of OneNetwork, Kuza's digital marketplace.

Through the Rural Entrepreneur Development Incubators (REDI), Kuza recruits and mentors enterprising rural young women and men as Agripreneurs and provides them with specially designed portable digital kits. The kit includes a personalized Android tablet with built-in Kuza apps, a self-powered portable digital projector to show farmers HD video content on Good Agricultural Practices (GAPs) in local languages, and an edge computing device that enables Agripreneurs to create immersive customer experiences even in remote Africa. Kuza's OneNetwork provides high-quality agricultural products and services at discounted prices.

The agripreneurs earn their farmers' trust by providing personalized free advisory and information services to a cohort of 200 smallholder farmers, which in turn generates demand for the agricultural products and services they sell. They earn commissions

by selling bundled agricultural products and services such as advisory, inputs, credit, and access to markets to their farmers, which are procured through the platform's curated service providers.

According to Kuza, they have a network of over 750,000 farmers (65% of whom are women) supported by 5,000+ Agripreneurs (40% of whom are women) in five East/Southern African countries: Kenya, Uganda, Rwanda, Tanzania, and Mozambique, as well as two South Asian countries.

Kuza adapts a deliberate systems approach to capture all interactions and transactions between all stakeholders, allowing for real-time measurement and monitoring. In addition, independent evaluation teams from the World Bank, IFPRI, ILRI, and other research teams conduct regular trials on the data sets Kuza collects for ongoing research.

The overall goal of the AYuTe intervention is to assist smallholder farmers with digital content and training in order to provide them and their farm produce with the feasibility that will increase sales and profit. According to Kuza, the total number of beneficiaries intended to be reached by the intervention is 60,000. The locations of the target beneficiaries are Kenya, Rwanda, and Uganda.

7.2 Progress and current status of the project

According to Kuza, Heifer International and Kuza have engaged in the following:

- Signed an MOU for 11 African countries
- Mapped the business requirements of all the countries
- Digitized four key value chains (dairy, poultry, swine, small ruminants) and Heifer cornerstones in four local languages (English, Swahili, Buganda, Kinyarwanda) in microlearning video format.
- Co-created Digital Agriculture Champion (DAC) initiative to be piloted with 325 DACs leveraging the existing programs/projects of Heifer International across three East African countries. (Kenya: 125 DACs serving 25,500 farmers across 13 counties; Uganda: 100 DACs serving 20,000 farmers across 21 districts; Rwanda: 100 DACs serving 20,000 farmers across 20 districts)

7.3 Current Status (Phase 1)

- Content digitization has been completed and signed off by Heifer International
- 325 DACs have been identified across three East African countries
- Portable digital kits have been set up with the digitized content and the required digital platforms

- Kuza dedicated coaches and program teams are in place
- Incubation of DACs is being rolled out across three countries

7.4 Key Challenges Encountered by Kuza in Implementing the Project

- Getting the time commitment from the existing program teams at the Heifer Country office
- Lack of budgets at the Heifer country level for supporting DACs
- A dedicated resource at the Heifer country office to support AYuTe projects

7.5 Recommendation

We recommend that the project not proceed to phase 2 due to numerous gaps in the project model and implementation plans. We reached out to Kuza to set up a meeting to get more information and clarification on their project model and the challenges they highlighted, but we did not receive a response.



Conclusion and Recommendation

The projects in view directly solve significant challenges facing smallholder farmers. The innovators have also clearly identified the 'pressure points' for the smallholder farmers and developed low-cost solutions to address these issues.

The overarching challenge is how the innovators ensure the sustainability of their offerings after the grant cycle. There is an urgent need to strengthen and build the capacity of the organisations that appear to be stretched thin and lacking in structure that fully supports smallholder farmers.

The findings from this report should be seen as an opportunity to further 'protect' the initial investment and close the organisational structural gaps. Innovators with a sound framework, adequate human resources, and a dynamic evaluation system in place, will be better positioned to continuously support smallholder farmers and generate a positive social return on Heifer International's investment.



