Stories from the Global Call on Agricultural Innovation

eSusFarm®: Empowering Smallholder Farmers through Integrated Data-Driven Solutions

International University of East Africa (IUEA)

Uganda

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eSusFarm®: Empowering Smallholder Farmers through Integrated Data-Driven Solutions

ABSTRACT

This project aims to enhance food security in Uganda, aligning with the United Nations' Sustainable Development Goals (SDGs) 1 and 2, focusing on "No Poverty" and "Zero Hunger." The key objectives include digitizing and commercializing smallholder farmers, improving their market access, ensuring product quality through traceability, and boosting household incomes. The approach involves the development of a user-friendly mobile application and web platform, eSusFarm®, which enables farmers to input, access, and share crucial agricultural data. The platform collaborates with various entities to improve decision-making and efficiency across the agricultural ecosystem.

Results show significant progress, as smallholder farmers gain access to markets, with real-time data helping development agencies, researchers, and financial institutions tailor their support. Additionally, eSusFarm®'s quality assurance system has improved product traceability, ensuring consistent high-quality produce. The solution addresses key challenges like market access, data gaps, and quality control, contributing to poverty reduction, food security, and economic development in rural Uganda.

Despite its success, the platform faces limitations such as low adoption due to lack of awareness and varying infrastructure conditions. However, eSusFarm® stands out as an innovative agri-fintech solution, integrating both online and offline tools to monitor farmer behavior and improve agricultural productivity. It introduces real-time data collection to forecast food production, a capability previously unavailable for smallholder farmers.

TAPipedia Tags

agri-food value chains, smallholder farmers, agricultural production systems, agricultural data

Other keywords

Agri-fintech, Agricultural statistical data, Smallholder farmers, and Agric-value chain

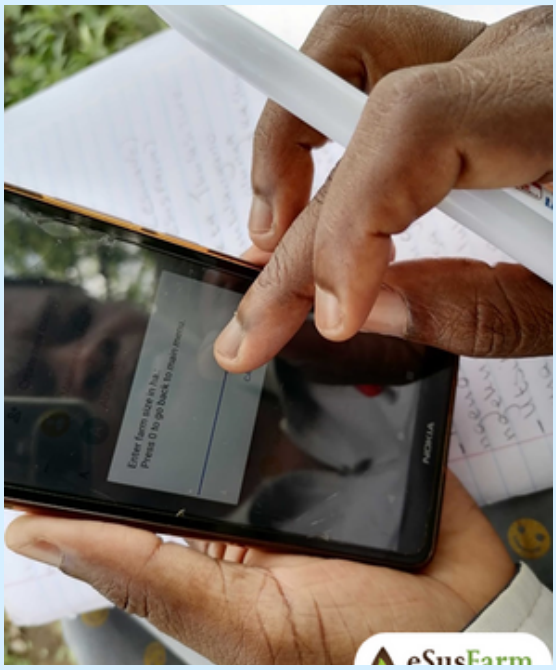
eSusFarm capacity building for Smallholder Farmers

Context

eSusFarm® is an integrated data-driven platform that leverages the capacities of partners including mobile network operators, financial institutions, farmer development agencies and input dealers, etc., to bundle and deliver a unique suite of services to smallholder farmers using their agronomic activities data which includes: digital advisory services, digital financial services, digital procurement services, agri e-commerce services and smart farming services and monitor smallholder farmer's behavior.

Challenges addressed

- *Energy demand and use in agrifood systems*
- *Population and development dynamics, food and nutrition security, sustainable diets*



A small holder farmer interacting with eSusFarm USSD Platform

KEY PROBLEMS

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Limited Market Access for Smallholder Farmers: Smallholder farmers face limited market access due to factors such as geographical isolation, particularly in remote rural areas, which makes reaching larger markets challenging. Inadequate infrastructure, including poor road networks, transportation, and storage facilities, further hinders their ability to sell produce. Additionally, a lack of access to market information, such as pricing trends and demand, makes it difficult for farmers to make informed decisions about production and sales timing.

Information Gap for Agricultural Players: Development agencies, researchers, and financial institutions face challenges in supporting smallholder farmers due to an information gap. Without accurate data on farmers' production and income, financial institutions struggle with credit assessments, while development agencies and researchers find it difficult to allocate resources effectively. This lack of information leads to inefficient interventions, as agricultural initiatives and research are not tailored to the specific needs of smallholder farmers.

Lack of Quality Monitoring for Smallholder Produce: Smallholder farmers face challenges in ensuring the quality of their produce, impacting market access and value chain efficiency. Quality variability among farmers makes it difficult for buyers to source consistently high-quality products. The lack of quality standards and monitoring mechanisms leads to inconsistencies in produce quality. As a result, smallholder farmers often miss out on premium markets or receive lower prices for their products.

INNOVATIVE SOLUTIONS

A small holder farmer interacting with eSusFarm USSD Platform

eSusFarm® uses a proprietary farmer assessment algorithm using human input and satellite data points, where a farmer is hand-held throughout the different stages of agricultural production until produce reaches markets and allows eSusFarm to track the quality and quantity of the smallholder farmer's crop and to categorize farmers between high, medium, and low proficiency in others words grade farmers based on their performance on the farm.

By modelling farmer behavior through our farmer assessment tool, we can deploy advanced AI & machine learning solutions to influence farming behaviors and decision-making towards regenerative agriculture. Our farmer behavior tool has a risk identification process that determines risks that could potentially prevent the farmer from achieving their objectives. The objectives of the farmer are to attain a very good harvest (yields tons/ha) and to meet the farming objectives.

Farmers use agronomic data to incentivize good decision-making and mitigate poor decision-making. Change in decision-making behavior is defined as Farmer Proficiency (measured as a percentage) and high farmer proficiency means a highly knowledgeable farmer who is low to risk. Lower proficiency means high risk while medium proficiency means in between medium risk.

Development of a Weather Index Insurance (WII) to improve livelihoods and increase the resilience of poor and vulnerable smallholder farmers to climate variabilities in Uganda. Our insights confirm the increasing vulnerability of crops to a myriad of climate and production-based risks alongside limited capacity amongst smallholder farmers to adapt, which has heightened the need for insurance products to cushion them from risks. Unfortunately, traditional insurance is expensive and in most cases does not work for smallholder farmers.

CRITICAL CAPACITIES

User Experience (UX) Design: The platform is user-friendly, especially for smallholder farmers who do not have advanced technical skills. A strong UX design team ensures that the interface is intuitive and accessible.

Cybersecurity and data privacy policy: Data security is paramount for user confidentiality, given that the system is a pool of sensitive demographic, financial, and agricultural data along with stakeholders in the value chain.

Zero-rated USSD: Mobile devices are often the least cost-effective but primary means of access for smallholder farmers. The USSD platform is mobile-friendly and thus supports widespread mobile network coverage.

Technology Infrastructure: A robust and reliable technology infrastructure crucial for data collection, storage, and dissemination is in place. This includes servers, databases, mobile applications, and web platforms.

Agronomic Expertise: Understanding agricultural practices, crop cycles, and regional variations is vital. The team involves individuals with agronomic expertise to interpret the data and provide actionable recommendations to farmers.

Data Accuracy and Quality: Ensuring that the data provided is accurate and of high quality. Inaccurate data can lead to poor decision-making and undermine trust in the platform.

Factors for Success

Localized Content development: The data and content to the specific needs and conditions of the local agricultural environment is localized to specific languages. This involves simplifying communication to less illiterate smallholder farmers through the use of ethnic languages that are easy to understand.

Partnership strengthening: The company has and is still building and strengthening both local and international collaborations with stakeholders in the agri-value chain, such as, government agencies, NGOs, local kingdoms, and financial institutions, to enhance the reach and impact of the platform.

Agricultural Expertise: Employment and partnerships with experts in agriculture to interpret and contextualize the data for the end-users. This includes agronomists and other agricultural specialists thus improving the efficiency and effectiveness of the system.

Marketing and Outreach: Effective marketing and outreach efforts to attract users and build trust in the platform. This involved community engagement and education.

Customer Support and Feedback Mechanism: The provision of accessible customer support to assist farmers in using the platform and addressing their queries and concerns has been crucial for customer retention strategies. The communication loop has enabled the collection of user feedback and continuous platform improvement based on user needs and suggestions.

Regulatory Compliance: Ensuring compliance with relevant data protection and financial regulations, as well as any agricultural or farming-related regulations in the regions served.

Community capacity building; Community adoption strategies like leadership engagement, community sensitization, educational, and user training have been key to fostering interaction and knowledge sharing among smallholder farmers and other participants in the agri-value chain. The strategies also contribute to the build-up of a wider pool of knowledge and skills on the use of the digital facet. Additionally, the training brings adult skilling to farmers with less ability to read and write.

Continuous Learning and Adaptation: The agricultural sector is dynamic, and the platform management team carries out regular adaption to changing conditions, incorporates user feedback, and ensures the technology stays relevant.

Market and Value Chain Linkages: The established self-sustaining agricultural ecosystems comprised of smallholder farmers, buyers, suppliers, and other stakeholders in the agricultural value chain have been key to project success through enhanced market access.

Sustainability: Developing a sustainable business model that can support the long-term viability of the platform. This involved revenue-generating models through subscriptions, partnerships, or other means.

Outcomes and Measurable Impacts

Increased Agricultural Productivity among smallholder farmers:

Outcome: The implementation of eSusFarm has led to noticeable improvements in crop and yield production among smallholder farmers by 47.5%.
Measurable impact: Tracking and comparing pre- and post-implementation productivity data allows for a quantitative assessment of the increase. This includes aspects like crop output, growth, and the ability to predict seasonal production. Such enhancements in productivity contribute directly to the livelihoods of smallholder farmers, ensuring a more secure and sustainable future.

Enhanced Smallholder Market Access:

Outcome: The introduction of virtual market linkages has resulted in a substantial 17% increase in market access for smallholder farmers, both locally and globally.
Measurable impact: Monitoring the number of smallholder farmers accessing markets, coupled with the increase in sales and profits, demonstrates tangible benefits.

Improved Smallholder Credit Access:

Outcome: eSusFarm has played a pivotal role in increasing access to financial services and credit for smallholder farmers by 11.2%.
Measurable impact: With 21,680 farmers, including 12,120 males and 9,560 females, obtaining credit, the impact on agricultural activities can be thoroughly assessed.

Efficiency in the Agri-Value Chain:

Outcome: The agri-value chain has experienced improved efficiency through better quality assurance, traceability, and certified suppliers. Currently we have 193,159 smallholder farmers digitalized (age, sex, location, stock owned, size of land, and production records of the farmer)
Measurable impact: A 17% improvement in the analysis of reduced transportation costs, a 5.6% decrease in wastage, and faster delivery to markets showcase the significant enhancements in the value chain.

Data-Driven Decision-Making:

Outcome: Agri-value chain stakeholders have increasingly adopted data-driven strategies.
Measurable impact: With 48% of stakeholders and users relying on eSusFarm data for decision-making, the resulting improvements in operations are evident. This not only enhances the efficiency of the agricultural sector but also empowers farmers with informed choices, thereby contributing to community development.

Increased Income for Smallholder Farmers:

Outcome: Smallholder farmers have experienced improved livelihoods and household incomes.
Measurable impact: The 12.7% increase in household income for participating farmers reflects a positive shift in the economic landscape of the community. These changes directly contribute to an improved quality of life, as farmers can invest in education, healthcare, and other essential needs.

Decreased Food Insecurity:

Outcome: eSusFarm has contributed to enhanced food security in the regions it serves.
Measurable impact: The reduction of food scarcity by 3.4% and a decrease in malnutrition rates are critical indicators of improved community well-being. This outcome not only ensures a stable and consistent food supply but also positively influences the health of the population.

Data Accessibility and Accuracy for Smallholder Farmers Decision Making:

Outcome: eSusFarm has ensured the availability of high-quality, accessible agricultural data through certification processes.
Measurable impact: The platform's reliable data, coupled with positive user feedback, supports efficient decision-making among smallholder farmers and contributes to improved agricultural practices and community development.

Challenges encountered

- Financial challenge in recruiting a diverse technical team. Despite the increasing user base, there remains a gap in the number of field personnel needed for training and supporting platform users, as well as for continuous platform development. This ensures that all solutions and services are readily accessible to smallholder farmers and the broader agricultural value chain to effectively achieve their objectives and fulfill their needs.
- Awareness Challenge in terms of educating and capacitating smallholder farmers and the value chain actors at large on the economic benefits of real-time agronomic data
- Resistance and low Platform Adoption due to the lack of awareness of the economic benefits of data and digital tools by smallholder farmers and the value chain at large.
- Data Collection and Accuracy issues due to errors of omission; Collecting accurate and up-to-date agricultural data can be challenging, especially in remote and rural areas where smallholder farmers are often located. This is challenging given that some farmers or users may enter untrue or inaccurate data. This is improved through double request confirmation of the system to the user.

Mitigation strategies

- Collaboration with already existing stakeholders like District Agricultural Officers (DAOs) and Community Development Officers (CDOs), etc., is key to supporting the minimal staff.
- Incentivizing smallholder farmer's behavior through the eSusFarm® platform providing the data to see and monitor the smallholder farmer's behavior and incentivize it through insurance where the pre-requisite would be a smallholder farmer must first be on the eSusFarm® platform and upload their agronomic data to get insured, that way farmers can be monitored and their behavior incentivized. We focus on farmer adoption to ensure that at minimum 20,000 smallholder farmers are onboarded and capacitated to test the solution appropriately.
- The adoption of local speaker personnel and digital facet translations is key to solving the language barrier issues and building local user trust. This has enhanced awareness levels, acceptance rates and eased social inclusivity among the communities. This has also contributed to reduced resistance by the communities.
- Omission errors on inaccurate/incorrect entries are lessened through an enabled double request confirmation of the system to the user.

- There has been an improvement and several updates in the system based on the feedback collected from the field. This has helped the system become more stable, reliable, and effective.

- The project team has gained better implementation approaches and strategies that promote more scalability, customer retention, and grassroots penetration.

- Our Artificial intelligence (AI) and Machine learning (ML) have greatly improved due to increased access to accurate data thus high data analysis and interpretation capacity.

Lessons Learned

eSusFarm capacity building for Smallholder Farmers

Digital Illiteracy: There is a need for farmer development agencies to train and help smallholder farmers realize that a mobile phone is also part of the most important tool they can use in their agricultural enterprises and there is more value to be realized outside of just getting in touch with relatives but they can also utilize it to create a digital track record and further get insights on how they can be more productive throughout the production season.

Farmers lack digital skills on how to make use of their mobile phones. Interacting with the eSusFarm® Platform is not a problem the issue is their lack of making use of their mobile phones. Farmers, especially the senior farmers utilize simple basic feature phones, however, they have a challenge in making use of their phones, especially interchanging between alphabets and numeric when sharing their data.

Access to Information and Continuous Learning: Farmers need to continuously learn and be handheld throughout the production season on how the platform works and with them being scattered and in rural remote areas, digital agricultural advisory and extension services can close the information gap and ensure farmers have all the information they need to be productive.

There is a need for Platform usage by farmer development officers to transfer knowledge to farmers throughout the production season to bridge the information gap which will also allow timely access to information by farmers and this can also include providing farmers with crop suggestions each farming season, fertilization advise and as well as input mix plan

Need to develop a skills development strategy: Smallholder farmers should be introduced to some adult training and teaching lessons on basics of financial literacy, and any other key skills to enable better internalization and conceptualization of the use of the eSusFarm platform. Empowering underserved or marginalized communities is important in many contexts, whether it's in finance, healthcare, or education. Tailoring services to their specific needs can have a broad impact.

Efficiency in Value Chains: There is a need to increase the overall efficiency of the agri-value chain through better product traceability.
Improving the supply chain requires data-driven management of the sector thus traceability can be scaled to the entire value chain for example; data entry on quality information of the products for increased customer trust and quality standardization.

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links to additional materials

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YOUTUBE
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Airtel Uganda plays a crucial role in bridging the digital divide for smallholder farmers by offering a zero-rated USSD platform (*222#) free of charge. This platform, accessible on basic phones without the need for data or airtime, provides farmers with a range of services in one place, eliminating the need for multiple applications. The data collected from farmers connects them to the entire agricultural value chain, improving productivity and climate resilience. Services include market access, agri-advisory, credit and insurance, quality inputs, and tools, as well as assessing farmers' readiness for climate-smart practices.

AIC Uganda and UNICEF Venture Fund

We have partnered with AIC Uganda and UNICEF Venture Fund to introduce blockchain weather index insurance in Uganda through a blockchain-based insurance framework to be developed by eSusFarm®.

The Kingdom of Tooro, led by King Oyo Nyimba Kabamba Iguru Rukidi IV, is finalizing a Memorandum of Understanding (MOU) with IUEA to support the adoption of ESUSFARM® and other technologies. The Kingdom will provide access to land, farmers, and local resources to ensure the project's success, as well as help mobilize the community, raise awareness, and ensure sustainability. The Kingdom is also playing a key role in scaling up the app across its districts.

The World Bank, an international financial institution, is supporting the eSusFarm® project after it won the Top Innovator Award in 2020. The Bank has committed $200,000 to the project, offering technical expertise and global outreach support. Additionally, the World Bank will assist in monitoring and evaluation to ensure the project meets international standards.

THE TROPICAL AGRICULTURE PLATFORM

The Tropical Agriculture Platform (TAP) is a G-20 initiative launched in 2012 to promote agricultural innovation in the tropics. TAP has formed a coalition of more than 50 partners, led by the Food and Agriculture Organization of the United Nations (FAO) and generously supported by the European Union (EU). The main goal of TAP is to strengthen agricultural innovation systems (AIS) in developing countries through coordinated multi-stakeholder interventions.

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MORE INFORMATION

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- www.fao.org/in-action/tap-ais
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Global Call for Agrifood System Innovations and Stories of Capacity Development for Innovation

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