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Diversification in East
and Southern Africa

Gamification in agriculture: A scoping study on opportunities and challenges

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Introduction

This report investigates the application of game design elements in agricultural contexts to influence user behavior and outcomes. It examines the effectiveness of gamification in bridging the gap between knowledge and action among farmers, utilizing various strategies like simulations, goal setting, and social gaming. The study, helps in identifying pathways to help agribusinesses scale their operations, improve their product and channel more effective marketing strategies using game elements.

What is gamification?

“Gamification” is the application of game design in non-game contexts, with the end goal of changing user behavior and outcomes (Johnson et al., 2016; Seaborn & Fels, 2015). These design elements include serious games (for educational purposes), personal informatics (self-reporting for self-monitoring) and persuasive technology (incentives). Information about agricultural operations raises awareness about certain topics, however, knowledge does not lead to behavior change. Incentives, reminders and social proof are more powerful ways to ensure the uptake of new behaviors. Looking at the potential to use advanced technology, many new platforms have been established to support smallholder farmers in their crop choice, make them more resilient to weather conditions or inform them of the latest technologies.

In this context, Gamification could potentially serve as a bridge to deliver the information in a playful way or to de-risk decision making in simulations. This research is further investigating how to bridge the intention-action gap, essentially trying to understand how far games can be used to improve adoption of certain behaviors both at an individual and societal level. Additionally, gamification can concurrently serve as an innovative way of collecting real life data in understanding and predicting individual and group behavior as gamification gets closer to real life exposure than a one-way survey instrument. Through simple and complex games, gamified features can enhance user experience as well as change the nature of the relationship between the user and the task (from a boring task into a meaningful one).

Types of gamification vary in many different forms, for example, simulations, which use real-world scenarios for behavior change and specific cognitive outcomes (not just entertainment); choice architecture, which map people’s decision making (ex, card sorting); goal setting, where the players are committing to achieve a goal based on a rewards system; performance feedback, where players receive constant feedback through the gamified experience, motivating them to do better; and social games, which are based on players interacting with each other either through competition or cooperation..

In this report, using the lens of behavioral science, we explore the gamification sector in East and Southern Africa. We focus on agribusinesses and use a multi-model approach combining literature review, in-depth interviews, and business model analysis to address the following research questions:

- What is the primary purpose and context of gamification in agriculture over the last 5 years?
- What gamification strategies are currently used in agriculture?
- How has gamification been applied in related sectors such as health and education?
- What adaptations are made when applying gamification strategies in rural Africa?
- What evidence exists in behavioral literature on farmer decision making?
- What are the gaps in the existing literature?
- What is the potential for gamification in East Africa?
- Which organizations can we partner with?

- If gamification contributes to behavioral change in the target population, how long lasting is this change? Does gamification need to be applied repeatedly to achieve a sustainable change in habits among the targeted population? What are the needed sequences of intervention?

Methodology

Literature review

We conducted a systematic literature review. We initially selected papers on gamification application cutting across all sectors (education, healthcare, environment, and climate change) before narrowing down to Agriculture and more specifically in rural Africa. Inclusion/Exclusion criteria used were:

- The study included white and gray literature (peer reviewed, case studies, and industry publications)
- The papers were extracted from various websites including Google Scholar, JSTOR, and Sci-Hub
- 28 papers or articles published between 2013 and 2023 were initially screened touching on applications of gamification in different sectors (education, healthcare, climate & environment, and agriculture)
- We effectively investigated the primary objectives of each study to ascertain it fits into our research scope.
- We narrowed down to papers touching on smallholder farmers, gamification, and its adaptations to rural setups in Africa.

Key Informant Interviews

The literature review provided insights into the specific use cases of gamification in Agriculture. Although there is scant literature on gamification in East Africa, the few existing use cases mostly focused on insurance and knowledge dissemination. Hence, to validate our learnings from the literature, we conducted Key Informant Interviews (KIs) with various stakeholders within the region who work with gamification and/or agriculture.

Primarily, we focused on agricultural organizations with a presence in the East African region, researchers in academia (although not based in East Africa), and game developers within the region.

Firstly, we investigated agricultural organizations or research partners who had experience in gamification in East Africa, and then used a snowballing approach during the interviews to request the organizations to refer their partner organizations whom they deem might consider this research meaningful to their scope of work. Secondly, we investigated organizations that had no prior experience in gamification but had direct engagement channels with farmers and/or offered some form of last mile service.

The organizations were identified through a combination of desk research, and internal Busara networks. We then held 45-60 minutes semi-structured interviews following a well authored qualitative instrument. (Attached in the appendix). The interviews were recorded and transcribed and then later analyzed to generate insights.

Game Design & Behavioral Science

Gamification and behavioral science are interlinked in many ways. Not only is gamification used for shifting behavioral outcomes, but game design often leverages many core behavioral science theories when it comes to reinforcements, goal settings or emotions. For example, a key element in simple and complex games is choice. In these games, players are required to make choices between different elements, which move the game forward and ensure that the user is an active, rather than a passive player. In such a gamified experience, these choices help change players' existing default options, help them think through hypothetical scenarios and enable researchers to understand a user's behavioral journey map.

Unlike traditional learning and teaching methods, choices and decision making in games help build engagement, ownership over actions and create a pathway for players to receive constant feedback based on their performance (Routledge, 2022). Reminders and reinforcement is another principle used in gamification, which draws on behavioral science theory. Reinforcements essentially entail the repetition of a message, with the purpose of teaching the user a certain concept or action. Repetition aids and reminders in reinforcement processes ensure players do the same activity over and over again, in turn, aiding habit formation. By making games fun, simple and engaging, gamification can help enforce new behaviors through reinforcements within a shorter span of time (Routledge, 2022). Game design elements can furthermore be placed within the Mechanics, Dynamics, and Emotions (MDE) framework. (Robson et al., 2015). Mechanics are the rules of the game that guide users on the dos and don'ts of playing the game, dynamics are how users interact with the mechanics (such as following or breaking rules), and emotions are the resulting feelings that arise in players when engaging with the game mechanics and dynamics (ibid.). Using the MDE framework, emotions are powerful motivators both within game contexts and outside. The success of a game can depend on the emotional response it generates in users, which in turn determines how likely they are to follow through with a specific gamification outcome measure.

Competition and collaboration further play upon emotions to generate these desired outcomes within gamified settings (ibid.), where significant importance should be given to local contextual understanding to make this more effective. Papanou (2019) investigated the difference between emotions elicited when gamification is used or not used on the exact same platform. Two different designs, a non-gamified and a gamified one, were developed and tested, getting users' feedback through interviews. The results indicated that the design which did not use gamification concepts elicits not only less emotions, but less intense ones as well, and more specifically serenity, trust, acceptance and apprehension. The second design, which included gamification elicited interest, anticipation, joy, admiration, annoyance, contempt, competence as well as two emotions that were elicited by the non-gamified design, namely apprehension and trust which play a major role in working with smallholders.

Similar to the way emotions work, social proofing, the phenomena where individuals emulate the behaviors and actions of those around them, is often leveraged in gamified experiences. Some examples of social proofing are: a) user ratings, which boost the credibility and quality of a game and encourage the uptake of the game; b) a referral system where users are referred to the game by someone else, which can enhance user engagement and the sustainability of a game. Within such a system, incentives can further be incorporated into game design to motivate users, and incentivize certain desired behaviors over others.

Application of Gamification across sectors

Gamification has the potential to create behavior change and achieve desired outcomes in non-game contexts. As a result, gamification has gained popularity amongst many different sectors in the development space, the two main ones being education and healthcare. In education, gamification has been applied to identify students' behavioral profiles, motivations, and perceptions targeting to improve learning outcomes and student engagement. A 2017 study in Brazil developed a framework for identifying students' gamification profiles that helped highlight core motivations of the digital age generation to

engage in gamified learning (Freitas et al., 2017). A similar study carried out in Kenya, Namibia, Nigeria and Ghana provided key insights into building gamified learning platforms for high school students. The learnings are transferable in designing gamified learning platforms in low-tech settings such as Africa (Osakwe et al., 2022).

Apart from education, gamification has been applied in the healthcare sector to train healthcare providers (eg, managing emergency medical scenarios), educate (eg, sex education for youth), and inform (eg, informing people about public healthcare policies). Using gamification in the context of health care has the important aspect, that the user is in a protective environment to share sensible data anonymously.

A 2019 study in Tanzania presents a framework for building digital games that are context-sensitive to meet the unique need of healthcare providers in low-tech settings. This game allows users (high school teenagers) to interactively e-learn sex education (Haruna et al., 2019). A 2020 study in Kenya utilized a smartphone-based game which simulated emergency medical scenarios and evaluated users (healthcare professionals) on their management skills. The study further looked at the influence of repeated playing of the game on learning levels (Tuti et al., 2020). Although gamification has been used on a smaller scale outside of the education and healthcare sectors, it has proved effective in battling misinformation on various platforms, especially through the use of inoculation theory.

Inoculation theory aims to equip people with the tools to counter future disinformation that comes their way. For example, the game "Bad News" is a free web-based game that allows users to simulate running a Twitter account as a fake news producer and in the game the player ought to maintain high levels of credibility while growing their customer base. If the player fails to garner a high credibility score, they lose. Hence, this simulation prompts players to actively think on how they might evaluate misinformation in real life situations. Maertens et al. (2020) further explore the efficacy of deploying inoculation-based media and information literacy interventions. Despite being used widely within the healthcare and education sectors, whether it be for shifting outcomes or collecting data, the use of gamification within agriculture has been more limited. Gamified elements, though few, have been primarily used in the following sub-sectors of agriculture over the past years: insurance, credit models, product marketing, climate & environment, gender norms, social norms.

Table: Gamification examples across different sectors

	Insurance	Credit Models	Product Marketing	Climate & Environment	Gender Norms	Social Norms
Overview	Breaking down the concept of insurance	Sensitizing farmers on record keeping to improve access to credit.	Sensitizing target audience of how a product works to spark interest in the product in real life	To sensitize farmers on importance of weather forecasting	To understand the influence of gender on adoption of new farming techniques	To demonstrate how to use games to deconstruct social norms that impact financial management
Examples of games	SimPastoralist, ResilientMe	ResilientMe, FarmingForward	AgroDuos, SimPastoralist	LetItRain, SimPastoralist, MahindiMaster	Laos (2020)	ChakraView

Source: Authors

Insurance

In insurance, gamification has been used to break down the technical jargon in the insurance space and make it easy to understand for consumers. For example, SimPastoralist, a game developed by UC Davis researchers, was used in the Northern part of Kenya to illustrate how livestock insurance works. The game was successful as it improved uptake of the insurance product once it was rolled out.

A snippet look of the game:

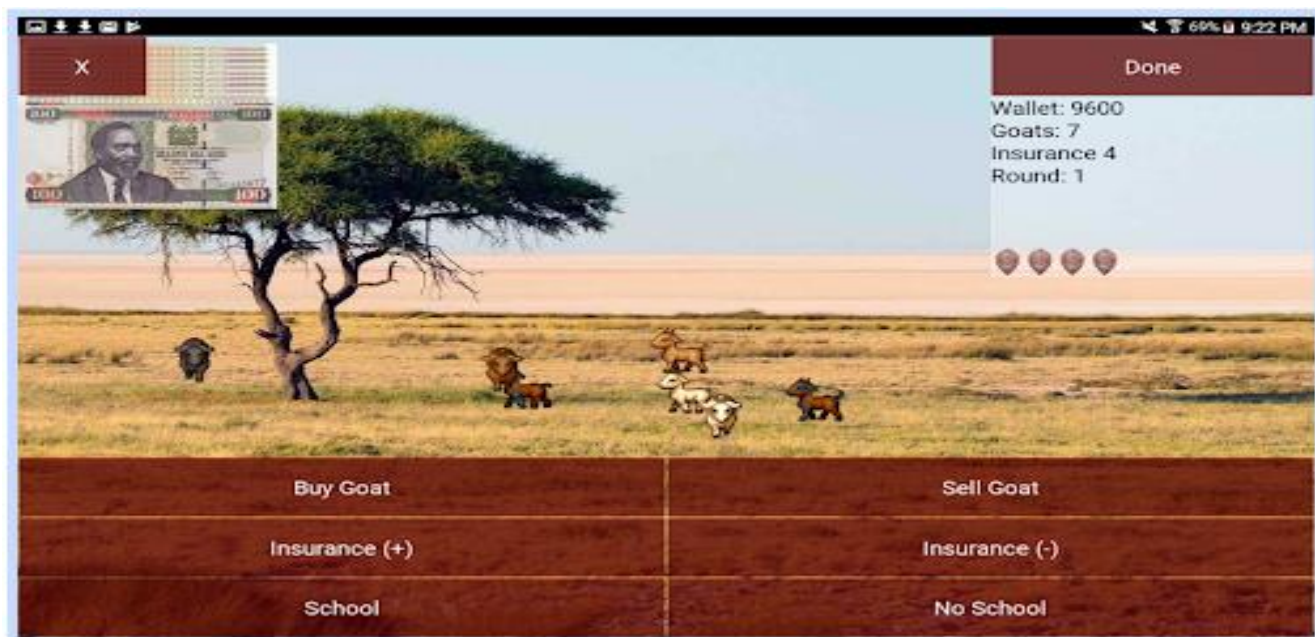


Image Source: Russel, 2019

Another example of gamification in insurance is by AB Consultants. They developed a card game called “ResilientMe”, which helped players think through risk management and, consequently, consider the importance of purchasing insurance.

A snippet look of the game:



Image Source: AB Consultants, 2023

These examples illustrate that within agricultural insurance, gamification has been used for knowledge dissemination and product marketing purposes.

Product Marketing

Gamification has further been used to sensitize users towards a given product. For instance, as seen above, games such as SimPastoralist, are used to market microinsurance livestock insurance to pastoralist communities in Northern Kenya. Similarly, Steinke, & van Etten (2017), used a physical card game tested in Honduras, called “AgroDuos”, for the purpose of empowering farmers to make decisions about plant breeding. It used a choice experiment model (like a card game) to understand farmer preferences for seed varieties and eventually helped farmers make better choices about seed variety in the future.

Credit Models

Games have also been used in developing psychometric tests in order to assess individual risk attitudes and credit worthiness. For example, in Kucheza’s “FarmingForward” game, players learn how to use record keeping of farm expenditures in order to enable users to have more access to quality credit. The game further allows farmers to simulate an agriculture venture financed by credit money and learn how to turn it into a profit (Kucheza, 2023). From a behavioral science point of view, this game can be utilized to combat the present bias effect where individuals place less worth in long-term future rewards of loans and instead overvalue immediate, smaller rewards/loans.

Climate & Environment

Within climate and environment, games have been used to improve advocacy for pro-environment policies. For example, CGIAR developed the “Let it Rain” campaign, whereby a game deployed via USSD targeted farmers and engaged them in weather forecasting. In essence, the game aimed to inform farmers on the importance of weather forecasts, especially since farmers reported missing the planting season by 10 days, which had cut yields by nearly half (Muzhingi, 2021). Behaviourally, this intervention was used to move the smallholder farmer away from Status Quo of thinking the rains are always coming on the 15th of March rather than consulting the latest weather services when making farming operational decisions.

Gender Norms

In the context of understanding mental models behind certain behaviors and decision making processes, gamification has been applied to understand the influence of gender in adopting new farming techniques. In 2020, a study in Laos utilized a game to understand the influence of gender in farmer decisions to adopt new farming techniques. The study revealed that women are more likely to adopt new varieties of white rice and more likely to engage in collaborative behaviors as exemplified in the game (Larson et al., 2020).

Social Norms

Social norms are known to influence individual and group decision-making. Gamification based on social norms tries to educate players about the benefits of cooperation, addresses norms that could impact financial management and shift mindsets to adapt to changing social environments. For example, “ChakraView”, a simulation game in based and developed in India, taught players how to deal with situations such as unwell family members, high costs of marriages, etc., all of which are some leading causes of farmer debts and suicides in the country (Neeti Solutions, 2023). Behaviourally, games can be used to simulate group dynamics and thus, can support in creating new beliefs as well as injunctive norms.

Gamification In East Africa

How to influence Farmer's Decision Making?

Local contexts are important to ensure the success of any project. Keeping that in mind, it is essential to understand the behavioral influences to farmer decision making in order to better adapt gamification to the rural African context. Rose, Keating, & Morris (2018) list five key aspects that guide farmer decision making. These are explored below:

Personal factors

Personal factors such as age, gender, education levels, beliefs, and religion, as well as past experiences influence farmer's perceptions of their reality and play a role in how farmers make decisions. For example, age plays a determining role in farmer adoption of new technologies, where younger generations are more likely to adopt newer technologies.

Incentives and rewards

Benefits outweigh the costs of making a certain decision. Hence, when the benefits of using certain new technologies or digital tools are made explicitly clear, the chances of uptake are much higher. Short term rewards also highly influence decision making, for example picking a seed variety which will ensure good harvest, over one that might be better for soil health in the long run.

Business factors including farm size, costs, profitability, cash flow, and number of farm staff/helping hands can also incentivise certain decisions over others. For example, greater income could lead to more innovations being adopted due to a larger proportion of available disposable income.

Social networks (family, peer and advisory networks)

Studies showed that opinions of those within the individual farmers' reference group significantly influence the farmers' individual decision making. For example, social pressure influenced farmers' pest management styles in Cambodia far more than individual beliefs (Bell et al., 2016).

Autonomy

Perceived autonomy to make decisions for themselves, as well as ease to implement decisions are preferred. This entails not being told what to do (instructional content is less effective) and feeling capable of completing a certain task (having adequate knowledge and skill set).

Rural African Context

When it comes to applying gamification to the rural African context specifically, there are certain features to keep in mind for improved uptake and sustained engagement of gamified tools.

Using **participatory game development** by engaging the farmers and relevant stakeholders from the onset of game design is important. Game development should be an initiative process where context-sensitive design and social and cultural norms are considered during the piloting phases of the game (Haruna et al., 2019). **Unifying values** such as community values or family structures can be leveraged in the gaming elements of the tool, to make it more relatable and accepted within communities (Oliveira, 2015).

Once the game is deployed, the platform should allow for **direct farmer feedback** and recommendations. The gamified tool should have a feature for improvements at no cost for the end user. For example, there should be an option to convey errors in local languages. Additionally, there should be **in-person support** such as field agents to train users on how to use the game. This will help maintain sustained and appropriate usage of the game. To further increase the uptake of the game, distribution should be considered via trusted authority figures such as village heads, and farming groups. **Incentivising** the use of the game by using rewards that are contextually specific to location, value chain and social conditions relevant to farmers can also help improve usage of the game (Oliveira, 2015).

Insights from Key Informant Interviews

To understand the potential of gamification in East Africa, Busara conducted key informant interviews (KIs) with relevant organizations. This section explains insights and findings from conversations with organizations working on Agricultural programs across East Africa. The purpose of this section is to understand which sectors have the most potential use cases for gamification. The following table is a list of organizations interviewed for the KIs.

Table 2: List of organizations for KIs

Name of Organization	Sector
Mediatec Solutions	Product-based industry/Media
AB Consultants	Insurance and credit models
Africa Instore Solutions	Good agricultural practices and environment
Hello Tractor	Product-based industry and credit models
Usiku Games	Good agricultural practices and environment
Mahindi Master	Good agricultural practices
DigiFarm	Insurance and credit models
SimPastoralist	Insurance and environment
Kuza Biashara	Good agricultural practices/Agent network
Sunculture	Product-based industry
Pula	Insurance
FAO	Good agricultural practices (Uptake of Climate and Weather information)
East West Seeds	Product-based industry and Good agri practices
Apollo Agriculture	Credit models and good agricultural practices

We conducted thirteen key informant interviews, ranging from 45-60 minutes each. Across most organizations, interest for gamification for knowledge sharing or product uptake games was most evident. Specifically, organizations expressed an interest in improving the uptake of information, de-risking decision making, increasing the uptake of products, and low cost and scalable research.

Where is Gamification most Effective?

The most potential for gamification was in the following sectors: good agricultural practices and training, insurance, and environment. Our KIs highlighted that within these avenues there are certain challenges that can best be resolved through gamification. These are explored below.

Organizations found that it is difficult to explain the importance and benefits of a product/program to target audiences. For example, it is difficult to make someone see the benefit of having climate insurance due to the long term and precarious nature of insurance. For example, in our interview with SimPastoralist, the game developer noted that the local community in Northern Kenya could not understand the importance of insurance before the game but after the game their knowledge on microinsurance and its benefits had increased so they ended up purchasing the insurance a year later. Without concrete and

direct evidence of the benefits of a product/program visible to the end user, the effectiveness and scalability of a product/program become compromised. In such a scenario, gamification can be used to simulate the outcomes of using a certain product/program for the user, which might not be possible to illustrate in real life.

Secondly, integrating youth into agriculture is a widespread problem across the region. Youth in Africa believe that agriculture is a venture for the older generation, or, in many instances, used as a means of punishment for wrong-doing. Rarely will youth consider farming as a fruitful business that can sustain a livelihood. A study in Kiambu County in Kenya (where 80% of the locals depend on agriculture) revealed that only 13% of female youth, and 20% of male youth in the study considered agriculture as a career aspiration (Noorani, 2015). Due to these existing beliefs, it has been difficult to engage youth in Agriculture. Incorporating “serious games” and digital tools can be an avenue for youth engagement in the sector, and create long-term behavior change. For example, SimPastoralist simulates livestock farming in Northern Kenya and aims at improving understanding of the need for livestock insurance within pastoralist communities. The developer of the game noted that while building the game, youth in the Northern part of Kenya actively participated in helping them design the game to fit the agricultural sphere of the locality and actually helped the older parents play the game. As such, this game provided a good avenue to engage youth and spike interest in agriculture.

Mobilizing farmers for training requires incentives. It is common practice to have farmers paid to attend training, when in essence, the training is meant to offer the most benefit to the farmers. Democratizing access to training via digital platforms through gamification can help circumvent this challenge.

For example, Kuza Biashara, which recently won the Africa-Korea Agtech Innovation challenge in the “improving access to markets for SHFs” category, utilizes an innovative model of having youth micro-entrepreneurs (who are not agronomists), to train farmers in villages using Artificial Intelligence/Machine Learning powered preloaded content on tablets. In this way, the company reported increased voluntary demand for training without having to provide monetary incentives to access training. The youth entrepreneurs act as last-mile agents for change, and as such will provide content derived from common reported problems within the locality (e.g a certain pest, certain livestock disease); hence, farmers have motive to learn rather than being nudged using monetary incentives.

Most farmers are interested in working with programs that help them improve their productivity and profitability. Farmers, like all rational beings, are motivated by profit from their agricultural venture. Hence, games that seek to help farmers improve their productivity and profitability will have a greater chance of being adopted by farmers. For instance, Mahindi Master app was developed by UC Davis researchers to help maize farmers in Western Kenya to simulate different combinations of fertilizers on an app to help them circumvent the challenge of having to try out the different combinations of fertilizers on their farms. The study is carried out in a region with heterogeneous soil acidity, hence making recommendations from agriculture extension officers difficult to implement, since each farmer’s farm is almost unique with different soil acidity compositions (Tjernström et al., 2021). The application enabled farmers to simulate various combinations of fertilizers and corresponding impact on yields. The game was successfully adopted since it primarily aimed at enabling farmers to improve their productivity and profitability.

Gamification has further proved to be effective in countering the drawbacks of 1:1 learning. Most agricultural organizations seeking to train farmers on good agricultural practices have reported challenges such as low attention span, non-uniform delivery of the content, and operational inefficiencies of getting a group to have a sit down. Gamifying technical content such as handling pests and diseases, will enable farmers to access the content on demand and at their convenience, rather than having to create time to have a sit down. Also, since gamification strategies utilizes design elements that trigger dopamine and make learning fun, games have proved useful in circumventing the low attention span experienced in traditional content-delivery methods.

“ The attention span of most people today is roughly 2-3 minutes, thanks to social media. Hence we make layered content of short videos to circumvent this challenge -
Mediatec Solutions

“ I have done agriculture training in Kajiado and other Northern parts of Kenya. I realized that if you come back to the study area a week later, majority of the people cannot recall anything the training covered” - Mediatec Solutions

Game Developers in the Region

Game developers are those organizations that program games for gamification projects. For this study, two game developers from East Africa were consulted to understand some of the challenges they experienced in developing and implementing gamified content to different target groups across the region.

The first game developer is Usiku games. They have a footprint in 11 countries and engage with a market of over 270 million smartphone users. They have developed 200 published games for smartphones and feature phones, as well as USSD accessible games. Their games vary on different social impact issues, such as a climate game in Kenya, *Let it Rain*, and a food security game, *Shamba Showdown*, seeking to make agriculture more attractive to the youth.

The second game developer interviewed for this study is Leti Arts. They have their headquarters in Ghana, but work across Kenya, India, Netherlands and Australia. They primarily work on pan-African based games built around African heroes. Leti Arts has built games on various issues such as a rights awareness game in Kenya, in partnership with Afroes, called *HAKI*, which has over 300,000 downloads. They have also worked with USAID on a 40,000USD game on sexual education for youth called, *My Jorley*, which reached over 3000 youth. Their more recent engagement is with UNDP.

Other organizations interviewed were Kuza Biashara, AB Consultants and SimPastoralist who use games in different capacities (beyond digital games) but are not solely focused on game development. Kuza Biashara, in particular, uses games in providing micro-learning content (three minute videos) to over 10,000 users. They use local youth, who are trained and equipped with portable Wi-Fi devices to in turn train farms in the field.

Key Challenges Identified by Game Developers

One of the key challenges identified by Usiku games and Leti Arts is a lack of investment for outreach. Namely, there is less funding going into the marketing of the game, which means that the target audience often does not hear about the game in the first place. Hence, the user numbers are low, in turn affecting the impact of the game.

“ Very often development agencies will budget project costs based on the production elements (eg: staffing) without taking into account the 3rd party media costs of marketing/outreach. There seems to be a bias that it is ok to spend development funds on in-market private partnerships (thereby creating jobs) but that taxpayer dollars should not be spent on paying Facebook for ads. Unfortunately, this often means that great projects sit on the shelf because the beneficiaries never hear about them. We believe that right at the beginning of a project, 50% of the budget should be allocated for user acquisition activities” - Usiku Games

Secondly, access to data still remains a key barrier to the uptake of games. With low data usage, not only do games that require data not work, but collecting user data also becomes difficult. Hence, games designed for research or market segmentation purposes have low success rates due to low internet connectivity.

“ People only turn on their internet data to use WhatsApp or Telegram - Usiku Games

Similarly, the number of smartphone users is still relatively low, therefore, the types of games that can be implemented is restricted to those compatible with feature phones or third party tables. For example, simulations require training and are only compatible on third party tables. They require field officers to go into the field and train the users on how to play the game, which can turn out to be too complicated to implement.

Game developers also realize the importance of games developed for specific contexts. If social and cultural norms are not matching with the target population, then sustained use of the game is inevitably going to be low. There is a potential for scaling gamified projects, but this is limited by contextualized context displays. For example, games developed in rural Africa should reflect the social norms of the particular target audience. This ensures that the game characters do not conflict already established social norms that could hinder its adoption in the community.

Despite these challenges, both game developers emphasized that there is a growing market for gamification in East Africa, with a promising return on investment.

Technology: What Works?

Technology is a key aspect of gamification, and plays a defining role in users experience, retention and uptake. Through the KILs, we tried to deconstruct what works and what does not work when it comes to technology in the East African context.

Games accessible via USSD and feature phones work best for farmers according to Usiku Games. This is true in low network connectivity regions, and areas where internet connection is not widely available. Similarly, HTML5 progressive web applications are often accessed on smartphones/Tablets/PCs rather than downloading applications through a game-store platform. Web links can be shared via WhatsApp or Telegram.

In low internet availability areas and places where smartphone use is not widespread, having a back-up physical game (board game or card game) is also an option, depending on the resources available.

To work around poor internet connectivity, organizations like Kuza Biashara also provide portable WiFi technology. Organizations also experiment with games, which can be played without the internet once downloaded, or games via alternative platforms such as audio games on the radio (for example, East-West Seeds).

For more complicated technology, Kuza Biashara uses field agents who support farmers when playing the game. This assisted use teaches farmers how to navigate the interface so that next time they can do it on their own. Alternatively, games with voice assisted features in the vernacular also work well in guiding users and improving user experience.

“ One challenge we noticed in our engagement with farmers using agriculture extension officers is that the way the content is delivered by the different extension officers varies greatly, and hence making the delivery non-standard. I think games can help make the educative content uniform as well as break down the technical jargon” - FAO

What does not work?

Smartphone access and use is growing. However, applications of games over certain technologies have varying impacts. Defining the target population will be important in this case to ensure that the technology being adopted is suited to the local context. For example, creating a game for WhatsApp use when WhatsApp is not a common digital platform used in the target community. Similarly, games that need some internet cost, for example a data bundle or WiFi, might not be feasible in hard-to-reach locations.

Complex games involving simulations are not always feasible. They may require field trainers to help farmers navigate the game. For example, East West Seeds in Nigeria, in partnership with Kucheza, implemented the “Farming Forward” game that aimed at improving the position of smallholder farmers in the value chain by creating an entrepreneurial mindset, increasing financial literacy, and improving collaboration among farmers. In the model, the game was administered by field trainers who helped farmers navigate through the tablets. However, East West Seeds reported certain challenges with this method:

“ We did a pilot with Kucheza (a Netherlands based gaming company)... [it turns out] the game was too complex. Farmers needed help on how to navigate and play the game... We had to force the farmers to finish the game. I felt that this was too complicated. While it was helpful in imparting knowledge on financial planning and record keeping, there has to be a lighter way to do it. If we have to train farmers on how to play a game, then we could resort to our normal approaches of using demo farms” - East West Seeds

Games only accessed via play store (Google or Apple store) also present a barrier to access for farmers without email addresses. This is an issue faced by Leti Arts, who when deploying the game, “Hello Nurse”, to train nurses on handling Malaria cases encountered a problem with users not being able to download the game because they did not have google accounts. To counter this, Leti Arts trained the users on how to create a google account as well as provide the application (apk) to the nurses who could then share amongst colleagues using “Xender”-which allows users to share apps without having to download it.

“ Our Client (USAID) expected that the game we were building could solve everything, forgetting the fact that the people we were targeting had an IT gap and were not tech savvy.” - Leti Arts

Leti Arts further uploaded their application onto Gara Store, a play store developed for the African audience, which does not ask for an email address when signing up. Gara Store further allows users to use mobile money to buy applications on the platform, rather than having to rely on a credit or debit card.

Next Steps: Behavioral Gaps and Potential Use Cases

Behavioral Gaps in the Existing Literature

Behavioral mapping can be used to improve user experience and uptake of any gamified product/program. Recently this has been explored in different sectors, however, such an analysis does not exist in the current literature on gamification in agriculture. Some of the key questions that arise when thinking about gamification through a behavioral lens are:

1. To what extent can gamification incentivize the uptake of information using the experiential learning part of the brain?
2. What are the long-term effects of gamification on changed behaviors of individuals and societies? And are there any spillover-effects?
3. Can gamification enhance the behavioral change on the ground more profoundly than traditional training methods?
4. Can gamification improve the quality of data collection?
5. Apart from motivation, engagement, and action, can gamification affect other behaviors?

Furthermore, evidence reveals that gamification in agriculture is narrowly focused, is not rigorous or systematic, lacks evaluation, and usually focuses on a single use-case when there are huge efficiencies for combining and integrating data collection, training, and simulation-based strategies. There is a lot of evidence of small wins and ad-hoc evidence in other sectors, but even then, the evidence is not synthesized and most testing is not thorough. Research has been done on single elements, even on social/cultural elements, but not holistically and across multiple dimensions.

Potential Use-cases:

Based on the behavioural gaps identified, there are a few promising use cases based on KII feedback. Firstly, the table below identifies preferences of types of games based on respondents from each sector. This table illustrates that the most desirable type of game is knowledge, which focuses on learning and teaching. This is across all sectors. Good agricultural practices, insurance and product-based industries are the most promising areas for future gamification, with environment being a sub-sector that can be incorporated into use cases within these main categories.

Table 3: Sector preferences for Types of Games

Gamification outcome measures	Insurance	Environment	Credit models	Product-based industry*	Good agricultural practices**	Total
Knowledge: learning and teaching	2	2	3	2	4	13
Research: data collection	1	2	0	1	2	6
Product marketing: market research and segmentation	2	0	2	2	0	6
Total	5	4	5	5	6	

*Product-based industry: Hello tractor, sunculture (solar panels), etc.

**Good agricultural practices: example, organizations working on educating farmers on practices to increase/improve productivity

The following are some potential use-cases:

Within agricultural good practices improving digital literacy could benefit farmers, especially market-place platforms. Additionally, tailored farming advisory services, possibly with a gender focus, to increase the uptake of farming by making it more attractive to different segments in society. Similarly, gamification focused on agricultural technology, where users can leverage social networking to make agriculture more attractive to young farmers. Partners organizations out of the KIIs for these use cases could be Kuza Biashara, East-West Seeds, and FAO.

Within insurance simplified risk management communication and exploratory games on the benefits of agriculture insurance could be used to increase insurance uptake. Furthermore, gamification focusing on mechanisms to scale last mile training, such as incentivising training and training of trainers are potential avenues for future games. Partners organizations out of the KIIs for these use cases could be AB Consultants, SimPastoralist

Environmental games are those games that educate farmers on how to deal with climate risks, such as floods, droughts, water management, etc. These are important in the face of growing climate change across the region. Gamification of product uptake from an environmental angle, such as seed resilience where farmers do not buy a good variety of seeds fearing climate risks, are also important areas for gamification research. Games focusing on environmental factors are advantageous since they can also be incorporated into games looking into insurance and agricultural good practices. Partners organizations out of the KIIs for these use cases could be SimPastoralist, Usiku Games, SunCulture, East-West Seeds

Conclusion

This scoping study explored the potential for gamification within the East African agricultural sector, particularly among smallholder farmers. The research reveals that gamification, when effectively integrated into agricultural contexts, can significantly influence farmer decision-making, driving behavioral change, and fostering more efficient and sustainable farming practices. Opportunities for the successful implementation of gamification in agriculture are manifold. Firstly, games designed with a deep understanding of local contexts, incorporating elements that resonate with the socio-cultural norms of the region, are more likely to be embraced by the community. This approach ensures that gamification is not just an external imposition but an engaging, relevant tool for the farmers.

Secondly, the use of gamification to address specific challenges, such as incorporating youth into agriculture and enhancing training accessibility, shows promising results. Games that simulate real-life scenarios can help demystify complex concepts like climate insurance, making them more relatable and understandable to farmers.

However, there are challenges to overcome, such as technological limitations in rural areas and the need for more comprehensive data on the long-term efficacy of gamification in changing behaviors. Addressing these issues will require innovative solutions like offline gaming options, leveraging USSD technology for wider accessibility, and ongoing field support to guide farmers in using these tools.

As a way forward, the integration of gamification with existing agricultural practices presents an exciting avenue for development. Collaborations with local organizations, continuous user feedback, and iterative game development will be key in refining these tools to suit the unique needs of the farming community. Additionally, further research and investment into gamification as a tool for data collection and training can open new pathways for understanding and enhancing farmer behaviors.

In conclusion, gamification holds substantial promise for the agricultural sector in East Africa. By tailoring these tools to local needs, harnessing the power of technology, and continuously adapting based on feedback and research, gamification can play a pivotal role in shaping the future of agriculture in the region.

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Appendix

Appendix 1: Qualitative Instrument for KIIS:

In-depth Interview Guide (KIIs)

Section 1: Respondent details [2 mins]

Respondent name

Sector/industry

Demand/supply

Section 2: Organization activities [10-12 mins]

Description of the organization's activities and who its target audience is?

What is your outreach like? (in numbers)

How and what channels do you use to engage with your target audience?

Any pain points/ areas of improvement noted in this engagement?

Probe: challenges related to gender?

Section 3: Gamification outcomes [10-12 mins]

Based on your current engagement with your target audience, where do you use or see a use for games? Or not?

If using games, with who and for what purpose?

Probe: which forum, channel or way of distribution are you using?

Probe: does playing a game create changes in the real life of the player? If yes, how long after playing the game do you see change in the desired outcome measure? Is there a spillover effect in the community?

If you are not using games, why?

Probe: effectiveness, resource constraints, etc?

Would you be interested in games for the pain points identified earlier?

Probe: who do they think benefits from games? Why or why not?

[Note for interviewer: In case people do not understand gamification, use proxy works like motivation/simplification/rewards, etc.]

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