

Project Name: Using Emerging Technologies to Capture and Disseminate Indigenous Agricultural Practices for Improved Food Production in Uganda: A case of Luweero District (INDIGRIC)

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What is the justification for the research interest?

Over the years, food production in Uganda and especially in Buganda has greatly declined (Bekunda & Woomey, 1996). Bananas/ plantain (also locally known as *Matooke*), which is the staple among the Baganda and around which the kingdom of Buganda evolved its cultural identity (Reid, 2005), have deteriorated to such an extent that most banana supply into Buganda comes from outside the region (Bekunda, 1999). *Matooke* are also a major food crop for several other Ugandan social groups including Basoga, Batooro, Banyankore and Bakiga (Amone, 2014). Other food crops with decline in yield output include sweet potato, cassava, groundnuts, and beans among others (Bekunda, 1999). The cause for low levels of production is attributed to several factors including presence of various pests and diseases, failure to modernize agriculture, unreliable water supply, changed socio-economic set up, the effects of climate change and poor soil fertility maintenance among others (Rukazambuga, et al, 1998).

These challenges have led to decline in household food production for both home consumption and agricultural financial incomes. Female led households are more disadvantaged since most women in rural areas wholly depend on agriculture for subsistence (Godfrey, 2010)). Moreover, several families lack sufficient financial resources to enable them purchase adequate amounts of food, nor do they easily access agricultural extension services for formal guidance to agricultural challenges (Nampijja & Birevu, 2016).

My recent studies identified several indigenous agricultural practices that are accessible, cheaper, easy to use and without side effects (Najjemba, 2019). These include mulching, using organic manure, intercropping, crop rotation, paspalum bunding, and catch-pits. These practices rely on locally available resources to improve soil fertility by enhancing soil water retention levels, curbing weed growth, providing organic manure and varying crop yields among others (Najjemba, 2019). While these practices were/ are common knowledge especially among elderly female farmers, who were/ are the custodians of home subsistence, the same cannot be said for the current younger farmers, male or female. Several younger farmers failed to access indigenous agricultural knowledge since most of their time was spent in formal schooling, yet elderly family members who/ are the custodians of indigenous agricultural knowledge and practices. Therefore, a good number of younger farmers neither have adequate resources to purchase and use modern farming agricultural inputs such as artificial fertilizers, herbicides and pesticides, access agricultural extension services nor do they possess knowledge of using indigenous agricultural practices.

Affordable and accessible technologies, especially in the area of mobile internet technologies can be used to empower younger farmers access 'small screen' digital information, with demonstrations of farming practices conforming to their resources. While the usage of smart phones is on the increase, and the African continent is home to over 350 million mobile phones, little has been done to use mobile phones for learning purposes especially among younger farmers (de Montjoye, et al, 2019; Nampijja & Birevu, 2016). Farmers are not aware

that social resources such as Short Screen videos, WhatsApp audio-videos, and online interactions can be used as moving learning environments (Kekwaletswe, & Ngambi, 2006)

This project (INDIGRIC Project) therefore intends to tap into younger farmers' social spaces by using ICTs, especially emerging technologies to capture, store and disseminate indigenous agricultural practices by means of training them to use moving online technologies, and an Application (INDIGRIC App) that will be developed and dedicated to specifically train younger farmers through step-by-step demonstrations of affordable indigenous agricultural practices to improve soil fertility, improve crop productivity and increase crop yield output.

State your project description, goal and Objectives

Description

The project seeks to use emerging technologies to revive relevant indigenous agricultural practices in order to improve food production in Uganda using Luweero as a case study. This will be done by identifying specific indigenous practices that are still relevant. Field visits will be carried out to identify farmers using indigenous agricultural practices successfully including mulching, intercropping, crop rotation, organic manure, paspalum bunding and catch pits. Selected farmers will include both men and women to provide good examples across gender. These will be approached, sensitized about the need to train and mentor other farmers to use these methods with the support of emerging technologies. The researcher will also approach and consult some media houses including New Vision Group of Companies and NTV television and use their data bases to identify farmers, especially those who displayed indigenous practices in programmes like 'Seeds of Gold', '*Lima Lunda Ggaggawala*', and '*Omulimi Asinga*' among others. Selection will be followed by identifying those ready to share information about how they use indigenous agricultural practices to improve soil fertility and cultivate several food crops at the same time. These will make step by step on farm demonstrations. Emerging technologies will be used to capture practical demonstrations in audio-visual forms accompanied with detailed step-by-step explanations of how the practices are applied.

An App (INDIGRIC App) will be developed and used to capture and document indigenous agricultural practices. These will be transferred to selected younger farmers in Luweero District who have mobile phones but lack knowledge of using indigenous agricultural practices to improve their farms. Target farmers will be those with farming challenges, having poorly kept farms but also financially unable to access modern agricultural inputs such as artificial fertilizers, pesticides and herbicides among others. Farmers, both male and female, will be enrolled into farmer groups and given names for easier identification. 5 farmer groups of 10 farmers in each group will be created with each group having both female and male farmers. Each farmer group will consist farmers coming from the same community for easier monitoring, collaboration, communication and sharing of resources. Six indigenous agricultural practices i.e, mulching, making organic manure, intercropping, crop rotation, paspalum bunding, and making catch-pits will be demonstrated.

The INDIGRIC App will be uploaded on farmers' mobile phones. Those without smart phones will be assisted by farmers in the group who have smart phones. Visits from Benchmarking farmers will be carried out. These will help provide further assistance through face-to-face consultations, and assess farmers' progress. Improvements will be made. Farming practices and harvests will be assessed and compared with previous harvests before training and use of INDIGRIC App. Lessons for improvement will be analyzed for improvement and redesigning of the INDIGRIC App and reapplication.

Objectives:

The objectives of the INDIGRIC project are:

- To capture relevant indigenous agricultural practices using emerging technologies.
- To transfer indigenous agricultural practices to younger farmers using a mobile Application (INDIGRIC App).
- To develop design principles for capturing, reviving and transferring relevant indigenous agricultural practices from older farmers to younger farmers.
- To develop a journal article disseminating findings about using emerging technologies to document and disseminate indigenous agricultural practices to farmers.

Goal

The goal of this project is to empower younger farmers across gender to improve food crop yields and household incomes by using emerging technologies to document, store and transfer still relevant indigenous agricultural practices to farmers.

Describe / present / discuss three possible research questions relevant to this area of research

- How can emerging technologies be used to capture relevant indigenous agricultural practices? This will involve identifying emerging technologies in the Ugandan situation. This is because emerging technologies differ from one country to another. It will also involve identifying those emerging technologies that are best suited to capture and document practical demonstrations and explanations of indigenous agricultural practices.
- How can a mobile Application provide a mobile learning environment for improving farming practices? Emerging technologies have infiltrated all aspects of life. However, efforts to use them to revive still relevant indigenous agricultural knowledge and disseminate it to especially young farmers in order to improve food production remained minimal. Yet most of the youths are ICT literate and are on several social media platforms including WhatsApp, Facebook, Tweeter, and short messaging system (SMS) among others. Although most youths view these as social platforms for leisure and fun, these platforms provide avenues for experience and knowledge sharing and delivering of educative information which can improve their socio-economic lives.
- How will the principles of Design Based Research (DBR) which include; the study environment, researchers and participants, training content and technology, inform the development of a mobile application intended to revive, document and disseminate indigenous agricultural practices?

Describe your research design, proposed activities and methods**Research Approach**

The INDIGRIC project will take an action-based research approach and will focus on using Emerging Technologies to equip younger farmers in Uganda, specifically Luweero District with relevant indigenous agricultural practices. The intention is to improve farmers' food crop cultivation capacities by enabling them to access cheap, reliable and side-effect free agricultural

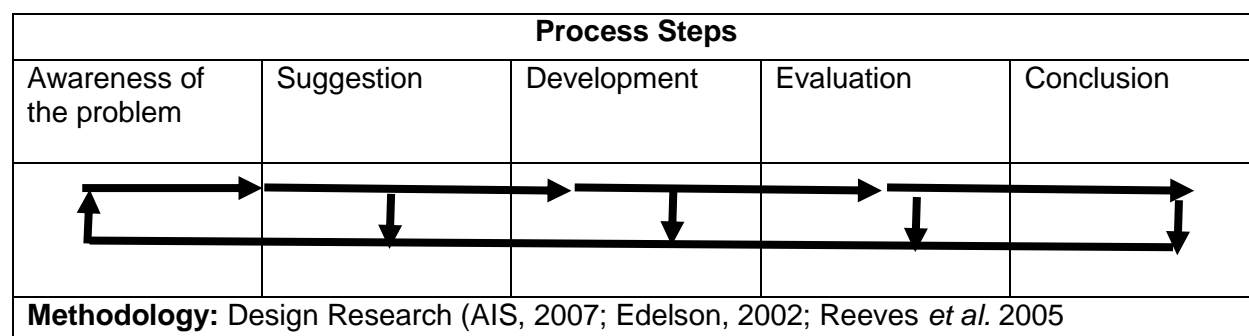
practices. The project will also revive still relevant indigenous agricultural practices and also reposition their relevancy in agricultural development.

The project will use a phased approach as follows:

- **Phase 1:** Several activities including a needs assessment survey, identifying farmers who use indigenous practices, using emerging technologies to capture practical demonstration and explanation of 6 indigenous practices which are; mulching, intercropping, crop rotation, paspulum bunding, making organic manure and making catch pits.
- **Phase II:** Identifying younger farmers in Luweero with poorly maintained farms but also lacking financial resources, sensitizing, making and naming 5 farmer groups of 10 farmers each, and training them to use indigenous agricultural practices using Emerging Technologies, and developing a mobile Application (INDIGRIC App.)
- **Phase III:** Uploading the INDIGRIC App on farmers' phones, face-to-face visits to farmer groups for continuous mentorship, guidance and consultations, evaluating, and designing principles to guide the use of Emerging Technologies to capture, revive and disseminate relevant indigenous agricultural practices.

Research Design

The INDIGRIC project will use the Design Based Research (DBR) approach. This combines research, design and practice with the output being the design principles guiding the use of Emerging Technologies to revive, capture and disseminate relevant indigenous agricultural practices and transferring that information to farmers who do not possess it. The DBR research design goes through five iterative processes as summarized in *Table 1 below*;



Using DBR, the INDIGRIC project will benchmark Salmon's five-stage model as the design principle to train younger farmers to use emerging technologies to access relevant indigenous agricultural practices.

Problem Awareness

This stage will embark on an exhaustive contextual analysis of the problem to highlight the extent of farmers' agricultural challenges, younger farmers' ICT competencies, level of need of a solution to soil infertility and poor food crop yields. Discussions with some stakeholders including media houses involved in agricultural improvement programmes, and literature review to establish how best to address the problem.

Suggested Innovation

This stage shall be used to come up with solutions including training farmers to use indigenous agricultural practices by accessing this knowledge through emerging technologies. Six indigenous agricultural practices will be captured and designed into an online indigenous agricultural training package and uploaded on the INDIGRIC App. It will be benchmarked on

Salmon's five-stage model: (Access and motivation; On-line socialization; Information exchange; Knowledge construction; and Development) (Salmon, 2013).

Development Component

In this stage, iterative cycles to test and refine the training package will be done. Review of the demonstrations and explanations accompanying the uploaded indigenous agricultural practices package by an agriculturist, indigenous knowledge expert and an education technologist will be done to ensure quality. Younger farmers using the INDIGRIC App will get visits from the benchmark farmers already using indigenous agricultural practices for further guidance and face-to-face consultations. Lessons learnt will be documented in order to guide further testing and refinement. This will be continuously done to enable improvement.

Evaluation

The revived and captured indigenous agricultural practices will be disseminated through workshops, meetings and the INDIGRIC App and evaluated against its ability to stimulate farmers' interest in continued use of the practices. The capacity of especially younger farmers to adopt and use indigenous agricultural practices to improve soil fertility and increase food crop production will be evaluated based on Salmon's five-stage model. Farmers' experiences in using mobile phones to inform their farming practices and using the INDIGRIC App will be evaluated. Redesigned indigenous agricultural package will be re-tested in order to be refined. Reflections will be made to come up with guiding principles.

Conclusion

Guiding principles for using Emerging Technologies to revive, capture and disseminate relevant indigenous agricultural practices will be developed.

Motivation. Briefly explain the expected outputs, importance or potential benefits

The right to food is enshrined within the United Nations (UN) agency of Food and Agricultural Organisation (FAO) and calls for appropriate actions by both government and non-government entities to ensure that every individual has a right to feed himself with dignity and can consistently access adequate food for a physically healthy body. The reduced banana productivity levels and that of other several food crops in Uganda, specifically Buganda calls for affordable, accessible and easy-to-use interventions.

While several indigenous agricultural practices are still relevant and can be used to improve soil fertility at minimal costs and without known side effects, these are not familiar to most of the younger farmers. Using emerging technologies, these practices can be captured and disseminated to younger farmers with the results of improving food crop productivity, hence enhancing yield output.

The outputs of INDIGRIC project will include:

- Documentation of 6 indigenous agricultural practices using emerging technologies.
- 5 groups of farmers each having 10 farmers trained in using the 6 indigenous agricultural practices.
- An application (INDIGRIC App) developed.
- Design principles for online training of farmers in using indigenous agricultural practices.
- 2 peer-reviewed publications.

The INDIGRIC project will contribute to reviving and documenting of some indigenous agricultural practices that are in danger of becoming extinct due to continued loss of elders who are the custodians of indigenous knowledge. The project will also demonstrate how two

knowledge systems (indigenous and western) can complement each other to improve rural people's livelihoods.

Dissemination Plan

Findings from the INDIGRIC project will be disseminated in several ways. These will include:

- Progress reports through which detailed information about work and activities carried out will be shared progressively in line with accomplished activities.
- Seminar series will also provide another avenue for sharing short segments of findings from the INDIGRIC project.
- Conferences will facilitate dissemination of findings to the wider and international scholarly community.
- Stakeholders' workshops will facilitate dissemination of information to stakeholders, especially in the areas of agriculture, ICTs, and people involved in the area of indigenous knowledge as well as other scholars interested in indigenous knowledge and ICTs.
- Peer-reviewed Journal articles will also be used to disseminate findings to the wider scholarly community.