Defying the Odds to Learn Innovative Farming in Uganda: Experiences of Small-Scale Farmers from Bududa District

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Abstract

This study examined the learning processes undertaken by small-scale farmers to navigate their way through the challenges of achieving innovative farming practices. Experiential learning theory underpinned the study. A qualitative case study was conducted in Bududa District in Uganda where data was collected from 22 farmers through interviews and focus group discussions (FGDs). Findings revealed that farmers' learning process involved experiencing, reflecting, thinking and doing. The process did not follow a fixed pattern, but slightly varied depending on the source of learning. Therefore, this study recommends that agencies offering farmer education ought to adopt approaches that enable farmers to learn by reflecting on their experiences, challenge the status quo and critically think of the best farming practices to be adopted.

Keywords: *adult learning, innovative farming practices, small-scale-farmers*

Introduction

Generally, intensifying farmer education on innovative farming is the most universally advocated strategy by scholars for overcoming farmers' challenges as it has continued to emerge in a number of scholarly papers (Bragdon & Smith, 2015; Tambo & Wunscher, 2018). Farmers' learning has also been central to most studies about innovative farming in Sub-Saharan Africa (Mukute, 2020). The dominant argument by scholars in most of these studies centres on learning innovative farming as the best therapeutic intervention to farmers' challenges.

Perhaps such argument informed Tambo and Wunscher (2018)'s definition of innovative farming as change(s) in farming processes or products aimed at giving farmers a leap forward in their livelihood activity.

Ugandan stakeholders within the agriculture sector seem to appreciate the role played by farmers' learning in realization of innovative farming practices as well. This appreciation is reflected in conceptualization of farmers' learning as the 'heart' and 'soul' of the agricultural sector in the country (Ministry of Agriculture Animal Industry and Fisheries [MAAIF], 2016, p.1). Perhaps such recognition and conceptualization were also informed by the fact that every human activity requires constant learning and innovation to remain sustainable (Serdyukov, 2017). Making specific reference to farming, Von and Haring (2012) posit that learning innovative farming is a precondition for successful handling of change in on-farm activities.

However, despite a plethora of efforts by the Ugandan government to mainstream farmer learning activities in most development programmes, notably, National Agricultural Advisory Services (NAADS), Operation Wealth Creation (OWC), Northern Uganda Social Action Fund (NUSAF), several sentiments and concerns continue to emerge regarding lack of innovative farming skills among the Ugandan small-scale farmers (Kabahemba, 2019; Sebaggala & Matovu, 2020; World Bank, 2019). This continues to worry players in the agriculture sector given a costly investment in farmer education services. The worry is also justified by a frequently suggested strong link between low farm productivity in Uganda and farmers' lack of innovative skills (Lybbert et al., 2017). Consequently, some stakeholders suggest the phasing out of some farmer education programmes, accusing them of incurring financial losses for the government (Kabahemba, 2019).

On the contrary, evidence that some small-scale farmers in Uganda are innovative in their farming activities also exist (Recha, et al., 2020; Uganda Bureau of Statistics [UBOS], 2020). Such evidence may not obliterate the fact that majority of farmers lack innovative skills, but rather provoke the question of how such farmers learn and improve on their innovative farming skill. In other words, how do such farmers defy the odds that block the rest? Thus far, this study examined the learning processes undertaken by such farmers in order to navigate their way through the challenges of farming with a case of Bududa District located in Eastern Uganda. Specifically, the study intended to answer the following research questions:

i. What are the main sources of learning innovative farming by small-scale farmers?

ii. How is the learning process of innovative farming from each source undertaken by the small-scale farmers?

Meanwhile, farmer-learning may take many forms (formal, informal and nonformal). Hence, clarity on the forms of farmer learning being examined is inevitable. Thus far, this paper examines how informal and nonformal learning processes are undertaken by small-scale-farmers. The two forms of learning were considered due to their continued recognition in scholarly literature regarding farmer education and learning (Bragdon & Smith, 2015; Tambo & Wunscher, 2018; Von & Haring, 2012). Accordingly, non-formal learning refers to learning through a programme but is not usually evaluated and does not lead to certification while informal learning refers to learning resulting from daily work-related, family and leisure activities (Boileau, 2017). On the other hand, this study examined only on-farm crop farming innovative practices since they are frequently used to determine farmers' innovative abilities in Uganda (UBOS, 2020). However, indicators suggested by Bragdon and Smith (2015) were used to determine small-scale farmers' innovative farming practices examined in this study. These were: on-farm practices that deviated from traditional crop farming, notably, introduction of new crop varieties, planting style, and maximization of land use; introduction of biological means of managing weeds, pests, diseases and maintaining plant nutrients; managing climate change reflected in use of less expensive and/or local resources for irrigation, water harvesting, and use of traditional knowledge systems. The foregoing indicators were preferred since they are also suggested as better farming practices for achieving sustainable farming (Spiegel et al., 2016).

The study contributes knowledge that may be a basis for understanding the sources of learning better farming practices by small-scale farmers in rural places, whose processes of learning and adoption of innovative farming are empirically less explained (Bragdon & Smith, 2015; Maerten et al., 2020). Secondly, the findings highlight the contributions of farmers' informal learning processes noted to have received less attention in studies examining learning of innovative farming practices in developing countries (Tambo & Wunscher, 2018).

Empirical studies on how farmers learn innovative farming

How farmers learn remains an area of interest to scholars because of its implication on acquisition and development of innovative farming skills by farmers. Previous studies conducted in line with this, highlight a wide range of methods and processes through which farmers prefer to learn. Thus far, some of them advocate for experiential learning processes (Maertens et al., 2020) others are for group learning methods (Prager & Creaney, 2017). Others completely differ from all the above and rather suggest hands-on learning through demonstrations, one-on-one with

experts, and farm visits (Franz et al., 2010). Despite the differences, the dominant theme emerging from all the cited empirical studies is learning innovative farming by doing. However, the studies seem to be inconclusive in explaining how farmers learn as noted below.

Firstly, most studies exclusively considered non-formal learning arrangement and ignored the informal opportunities through which farmers might also learn. Yet, some scholars suggest that much of work related learning may be acquired informally (Boileau, 2017; Pamphilon, 2017). For that reason, this study considered both nonformal and informal learning because they complement each other (Kanukisya, 2020). Secondly, the previous studies focused on preferred methods of learning rather than describing the process of learning. This particular study examines the sources of learning and describes how learning ensues under each source. Thirdly, the previous studies share experiences of farmers from countries of the north except a study by Maertens et al. (2020) which was conducted in Malawi. The present study shares experiences of Ugandan small-scale farmers with focus on a rural district of Bududa.

Theoretical framework

The study was guided by experiential learning theory (ELT). Experiential learning denotes learning from experience or creation of knowledge through transformation of experiences (Kolb, 1984). Indeed, proponents of experiential learning theory advance that knowledge generated through experiential learning is a combination of grasping and transforming one's experiences (Kolb & Kolb, 2017). Thus, the theory was suitable in predicting and interpreting how farmers learn because it is precise with regard to approaches of learning, namely independent learning, learning by doing, work-based learning, problem–solving which have also been frequently suggested to have a strong link between farmers' ways of learning and their innovative abilities (Maertens et al., 2020; Pamphilon, 2017; Prager & Creaney, 2017). Moreover, in general adult learning discourse, it is believed that majority of human learning and development is associated with practice-based experiences (Merriam, 2017).

Secondly, ELT is elaborate on the four-stages of learning process (concrete experiencing, reflecting, thinking and experimenting) illustrated in experiential learning cycle (Kolb & Kolb, 2017). Thus far, the theory presented precise constructs to illuminate how farmers learn from their prior experiences and transform such experiences into new practices starting with either reflections or actual practice. Meanwhile, the constructs of ELT with regard to different learning styles of

learners and their respective characteristics appeared precise in comprehension of the individual farmers' learning abilities.

However, critics of ELT challenge it on conceptual and empirical grounds. Conceptually, critics argue that the mix of the learning styles and stages as reflected in the graphical representation of the theory shows a contradiction between the two concepts. As a result, the critics hold some reservations with respect to reliability and validity for findings of studies guided by ELT. On the contrary, critics neither ground their criticisms on empirical studies nor suggest better alternatives. As such, ELT remains a dominant theory which espouses clear characteristics of being the process of learning theory.

Methodology

This paper presents findings from a qualitative case study. Qualitative case study was considered to allow the researchers gain detailed information on such processes since it is commended for facilitating better examination and understanding of processes used to improve practice (Baxter & Jack, 2008). As a result, Bududa district as a Ugandan case famous for being a food basket for Eastern Uganda and beyond amidst land scarcity was considered (Uganda Investment Authority [UIA], 2019). Through typical case sampling, participants ($n=22$) were selected from three sub-counties of Bududa district. Participants' typicality was determined by their excellence in innovative farming practices as reflected in better management of crop farming projects such as increase in crop production and supply in the area, better management of crop diseases, and introduction of new crop varieties, among others. They were identified with the help of key informants and further verified by cross-checking with records at the Bududa District's Department of Production on model crop farmers in the whole district (Bududa District Local Government, 2020). Data were collected through interviewing each of the 22 participants, triangulated with documentary review and two FGDs with participants. In order to maintain anonymity, participants were assigned codes for identification during data presentation and analysis.

Meanwhile, all important ethical procedures were observed from the inception of the study to its conclusion. These included obtaining both administrative and research ethics clearances from relevant authorities in Uganda. Data analysis followed Braun and Clarke (2006) six-step framework of thematic analysis.

Findings and Discussion

The situation analysis section of the Uganda National Agricultural Extension Strategy 2016/2017-2020/2021 by the Ministry of Agriculture Animal Industry and Fisheries (MAAIF, 2016), highlights the barriers to adoption of technologies and best farming practices by small-scale farmers. These are: uncoordinated and fragmented farmer education services; low coverage of extension beneficiaries; narrowly focused farmer education content; ineffective farmer education approaches; inadequate budgetary allocation for farmer education services; and limited access to affordable credit by farmers. This implies that the challenges that affect farmers' innovative abilities in Uganda are well documented in policy and other farmer education strategic plans. However, efforts to avert the challenges are somewhat in place but not reaching most small-scale-farmers (Lybbert et al., 2017). The findings of this study revealed that participants navigated their way through the challenges by learning from fellow farmers, advice from experts, the unit on a farm and other community-social-systems to achieve the innovative farming practices. This section therefore, presents findings by providing explanations on the sources and process of learning innovative farming by small-scale farmers.

Learning innovative practices from fellow farmers' advice and practices

The findings revealed that advice and practice by fellow farmers triggered learning innovative farming. The most frequently mentioned methods of learning from such sources were observing and comparing farming practices with or without the consent of the owners. The interview quote below provides illustrative evidence of how learning from practices of fellow farmers could be done in most cases. One of the farmers narrated:

> I was on my way to Bumatanda but got impressed by a banana garden of a certain farmer. I stood to observe activities in his banana garden for some time. I admired the cleanliness, mulching, desuckering and size of banana bunches. …I imagined each one of those bunches would fetch him over thirty thousand shillings as per the market price for banana as at then. In my mind I resolved to do the same on my farm. That is where I picked inspiration to change my way of caring for bananas. The size of bunches of bananas in my farm are bigger compared to those from the neighbours' farms.

The above interview comment suggests farmers' level of differing from conventional crop farming practices to adopting better crop management practices through

learning from fellow farmers. The quote suggests that the practices learner-farmers get attracted to, seem to be better compared to their own. As such, the best practices were the source of learning and better farming skills learned were taken up for implementation. The learning process can be interpreted to have taken the shape of: *observing-reflecting-thinking-doing*. On the other hand, the findings also reveal that learning from practices of fellow farmers is self-directed. It was a product of learner-initiated and guided learning activities although it would take place incidentally as participants pursue other daily tasks. Subsequent interviews showed such learning could be informally planned as well. The interview quote below further provides illustrative evidence of how most farmers acknowledged to have had planned and purposively informal learning from advice provided by fellow farmers.

> I visit other farmers and share with them some of the challenges and through such discussions, solutions to my challenges are got. Like this irrigation system I use here, I got ideas from the owner of Sabunyo farms. I paid him a visit and he inducted me on how he gets better and cheap materials for irrigation. I took some pictures so that I could share with my people who help me on this farm. As a result, I have been influenced to continue with my farming activities through irrigation during dry season.

The interview response reveals how small – scale-farmers learn innovative practices of managing climate change using less expensive resources for irrigation. However, the learning process was facilitated by observation and interactive discussions. The experiential learning theory illuminates such a process of learning. Thus far, the entry point for a learner-farmer is experiencing (from past experience). Then, they reflect by paying attention to what is being attractive in comparison to their own farming activities. In other words, the learner-farmer is involved in making comparisons and judgments (*reflecting*) on the current situation, the gap, the expected situation and what it takes (plan of action) to reach the ideal situation thus being involved in abstract conceptualization – *thinking*. Finally, when such farmers take a step to implement (*doing*) what was learned, active experimentation is espoused. The deduced learning process is also consistent with Roberts (2006) who opines that experiential learning is cyclical in nature and requires an initial focus for the learner, followed by interaction with the phenomenon being studied, reflecting on the experiences, developing generalizations and testing those generalizations.'

Overall, the findings are consistent with previous studies that have commended the effectiveness of farmer-to-farmer learning in building farmers' innovative farming capacities (Fisher et al., 2018; Nakano et al., 2018). On one hand, the

findings of this particular study bring to the fore, the contribution of informal farmer-to-farmer education in learning innovative farming, especially in less developed countries like Uganda and others in similar contexts, where adoption of innovative farming is affected by inaccessibility to the expertise (MAAIF, 2016; Pamphilon, 2017). On the other hand, the learning processes uncover the influence of the past experiences in learning innovative farming. As such, it may be argued that although the processes involved informal learning, the findings may have an implication on nonformal farmer education as well given the critical role experience plays in farmers' learning. Consequently, the educators have to emphasize critical thought and reflective learning by participants in the nonformal farmer-education programmes from time to time as a way of enabling participants learn from their experiences and ensure effective transfer of knowledge into practice.

Findings further revealed that some farmers learned innovative farming practices as they facilitated others to learn as well. Some farmers disclosed their better farming practices had made them to be assigned roles of community farmer-educators by the organisations supporting their farming activities. The foregoing narration can be illustrated by an interview comment from a participant who said that:

> These contour bands have made me known as a model farmer in this sub – county and beyond. Farmers come to learn from what I do here because my farm has been selected as a demonstration farm for contours. I remember one day as I was explaining how important regular desilting of contour bands is, one of the participants who was listening gave me an idea on how I can avoid wasting the space between coffee trees and where I pile the silt. That is how I developed the idea of planting green pepper and eggplants in there.

It can be noted from the excerpt that some farmers informally learned to introduce new crops and made some changes in crop planting style in the process of educating other farmers. In other words, findings show that the host-farmers can learn from facilitating others. However, the learning process involving facilitating others can be interpreted to have taken the shape of: *doing – inquiry – listening – thinking – doing*. Although previous studies (Fisher et al., 2018; Maertens et al., 2020; Nakano et al., 2018) provide evidence on effectiveness of farmer-to-farmer extension in building each other's innovative farming capacities, they are silent on the reciprocal learning benefits of the practice to the host-farmer. This perhaps informed the argument by Leeuwis (2004) on rethinking farmer-extension philosophy by changing from farmer-education to communication for innovation so that interactive learning is enhanced. The findings of this study thus add a voice to such a line of thinking about farmer education.

Learning from advice provided by experts

Advice from experts such as farmer-educators and model farmers were other sources of learning about innovative farming. The converging views with regard to participants' approach of seeking advice from experts were exhibited in two forms, namely directly contacting experts or contacting fellow farmers who were perceived as experts whenever farmers encountered particular farming challenges. On recognition of such a source of learning, one of the farmers said:

> When coffee stem borer became a challenge to my coffee, I talked to the extension worker of our sub-county. He came and checked and advised me to paste *neem-leaf-extract* on the affected coffee stem. In that way, I learned proper care for my coffee garden and I have avoided further attack by those insects without using spays which I know are hazardous when one is exposed to them quite often. Besides, such pesticides are expensive.

The excerpt suggests how farmers may learn and introduce biological means to control pests' population on their farms as opposed to the use of chemicals which were noted to be more expensive and hazardous to farmers' lives. Findings further revealed that through advice of fellow-farmer experts, some farmers learned and introduced biological means of maintaining soil fertility on their farms. The following illustrative statement shows how some farmers learned and adopted such practices through advice of fellow-farmer experts:

> The fertilizers I often applied would make my crops wither, made the soils so hard especially during dry season. This was a common challenge here because other farmers had similar complaints. I thought deeply about it and shared with other farmers. Some of those consultations helped me learn how to make liquid manure (bio-syrup) from a colleague who had received some training by Agriterra Uganda. He came and trained me how to make bio-syrup and its application on my farm. I acquired a lot of knowledge from that training. We now make local and very cheap manure for all crops we grow here. I no longer cry of poor soil like it used to be before.

Based on the interview responses from the two farmers regarding biological means of managing pests and maintaining soil fertility respectively, it is evident that the learning was problem-based. This shows why problem-based farmer education is suggested as one of the suitable approaches for facilitating learning innovative farming (Pamphilon, 2017; Prager & Creaney, 2017). Moreover, problem-based farmer education espouses principles of experiential learning (Prager

& Creaney, 2017). Findings suggest that learning process undertaken by farmers while learning from advice provided by experts through problem-based learning involves: *monitoring-consulting-observing-reflecting-doing,* a process which is loosely congruent with experiential learning (Kolb & Kolb, 2017).

Learning new practices from the unit on a farm

The findings also revealed that some participants acquire innovative farming practices from flourishing units on their farms. Findings further revealed that through observation, monitoring and comparisons, participants acquired new knowledge which they tried to replicate elsewhere and success would guarantee adoption of the practice. The interview comment by one of the farmers cited below provides illustrative evidence on how monitoring and observation of units on a farm was a source of learning innovative farming to some farming challenges. The farmer narrated:

> Banana bacteria wilt attacked almost all banana species but '*Mundizi'* (short chubby bananas) were most vulnerable. For heaven's sake my wife used to pour ash under that *mundizi* [*Pointing to the mat just adjacent to his kitchen*]. She did that without knowing she was immunizing it against banana bacterial wilt, only to discover later when I saw that it was the only stool still surviving after the rest were affected. I uprooted some suckers from that very stool and planted elsewhere, unfortunately, they were also attacked. I kept on wondering. Then, something appeared in my mind that probably by pouring ash in the mother plant we killed the bacteria. I tried transferring the suckers again but this time before I could plant, I put ash and compost manure in the hole. The plantlets survived. This has enabled me to maintain *'mundizi'* until now.

The narrative from the participant shows how a unit on the farm was a source of learning innovative ways of managing banana wilt through less costly, yet effective biological means. However, it can also be noted that successful learning from the unit on-farm calls for great commitment from the farmer. It requires paying attention to every small detail with regard to behaviours of their crops on the farm. Moreover, the methods noted to facilitate such a process of learning include: observation, monitoring, comparison and reflection. Besides, it is more of an individual learning process on ones' own-farm. Nevertheless, it seems the participants' prior experiences somewhat indirectly plays a big role in such learning because comparison and reflection involve a juxtaposition of experiences. It can

be interpreted that the learning processes undertaken by farmers while learning from a unit on the farm involves: *observing – comparing – thinking – reflecting – doing – observing – reflection – doing.* Perhaps some other stages were repetitive because it involved trial and error learning methods. This might be not surprising given the understanding that trial and error is a continuous process of grasping and transforming experiences (Kolb, 1984; Kolb & Kolb, 2017). It also echoes the argument of Kolb (2017) that learning through the cycle of experiential learning can start at any stage among the four.

Overall, two issues emerge from the findings regarding learning new practices from the unit on a farm. First, that innovative farming practices learned were through trial and error. In other words the learner puts the knowledge or skills acquired into practice until the desired results were realized. This implies farmers gain new experiences and continuously reflect on them based on outcomes of experimenting on the same experiences. Moreover, even where failure was experienced in the initial trials of the practice, and the learner remained convinced and persisted with more trials, success would be realized. Kolb and Kolb (2017) recognize the foregoing experience as 'initiating styles characterized by ability to initiate action in order to deal with experiences and situations' (p.23). Similarly, Nieuwenhuis (2002) refers to it as balancing between chaos of uncertainty and grooves of experiences when learning and practising innovative farming. Therefore, it means individuals with such a style undertake active experimentation (AE) and concrete experience (CE) as their dominant learning abilities (Kolb, 2017).

Second, it emerged that the 'learner-farmer' exclusively goes through informal learning with incidental learning taking course. In most cases, there is always a risk with such knowledge since the source, the learning process and resultant knowledge appear to be tacit, traditional and somewhat intuitive. As a result, despite being practice-based knowledge, it may be displaced or pushed to the margins due to the strong beliefs by most stakeholders in the standardized scientific or expert knowledge. However, as the practice by participants of this study seem to suggest, recognition of such sources of knowledge may be equally important. Moreover, Leeuwis (2004) argues that, ''farmers' practical knowledge that has for long been branded tacit, implicit can be partly made explicit and / or transferable to others through cooperating with the person with such knowledge''(p.97). Similarly, other scholars (such as Nieuwenhuis, 2002; Tambo & Wunscher, 2018) contend that most agricultural innovations are built on tacit knowledge and ingenuity by farmers. As a result, it may be suggested that perhaps the formal or scientific institutions need to gain access to such knowledge and subject it to further verification, thereby fostering its transfer beyond the boundaries of a particular community or family.

Learning innovative farming from community-social-systems

Findings revealed that some small-scale farmers learned innovative farming from community-social-systems of media and traditional knowledge systems. Learning from the social media was facilitated by internet services especially for elite small-scale-farmers to do research on innovative farming. Findings further revealed that learning from such sources was through reading and analysing written and/or video clips published from ideas of experts or model farmers. In recognition of social media as a source of learning, one of the farmers stated that:

> Of late, banana wilt was so disastrous but I could hear lots of advice from other farmers. So, I did some research on some ways I had heard about. My research made me learn a lot especially on using rabbit urine and ash to treat banana bacteria wilt. So, whenever my bananas are attacked, I look for rabbits' urine and make pesticides.

Arguing consistently, and in appreciation of social media as a source of learning, another participant said:

> I learned how this Bucket-kit drip irrigation works from a video clip on the internet. […] I have found it to be a low-cost method of delivering water and fertilizers to my farm as compared to when I used to hire people to do it.

The two interview comments above, suggest how farmers take advantage of available community information communication media to learn low-cost yet easily adoptable farming innovations. However, the first excerpt shows that some farmers seem to give little faith in informal knowledge generated by fellow farmers despite such knowledge being experience-based. However, as a matter of continuous learning, the receiver of such knowledge may verify it by consulting other authorities. This suggests that the source of learning was limited to small-scale farmers who had achieved a relatively higher level of formal education and of better economic status to afford internet services. aAll in all, findings show that farmers were continuously learning, in varied contexts and quite often, the motivation for learning was improvement on their farming skills. The process is consistent with the assertion by Von and Haring (2012) that continuous learning is relevant in developing farmers' innovative farming skills.

Furthermore, indigenous knowledge systems (IKS) were another significant source of learning innovative farming practices. Findings revealed that some participants used IKS to manage challenges which were especially posed by unfavourable weather changes. It was revealed that such knowledge was acquired through

monitoring and comparing the area's ecological happenings including: the direction from and/or to which the wind blows, particular spots where thunderstorm occurs, and emergence of a flock of *Kamakumeti* (folklore birds). The comment made by one of the farmers during a focus group discussion provides illustrative evidence of what some farmers asserted in recognition of how IKS was source of learning.

> […] unless thunderstorm for first rain season is heard from that Tsekululu hill, believe me, such rain will disappear. So even if there were some rain, we know a dry spell is likely to set in. […] in my plot for horticulture, I can't plant onions or cabbages which require much rain water because I may make losses. I instead plant tomatoes but scatter them so that more space is left for other crops to be planted when the real seasonal rains set in.

It is evident that IKS are useful sources not only to learning about ecologically friendly crops production for food security, but also to learning skills of maximizing land use as well as developing crop farming financial literacy. The findings also suggest that rural farmers are always well versed with natural happenings which are associated with weather changes in their respective areas. In that regard it may be argued that indigenous knowledge system (IKS) is among the strategy for mitigating challenges of climate change given that the happenings were not only used to predict weather changes but also helped farmers to decide when and what crops to plant. The findings further bring to light the value of IKS in developing farmers' abilities to experiment and gain innovative skills that can help them to adapt to ever changing climatic conditions. Learning from IKS may not be surprising especially for farmers in rural settings. Empirical research studies especially in Africa have frequently suggested a strong link between IKS and small-scale farmers' ability to develop innovative farming abilities (Tambo & Wunscher, 2018). Perhaps this explains why Boileau (2017) contends that "IKS did not only facilitate traditional apprenticeship, but it is ubiquitous in modern knowledge-based economic activities in form of cognitive apprenticeship" (p.3). However, through subsequent interviews with other farmers, it was noted that IKS as a source of learning was castigated by a 31-year-old farmer as an unreliable source of knowledge on farming practices of their generation. The farmer noted: "…you see, we no longer live in the old days of our parents who predicted the changes in weather using natural happenings like movement of the wind and birds in the sky…"

Such a statement suggests conflicting sentiments exist among farmers with regard to the presumed critical role played by IKS in mitigating farming challenges as revealed earlier. Furthermore, it also suggests that use of IKS may be delineated

by some young farmers as an exclusive preservation of the elderly farmers. As a result, it may be argued that the use of IKS in learning and the presumed impact in mitigating farming challenges is often pushed to the margins by a certain category of farmers. The emerging conflicting sentiments on IKS as a source of learning innovative farming further suggest the causes of the dilemma in recognition of farming innovations generated from such a learning process by most stakeholders in the farming sector (Bragdon & Smith, 2015).

The findings suggest that learning from IKS is an informal learning process. For instance, it is unlikely that one would predict the time for thunderstorm to happen and therefore prepare to learn from such an occurrence. It therefore remains an impromptu way through which farmers learn. The informal learning process is noted to involve: awareness-reflection-analysis-prediction. Nonetheless, the process still shows the significance of experience in learning. For instance, knowledge about community weather means grasping from experience thus, *experiencing*. Similarly, the mental models (beliefs) that associate happenings with weather, exemplifies *reflective observation,* and the decision of whether to plant or not means *taking action* (doing). It can therefore, be deduced that the learning process takes the shape of: *experiencing-reflecting-doing,* a process found to be congruent with the stages of experiential learning proposed by Kolb and Kolb (2017).

Conclusions and Recommendations

Findings of this study have revealed that some small-scale farmers learn innovative farming from: advice and practices of fellow farmers; advice by the experts; crop health of particular unit on a farm; the community-social-systems; media and indigenous knowledge systems. However, learning from each of the sources was undertaken informally and facilitated by diverse methods of learning. Some methods of learning were unique to learning from particular sources while others cut across. For instance, observation and comparing were ubiquitous with all sources of learning. However, reading and analyzing facilitated learning from community social-systems and media in particular. Regardless of the source, findings further revealed that learning was motivated by the need to solve particular farming challenges.

Based on these findings, the study concludes that the learning process undertaken by small-scale farmers involves: experiencing, reflecting, thinking and doing which are congruent with the stages of Experiential Learning Theory. However, the processes did not follow a fixed pattern, but slightly varied depending on the

source of learning and the operational circumstances of the 'learner-farmer'. With the lens of ELT, these variations were precisely illuminated.

Based on the study findings and conclusions, this study recommends that: Firstly, since findings have shown how farmers' experience may play a pivotal role in learning innovative farming practices, agencies offering non-formal farmer education ought to adopt approaches that can enable farmers to learn by reflecting on their experiences in order to challenge the status quo and critically think of the best farming practices to be adopted in their respective contexts.

Secondly, the study has shown that learning from practices and advice provided by fellow farmers promotes adoption of both context-based and problem-based innovations, has and it has further demonstrated how farmer-to-farmer learning may be adopted for crop farming extension services. This may somehow close the ever-widening human resource gap of experts to do fieldwork activities especially in rural areas.

Thirdly, the findings showed that despite acquiring innovative farming skills from informal learning sources, farmers were able to generate some farming innovations. However, scaling up of such innovations was limited. This study recommends that experts in the farming industry ought to develop interest in farmer-generated innovations and work towards scaling up their adoptions. In this way, the context-based farming innovations may not remain with few individual farmers' families but rather diffused and adopted by other farmers in the community.

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