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Applying a Needs Assessment Model for Improving Agricultural Education in Guinea

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Abstract

Extension education is considered an essential component of improving agricultural sustainability by diffusing innovations that increase crop yield and alleviate poverty in Guinea, Africa. To accomplish learning outcomes, extension agents must be confident and competent in their instructional abilities. This is achieved by self-evaluation of their training needs. The objective of this quantitative research was to conduct a needs assessment with leaders of the Farmer-to-Farmer educational program to identify their training needs. A purposive sample of thirteen higher-education leaders of the Farmer-to-Farmer program were asked to identify their educational needs and prioritize items contributing to the knowledge gap following their participation in a ten-day training. The Borich Needs Assessment Model was used to calculate the mean weighted discrepancy score (MWDS) of all items. The top five content areas with the greatest reported needs were: Power Point presentations (MWDS = 5.72), teaching financial management (MWDS = 5.51), using SWOT analysis (MWDS = 4.5), teaching marketing concepts (MWDS = 4.36) and incorporating stakeholders (MWDS = 4.35). Following a Pre/Post-Test, the top five content knowledge improvement areas and percent increase in reported knowledge were utilizing strategic planning (176%), using Borich (1970) for program needs assessment (153%), using SWOT analysis (122%), analyzing external influences in educational programs (115%) and strategies to conduct farm trials (67%). Respondents reported increased confidence in seeking stakeholder needs and building resources to increase program value. The results have implications to build education equity and sustainability in Guinea.

Keywords: Borich needs assessment, agricultural extension education, Guinea agriculture, program planning, strategic planning, Farmer-to-Farmer

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Introduction

Hunger is an important real-world issue. Many farmers in Guinea, Africa, rely on subsistence agriculture for survival (FAO, n.d.). Areas that use subsistence agriculture are prone to food insecurity, malnutrition, and nutrition-related diseases, which are all commonplace in Guinea, particularly in the southwestern region (FAO, n.d.). A recent “increase in crop production in response to strong global demand and higher prices” has created the additional challenge of ensuring that Guinea farmers use practices that do not negatively impact biodiversity (Monteiro et al., 2017, p. 1). The “need for sustainable alternatives to industrial farming has led to a revival of interest in traditional agro-ecosystems,” necessitating an understanding of the social and physical–technical communication systems that allow for the intergenerational transmission of sustainable agriculture practices (Fraser et al., 2015, p. 1). Lack of access to both new technology and improved farming methods limit potential yield and sustainable agriculture practices (FAO, n.d.).

Guinea lies in what is collectively known as Sub-Saharan Africa (SSA), which is one of the world’s most food-insecure regions with nearly a third of its inhabitants suffering from malnutrition at a rate as high as 31.5% in some areas (FAO, 2016). Agriculture in Guinea is largely subsistence based, thus negatively impacting economic, social, and environmental sectors by creating issues such as poverty, food insecurity, and lack of biodiversity (Monteiro et al., 2017). A recent increase in cash crop production in SSA, due to global demand and higher prices, has illuminated the knowledge gap between local farmers and the sustainable practices that would give them economic and social stability (Havik et al., 2018).

The Farmer-to-Farmer extension program, which was designed to “support farmers and agribusiness professionals in developing countries to improve their livelihoods and food security” (Farmer-to-Farmer, n.d, Home section, para. 1), has recently been reintroduced to SSA with the aim of reaching more farmers within a shorter time frame and making it more affordable for participants (Kiptot & Franzel, 2015). The program uses lead farmers to disseminate information to those in their communities where the bond of trust is highest (Mulwafu & Krishnankutty, 2016). This format allows for greater consistency in sharing feedback within the farmer-extension relationship (Kiptot & Franzel, 2015). Furthermore, because SSA suffers from a shortage of trained extension agents and limited travel budgets, using lead farmers alleviates some of the demand for trained program leaders (Amudavi et al., 2009). Farmer-to-Farmer deploys U.S.-based volunteers with experience in the agricultural industry to over 30 countries around the world, providing local farmers with hands-on training to improve the country’s agricultural sustainability.

At the basis of the educational model was a Borich Needs Assessment, which is a comprehensive model that assesses the competency of extension agents and recognizes their training needs (Conklin et al., 2003). The purpose of a needs assessment is to identify the gap between current extension program practices and what is ideally required or anticipated for the learning outcomes (Borich, 1980). Borich refers to these “gaps” as discrepancies (Borich, 1980). A needs assessment is accomplished by allowing extension agents to indirectly express their training needs through “self-assessment and professional judgement to point out the areas of [discrepancy] that need to be filled” (Olorunfemi et al., 2020, p. 63).

A discrepancy analysis of the mean weight discrepancy scores (MWDS) of those high need areas can give an accurate determination of the level of competency as extension agents rank the importance of each of their need areas (Borich, 1980; Goli et al., 2013; Olorunfemi et al., 2020). This measure is achieved by computing the difference “between the level of

importance rating of the extension agents (relevance of each competency item to the job function) and the ability to perform (level of attainment of each competency)” (Olorunfemi et al., 2020, p. 64).

It is important to note that needs evolve over time and are influenced by cultural norms, community traditions, and educational levels. There are several issues that influence needs including physical, social, psychological, economic, and political factors. Extension agents should take these considerations into account when planning and designing programs that best meet the needs of their target audience (Waddington et al., 2014). The results from our needs assessment analysis can better direct agricultural extension agents on the methods and strategies most successful in accomplishing learning outcomes in professional development training.

Jack Mezirow’s theory for transformative learning is an adult learning theory that combines both instrumental and communicative learning (Mezirow, 2000). Mezirow believed that the first step in overcoming distorted communication is practicing radical discourse through collaboration, leading to self-determination and ownership of the learning environment (Mezirow, 2000). Information transfer within the theory follows the concepts of solidarity, empathy, trust, and self-emancipation through self-understanding. Research by Vygotsky (1978) found that collaborative learning uses small groups with heterogeneous and interdependent members to build new knowledge by formulating connections to existing knowledge. Collaboration allows individuals to achieve consensus on new material and become student-teachers, disseminating information among their peers (Bruffee, 1999). Because collaborative learning groups often focus on a small number of individuals, the learning environment becomes a safe place “for learners to challenge and reshape each other’s thinking through meaningful connections with the content” (Smith, 2008, p. 326).

To apply Mezirow’s transformative learning theory within extension program design, a needs assessment must first be conducted to establish the program goals. Identifying the target population social, economic, and environmental condition characteristics, as well as funding and resources available to make the program run smoothly, is a key first step in performing a needs assessment (Diaz et al., 2018). After identifying the target population characteristics, the program planner should pinpoint the intended outcomes such as the knowledge, attitudes, skills, and aspirations (KASA) the program will impact (Diaz et al., 2018). Setting progressive and sequential objectives and building relevant content are essential to achieving intended outcomes. Last, following implementation of the program, Boyle (1981) recommends assessing specific and measurable outcomes through group assessments, observations, and end of program surveys; pre and post-test results are useful in measuring the program’s economic or social impact.

Purpose and Objectives

The purpose of the study described herein was to identify educational program leader planning needs to increase the likelihood of future Farmer-to-Farmer program participants achieving educational outcomes. Three objectives guided the study:

1. Identify program participants training needs on essential extension program aspects; and
2. Identify knowledge gained from delivery of a customized program to address educational priorities; and
3. Identify program participants perceived post-workshop training needs on essential extension program aspects to improve future trainings.

Methods

Needs assessments assist program leaders in establishing needs that will be addressed by the program. According to Moore and Rudd (2004), organizations that identify their core competencies can tailor professional development training to those specific needs, leading to improved outcomes. The finding was corroborated by Liles (2004), who discovered that customizing programs to organization or participant needs leads to quality outcomes. Developing countries face an additional challenge in identifying extension program needs for program leaders and farmers in their regions (Strong, 2011). Therefore, it is essential international agricultural educators use needs assessments to identify competencies that direct their extension program activities (Ghimire et al., 2017; Lamm et al., 2017). Using the Borich (1980) Model for Needs Assessment can assist program planners with defining priorities that maximize learning outcomes (Barrick et al., 1983; Garton & Chung, 1995; Layfield & Dobbins, 2002). It is crucial to the success of the organization that local educational leaders are involved in the process of identifying potential educational strategies as such a measure may play a positive role in achieving intended outcomes (Waters & Haskell, 1989).

Sample

In November 2016, 13 leaders of higher-education programs in Guinea took part in an on-site educational program to enhance program planning and improve educational outcomes provided through the Farmer-to-Farmer program. Winrock International facilitated the training with the United States Agency for International Development (USAID) sponsoring it and the Ecole National D'Agriculture Et D'elevage (ENAE) De Macenta hosting it. Participants in the program represented the four main universities in Guinea: the Université Kofi Annan de Guinée, the Université Utad-Guinée, the Université Mercure Internationale, and the Université Général Lansana Conté de Sonfonia. The Université Kofi Annan de Guinée is the only multidisciplinary higher education institution in Guinea. The guiding principle that drives instruction at this university is an emphasis on providing educational opportunity for all to help fight poverty and improve sustainability. The Université Utad-Guinée is a private university located in Conakry, the capital of Guinea. It offers eight bachelor's programs in the areas of business administration, economics and management, legal and political sciences, computer science, mines and geology, sociology, logistics, and transportation. The Université Mercure Internationale "aims to train versatile executives capable of implementing the basic tools to ensure, control and optimize the quality and safety of food, biotechnology and health products (design, manufacture, control and distribution), [as well as] management of the environment and the safety of people" in Guinea (Guide Orientation, 2020, Hygiène et Environment section, para. 1). The Université Général Lansana Conté de Sonfonia has four colleges that focus on legal and political sciences, economics and management, social and human sciences, and letters and language sciences.

We purposely sampled all the higher-education program leaders of the Farmer-to-Farmer program in Guinea (N = 13), some of whom were employed by the same university. The program was composed of all male participants, which is common for the culture given the predominantly Muslim religion and the practice that women are not commonly involved in leadership roles. However, the small sample size allowed the researchers to build an environment of collaborative inquiry that fostered inclusion and open dialogue.

Data Collection

Although it was a 10-day educational program, research was collected using the first two days to identify the participants' educational needs, then utilizing the remaining days to prioritize educational content to fill the identified gaps that surfaced from the initial assessment. These educational sessions offered interactive activities to share curriculum and support developing agricultural extension programs. Questions for the pre and post assessment were drawn from a training module used by the United States Agency for International Development (USAID) project, which is identified as Modernizing Extension and Advisory Services (MEAS), and served as the content base of this project while also addressing validity and reliability (Strong, 2011). This training module was originally tested on extension programs in the Caribbean Region to great effect and success; although initially tested in that region, the "module was developed to be functional and applicable to farmer-driven extension systems" across the globe (Strong, 2011, p. 2). The module included 29 items of content knowledge, but participants also responded with interest in overall program comprehension and teaching with PowerPoint to reach a total of 31 content areas. All thirteen participants fully contributed data, leading to a response rate of 100%.

The collaborative learning approach in delivering the content and collecting the data was utilized to fulfill the purpose of this research because it was determined to yield the most valid results. Individuals in developing countries who rely primarily on traditional agricultural practices can be skeptical of receiving instruction from those with whom a foundation of trust and mutual respect has not been cultivated (Cranton, 2006; Fraser et al., 2015; Smith, 2008). Collaborative inquiry fosters community building through reciprocal dialogue, involving program participants in planning and evaluating their educational needs, and building relevance by relating curriculum to real life experiences (Knowles et al., 2015). When adult learners take ownership of their own learning experiences in an environment where open and honest dialogue is encouraged, they are more willing to answer fully and truthfully, thus providing researchers with an accurate understanding of their viewpoints and the reasoning behind those perspectives (Karmelita, 2017). Finally, collaborative instruction facilitates the formulation of Value Creation Networks, in which program participants reflect on a learning outcome's immediate, potential, applied, realized, and transformative values. Recognizing these values can improve a learning outcome's long-term practice and potential for innovation adoption (Whisler et al., 2017).

Data Analysis

We chose the Borich Needs Assessment Model for data analysis and used the MWDS to calculate each item in the instrument (McKim & Saucier, 2011). The MWDS model calculates the program participants' levels of importance for each of the evaluated items, which allowed us to rank the resulting ordinal data clearly. Ranking the data was essential for extension agents to establish future educational program priorities that meet the needs of their participants (Conklin et al., 2002). To use MWDS to analyze the data and determine where gaps in educational competency occurred, we collected two ratings for each content area (Olorunfemi et al., 2020). We calculated a discrepancy score by subtracting the ability rating from the importance rating in each of the content areas for each participant, and a weighted discrepancy score by multiplying the discrepancy score by its mean importance rating (Olorunfemi et al., 2020). Finally, we calculated MWDS by adding the weighted discrepancy scores for each content area and dividing it by the number of participants (Saucier et al., 2014). After calculating MWDS, we prioritized the content areas to address the areas of greatest training need. We ranked the MWDS from high

to low and calculated the mean of the MWDS (x MWDS) for each content area. Then, using the x MWDS, we ranked the content areas from high to low. To identify the educational areas with the greatest training needs, we identified content areas with a high MWDS or high x MWDS (Saucier et al., 2014).

Limitations

Our study had three limitations. The first was threats to internal validity, which can include subject characteristics such as participant age, gender, ethnicity, attitude, socioeconomic status, and political and religious beliefs. Despite that factor, the subject characteristics provided an in-depth view of the challenges facing Farmer-to-Farmer educational leaders in rural Guinea. A second limitation was the small, all male sample. However, given that males are the predominant gender employed in higher agricultural education occupations in Guinea, this aspect was not altogether unexpected. Additionally, the small sample size allowed us to spend quality time with each participant. Last, the study also had the potential to suffer from researcher bias. We took every effort to monitor subjectivity and allow for naturalistic inquiry. Having background knowledge of the subject gave us the advantage of being able to deduce which research methods would be most beneficial to accomplish the research objectives.

Results

To address the first objective, the Borich Model for Needs Assessment (Borich, 1980) was applied to the 31 educational content areas to measure participants educational needs (Table 1). Considering the MWDS for each strategic area, the top five areas with the greatest reported need included: (1) Power Point presentations (MWDS = 5.72), (2) teaching financial management (MWDS = 5.51), (3) using SWOT analysis (MWDS = 4.50), (4) teaching marketing concepts (MWDS = 4.36), and (5) incorporating stakeholders (MWDS = 4.35). One notable result was that the content areas of lecturing and conducting a workshop had the lowest MWDS and were likely not an area of focus for the training.

Table 1

Identified Needs Assessment of Attendees using the Borich Model Mean Weighted Discrepancy Score (MWDS) (N = 13).

Rank	Content Areas	MWDS
1	Teaching with PowerPoint presentations	5.72
2	Teaching financial management	5.51
3	Utilizing SWOT analysis to review or offer change / develop new programs	4.50
4	Teaching marketing and concepts of adding value	4.36
5	Including stakeholders in planning the program	4.35
6	Teaching the concepts of diversification through developing new programs	4.15
7	Importance of needs assessment	3.89
8	Clearly stating the intended results	3.69
9	Promoting educational programs through assessing stakeholder needs	3.68
10	Identifying target audiences for my programs	3.55
11	Using assessment results to quantify a program	3.38
12	Developing a work plan	3.25

Rank	Content Areas	MWDS
13	Using quantifiable objectives	3.23
14	Conducting on-farm trials and their importance in an educational program	3.15
15	Providing an alternative explanation when clientele is confused	3.02
16	Utilizing the SIVA model to define a program's value and become strategic	2.97
17	Establishing and managing demonstration plots	2.96
18	Utilizing the Borich Model (gap analysis) to determine higher priority needs	2.88
19	Motivating clients to participate in programs	2.72
20	Developing lesson plans to prepare for a presentation	2.72
21	Brainstorming within a group to develop ideas	2.68
22	Facilitating group discussion	2.66
23	Conducting individual farm visits	2.60
24	Adjusting lessons to the proper level for individual clientele	2.50
25	Identifying necessary resources (e.g., money, time, materials) for my programs	2.40
26	Utilizing PESTEL analysis to review external influences and build collaborators	2.27
27	Conducting field days	1.23
28	How to evaluate comprehension of your program	0.89
29	Conducting workshops	0.44
30	Determining what content is needed to achieve intended program outcomes	0.00
31	Lecturing	(0.71)

The second objective was to measure the knowledge gained from the educational program, which included pre- and post-workshop knowledge-tests. The top five content knowledge improvement areas and percent change in reported knowledge were: (1) utilizing strategic planning to identify program value (176% increase), (2) using Borich (1980) for program needs assessment (153% increase), (3) using SWOT analysis (122% increase), (4) analyzing external influences in education programs (115% increase), and (5) strategies to conduct farm trials (67% increase). Table 2 illustrates that participants gained knowledge in all areas, predominantly in the top areas of knowledge attainment (ranks 1 through 11). The list of pre and post content knowledge followed the 29 core items outlined by Modernizing Extension and Advisory Services (MEAS) (Strong, 2011).

Table 2*Pre to Post Values on Perceived Content Knowledge for Key Lesson Objectives (N =13)*

Rank	Content Priorities for Educational Training	Pre-Knowledge	Post-Knowledge	Percent Change
1	Utilizing the SIVA (Supporting Individuals through Valued Attachments) Model to define a program's value and become more strategic	1.00	2.77	176.9%
2	Utilizing the Borich Model (gap analysis) to determine higher priority needs	1.15	2.92	153.3%
3	Utilizing SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis to review or offer change/develop new programs	1.38	3.08	122.2%
4	Utilizing PESTEL (Political, Economic, Social, Technological, Environmental and Legal factors) analysis to review external influences and build collaborators	1.00	2.15	115.4%
5	Conducting on-farm trials and their importance in an educational program	1.85	3.08	66.7%
6	Teaching the concepts of diversification through developing new programs	1.62	2.54	57.1%
7	Using quantifiable objectives in lesson planning	2.23	3.15	41.4%
8	Promoting educational programs through assessing stakeholder needs	2.08	2.85	37.0%
9	Teaching marketing and concepts of adding value	2.31	3.00	30.0%
10	Conducting individual farm visits	2.23	2.77	24.1%
11	Using assessment results to quantify a program	2.46	3.00	21.9%
12	Brainstorming within a group to develop ideas	2.25	2.69	19.7%
13	Including stakeholders in planning the program	2.62	3.08	17.6%
14	Teaching financial management	2.31	2.62	13.3%
15	Identifying target audiences for my programs	2.92	3.31	13.2%
16	Establishing and managing demonstration plots	3.08	3.46	12.5%
17	Conducting workshops	2.46	2.77	12.5%
18	Importance of needs assessment	2.54	2.85	12.1%
19	Determining what content is needed to achieve intended program outcomes	2.69	3.00	11.4%
20	Identifying necessary resources (e.g., money, time, materials) for my programs	2.77	3.08	11.1%
21	Adjusting lessons to the proper level for individual clientele	2.92	3.23	10.5%

Rank	Content Priorities for Educational Training	Pre-Knowledge	Post-Knowledge	Percent Change
22	Providing an alternative explanation when clientele is confused	3.15	3.46	9.8%
23	Motivating clients to participate in programs	3.23	3.46	7.1%
24	Facilitating group discussion	3.15	3.31	4.9%
25	Developing lesson plans to prepare for a presentation	3.23	3.38	4.8%
26	Lecturing	3.31	3.46	4.7%
27	Developing a work plan	3.00	3.08	2.6%
28	Clearly stating the intended results	3.08	3.15	2.5%
29	Conducting field days	3.69	3.69	0.0%

To address the third objective, we conducted a final needs assessment following program delivery and training completion for all 31 content areas. This additional assessment of needs represents continued training needs, which assist in future training plans. Table 3 provides the ranking of training needs post event. Teaching with PowerPoint presentations remained the top content area for reported need, which was not able to be achieved in this training based on the lack of access to electricity. The remaining four content areas of the top five needs identified in the pre-assessment decreased in rank after the training.

Table 3

Post-Workshop Needs Assessment of Attendees using the Borich Model Mean Weighted Discrepancy Score (MWDS) (N =13)

Rank	Content Areas	MWDS
1	Teaching with PowerPoint presentations	5.99
2	Importance of needs assessment	4.22
3	Determining what content is needed to achieve intended program outcomes	3.77
4	Developing a work plan	3.69
5	Using assessment results to quantify a program	3.62
6	Teaching financial management	3.54
7	Promoting educational programs through assessing stakeholder needs	3.48
8	Teaching the concepts of diversification through developing new programs	3.10
9	Clearly stating the intended results	3.02
10	Including stakeholders in planning the program	2.96
11	Identifying target audiences for my programs	2.77
12	Conducting workshops	2.72
13	Developing lesson plans to prepare for a presentation	2.46
14	Utilizing PESTEL analysis to review external influences and build collaborators	2.44
15	Conducting individual farm visits	2.40
16	Identifying necessary resources (e.g., money, time, materials) for my programs	2.27
17	Teaching marketing and concepts of adding value	2.06

Rank	Content Areas	MWDS
18	Adjusting lessons to the proper level for individual clientele	2.03
19	Using quantifiable objectives	1.99
20	Brainstorming within a group to develop ideas	1.88
21	Motivating clients to participate in programs	1.81
22	Utilizing the SIVA model to define a program's value and become strategic	1.76
23	Facilitating group discussion	1.74
24	Conducting on-farm trials and their importance in an educational program	1.63
25	Establishing and managing demonstration plots	1.48
26	Utilizing SWOT analysis to review or offer change/develop new programs	1.44
27	Utilizing the Borich Model (gap analysis) to determine higher priority needs	1.38
28	Conducting field days	1.23
29	How to evaluate comprehension of your program	1.18
30	Providing an alternative explanation when clientele is confused	1.16
31	Lecturing	(0.51)

At the conclusion of the program, we asked the participants to rate their satisfaction with the training program informally. They reported satisfaction with the program and believed it was a valuable use of their time. They specifically noted that the concept of beginning with an assessment of their needs and developing content priorities based on their results was a valuable approach, which validates the previous research findings of Karmelita (2017) and Whisler et al., (2017).

Conclusions and Discussion

Needs assessment is a valuable tool in directing program expansion and curriculum development. Based on the results of the surveys, we determined that the areas in which Farmer-to-Farmer program leaders have the greatest training needs are teaching with PowerPoint presentations, teaching financial management, utilizing SWOT analysis to review or offer change to existing programs or develop new programs, teaching marketing and concepts of adding value, and including stakeholders in planning the program. They also expressed support needs in the areas of the importance of needs assessment, determining what content is needed to achieve intended program outcomes, developing a work plan, and using assessment results to quantify a program.

Following analysis of the data, we created a suggested model of program development. The model uses the results of our research to create an outline for successful agricultural extension program implementation in Guinea and other developing regions. It addresses key concepts from the assessments, including encouraging stakeholder involvement, using needs assessments to direct instruction, and program evaluation and is illustrated as Figure 1.

Figure 1

Model for Strategic Educational Design in Developing Regions

Strategic Planning	Refinement	Program Design	Implementation and Assessment
Define Target Populations Define SIVA aspects of a program Complete SWOT analysis to better define strategy Review Matching and Converting Develop a “Strategic Plan for the Program” for further review	Using Strategic Planning concept, test potential results Complete Focus Group Analysis using Nominal Group Technique Develop an Advisory Council for further implementation Using results, develop a program proposal and define Advisory Council objectives	<ul style="list-style-type: none"> - Use ADDIE Model to develop a graphical program proposal - Define program mission statements and vision planning - Define program logo/branding - Define resources and stakeholders to target proposal sharing 	<ul style="list-style-type: none"> - Deliver the program - Using Borich Needs Assessment Model, begin needs assessment - Refine programs and make needed adjustments - Using refined objectives, review program initiatives and branding

Note. The proposed model shows the interactions between Borich, SIVA, ADDIE, and SWOT used to create effective program design for agricultural extension programs (Hanagriff, 2016).

The model emphasizes the importance of educational strategic planning through SWOT analysis to ascertain an organization’s strengths, weaknesses, opportunities, and threats. We also suggest using the SIVA Model as it places emphasis on “collaboration, goal-direction, self-management and healthy empowerment to strengthen relationships” that “inspire problem solving, decision-making and systemic change” (SIVA Training, 2014, Our Programs section, para. 2), which allows for refinement of the program to be applicable and relevant. The ADDIE Model, another essential component of the proposed model, accentuates factors such as “Analysis, Design, Development, Implementation, and Evaluation [to] represent a dynamic, flexible guideline for building effective training and performance support tools” (Culatta, 2020, ADDIE Model section, para. 1). The final aspect is to implement the program and complete an assessment to review results and make modifications. A summary review of the proposed improvement model for strategic educational design in developing regions is listed as Figure 1.

Recommendations

Although the study was successful in achieving the research objectives, the following recommendations are suggested to improve similar programs of this nature in Guinea. Given the program’s location, access to electricity and internet technology was lacking and required us to think creatively and pre-plan accordingly to accomplish the research objectives. A location with better internet accessibility would facilitate increased access to support resources, leading to program improvement (Avci et al., 2020). We also recommend continuing the use of participants involvement in program planning to increase value and participation (Karmelita, 2017 and Whisler et al., 2017). We also recommend a follow up evaluation with the program participants

to ascertain how they are using the knowledge acquired during the training. Potential areas of interest include:

1. Have the program participants developed any type of group analysis (such as focus groups) or developed an advisory council?
2. Have the program participants engaged with their colleagues in a SWOT analysis, a SIVA Model conversation, or a group meeting to better define their program?
3. Have the program participants altered their implementation of lesson planning?
4. Have the program participants completed or initiated a survey?
5. Have the program participants implemented a Borich Model for Needs Assessment?

A follow-up evaluation would hold program participants accountable for ownership of their Farmer-to-Farmer programs by encouraging them to think critically on how to engage in further strategic planning to define their programs, seek new partners, and obtain new funding sources (Halbleib & Jepson, 2015). This could also take the form of a larger longitudinal study to track program implementation strategies over time.

A final recommendation is to incorporate the use of capstone projects, internships, or other student-led projects that connect course content to real-world situations in the agricultural industry. Engaging in practical learning opportunities would increase the social capital of the universities, leading to improved socioeconomic conditions and revitalizing rural farming communities in Guinea and other regions in SSA (Havik et al., 2018; Martin & Henry, 2012).

Implications

Although the results are only generalizable to Farmer-to-Farmer leaders in Guinea, they may have implications for future research in other regions in SSA with similar agricultural practices (Havik et al., 2018). A major implication of our research is to better direct the focus on developing strategic programs that increase sustainability and resource funding (Liles, 2004). Participants reported increased confidence in their ability to be strategic in seeking stakeholder needs and developing programs to address those needs. We observed the program participants transitioning from a reactionary educational planning approach to developing programs based on the needs of their community and defining new stakeholders such as potential employers and other industry partners. This is essential to build resources and increase program value (Whisler et al., 2017). A further implication is that the research builds education equity and independence, which can in turn improve program relevance and sustainability (Liles, 2004; Waters & Haskell, 1989).

The results of this research also have implications to enable Farmer-to-Farmer program leaders to understand how the diffusion of innovations process works in Guinea; this knowledge can be utilized to foster successful interactions and adaptations of new technology (Mwololo, 2019). Making Farmer-to-Farmer programs in Guinea more efficient by not focusing time on pre-existing knowledge will also identify the information exchange methods that are the most impactful in producing meaningful exchange of new material (Nakanoa et al., 2018). This identification builds self-efficacy among Farmer-to-Farmer program leaders and provides them with strategies to market themselves and new agricultural innovations successfully (Bandura, 1997; Nakanoa et al., 2018). A long-term implication of this study is that the results can be used to minimize Farmer-To-Farmer program leader burnout and enhance retention (Kitchel et al., 2012). Last, results of this research can aid Farmer-to-Farmer program leaders in understanding how new technologies are disseminated through social and geographical networks (Fraser et al., 2015). It is essential to provide farmers in Guinea with learning opportunities that promote

sustainable agriculture. Educational leaders of the Farmer-to-Farmer program are a necessary component in successfully addressing this challenge.

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