

Transforming Agriculture through Radio in Selected Value Chains in Nakuru County, Kenya

Abstract

The objective of this paper is to identify performance requirements and the knowledge, skills, and abilities gaps that the agricultural programme at Egerton Radio (101.7 FM) can address for farmers to improve adoption of technologies. The study used a participatory action research design that allowed the researcher and the study participants to collaborate in collecting and analysing data, and re-defining the research question and the research method in a cyclical process. A baseline survey was conducted to establish the current situation in participatory monitoring and evaluation within the agricultural programme at Egerton Radio (101.7 FM). The study found out that most of the participants are male (53.5%) who are middle-aged (46years) with enough experience (10years) and attained formal education to only primary level (45.8%). The population falls within the lower range of the scale being measured in terms of land size ownership of up to 2 acres. Most of the individuals had enough experience in different farming activities. The most common source of information is local chicken farming which also the leading source of training needs for the radio programme. Further, regarding Training and Knowledge areas, dairy cow stands out to be most common training need for the radio programme. In this regard, the study recommends that, the government and non-governmental organizations should empower farmers practicing various farming activities through offering of radio programmes, trade fairs, and capacity building to impart more knowledge and skills to the farmers to transform agriculture.

Keywords: transforming agriculture, radio, gaps, value chains

1. Introduction

Globally, Universities and Higher Education Institutions (HEIs) have three main responsibilities including; teaching, research and community outreach (Nampala, 2016). The African traditional view of universities as places where teaching and research occur to equip graduates with knowledge and development of skills needed to live in a diverse society (RUFORUM, 2017). Though not a traditional strength of Africa's higher education sector, there is an increasing sense that universities should be doing more to engage with various kinds of communities in the course of their activities (McIlrath *et al.*, 2013).

Community engagement concept is entrenched in teaching and training; research and innovation; and, outreach, service and community development (RUFORUM, 2017). University-community engagement involves a university collaborating with a community group to build capacity within that community (Howard *et al.*, 2007). Community engagement offers universities unique opportunities for experiencing community needs first-hand and contributes towards graduates with relevant knowledge, skills and attitude. It enriches learning, teaching and research and simultaneously addresses societal problems, issues and challenges (Fry, 2008). The emphasis in community engagement is on knowledge exchange between university and communities (Bender, 2008). Ekwamu (2017), challenges the universities by asking, “How can universities claim to be relevant if they cannot impact the communities around them?” Community Engagement (CE) has been recognized as an important factor in the successful introduction and adoption of new technologies. Bandewar *et al.* (2017) note that, despite a growing appreciation of its importance, what makes CE effective remains poorly understood.

The current monitoring and evaluation system in the agricultural programme at Egerton Radio is by some stakeholders (students) through monthly reports. Although these reports are valuable, they are not the sole methods for tracking activities (radio shows and field visits), performance or change in a regular and systematic manner.

The students and small-scale farmers, who are major stakeholders in the agricultural programme at Egerton Radio do not fully participate in monitoring and evaluating the activities, as the indicators of success are not well defined.

2. Literature review

2.1 University Community Engagement

The Africa Agriculture status report of 2018 found, Africa practices inefficient and low productivity agriculture in most sectors. The sector can barely sustain its farm population, let alone burgeoning urban population, even at a minimum level of subsistence (AGRA, 2018). University Community Engagement operate in a variety of ways referred to as Outreach, Service, Community Engagement (CE), University-Community Engagement (UCE), community consultation, public participation and a host of other terms (RUFORUM, 2017). A community may be understood as a group of people with diverse characteristics who live in the same geographical area or who have some other non-spatial element of shared social ties, such as a similar trade or group membership (MacQueen *et al.*, 2001). Engagement is a core activity of any university. Mirza *et al.* (2012) states that “while there is growing global consensus on the need for community engagement, there is no standard way to carry it out.” It is in line with this

that Stuart Laing, said 'universities need to have the courage to look outward and learn, for that is where the future lies' (Laing, 2016). However, Albertyn and Daniels (2009), argue that academics most often neglect this aspect when they are faced with the pressures of multiple roles.

Community engagement provides agricultural extension advisory services and offers universities unique opportunities of experiencing community needs first-hand, contributing towards meeting them; not only during the engagement activities but also through producing graduates with relevant knowledge, skills and attitude and through conducting relevant research (Mulu-Mutuku et al., 2017). CE should also involve the identification and expression of demands for relevant knowledge and technologies, their participatory development and efficient use by the farmers. Egerton University engages with communities through students' service-learning activities, community-based participatory research, community service, outreach and advocacy in the areas of crop and livestock production, nutrition, health and sanitation, environmental conservation, rain water harvesting, value addition and income generation, family dynamics, among others (Mulu-Mutuku, et al., 2017).

Egerton University Community engagement approaches include field attachment, farm attachment, outreach and Community Action Research geared to offering students' opportunities to apply their academic learning to real life situations. A study on the field attachment programme by Mungai *et al.*, 2016, found that the impacts and benefits of the programme include increased productivity at the farm level though like in many other universities, community engagement remains a scholarly activity. However, the communities often do not recognize the potential for engagement (Swanson, 2009). In this study, the focus is primarily on organized farming entities (farmer groups) within a community. University community engagement (UCE) can play a role in agricultural transformation through development of on-farm technologies and appropriate technologies for the respective communities. Such technologies or technology must target increases in land productivity combined with increases in the productivity of labour that is limiting the number of cultivated hectares in many systems and other factors.

This therefore calls for university staff involved to take a proactive role in furthering engagement through documenting best practices and lessons learnt. There is need to define what can strengthen engagement initiatives and strengthen the role community engagement plays for the university and the community.

2.2 Influence of Experiential Learning

In its simplest form, Experiential Learning (EL) is the process of learning through experiences (practice/experiment/discovery and so on) to develop new skills, attitudes and thinking (Hien & Oanh, 2018). A person learns when they can retain an idea in such a manner that they can use it to guide new learning (Moon, 2004). Experiential learning is largely unstructured; begins with experience not principles or concepts; and is usually more permanent (Noble, 2002). EL is a learner-centered approach involving experience followed by a process of reviewing, reflecting and applying what has been learned. In EL, staff and researchers are more of facilitators in the learning process and not only a source of information (Schwartz, 2012).

The most common explanation on experiential learning is based on Kolb's work. Kolb (1984) suggested that the process of experiential learning (EL) can be described as a four-stage cycle involving four adaptive learning modes: concrete experience, reflective observation, abstract conceptualization, and active experimentation. The model is a recurring cycle within which the learner tests new concepts and modifies them as a result of the reflection and conceptualization (Cano, 2005) but its notable that learning can take place at any stage in the cycle (Kolb, 1984). While the learning cycle can begin at any one of the four points in a continuous spiral fashion, it often kicks-off with a person carrying out a particular action and then seeing the effect of the action in the situation. Experiential learning as opposed to the conventional learning is more flexible since the individual guides the learning process.

Experiential learning benefits learners by providing applied skills necessary for essential learning goals and future employment (Nampala, Kityo & Adipala, 2016) and encourages learning, participation and partnership. Experiential learning can be divided into two major categories: field-based experiences and classroom-based learning. Field-based learning includes internships, practicums, cooperative education, and service learning (Schwartz, 2012). The underpinning principle of the learning activity must be the use of reflection to focus on the process of learning, allowing generalization of the experience to other situations (Moon, 2004); otherwise, learners will not necessarily learn from every experience. To help learners make sense of their experience, Moon suggested that learning focused with the following: carefully structured learning outcomes; briefing sessions and/or handouts; opportunities for reflection; tasks that directly apply the learning gained from the placement; and assessment criteria. A study by Tomlinson and Rhiney, 2018, found participants perceived themselves as having a higher adaptive capacity in comparison to non-participants, despite both groups having access to similar stocks of assets.

2.3 Outcomes of University Community Engagement

In research in the United States, Cook and Maury, (2016), found many universities in the USA are determined to engage their communities as part of their effort to strengthen democratic principles and processes. However, the Kellogg Commission on the Future of State and Land-Grant Universities (1999) in its report 'Returning to Our Roots: The Engaged Institution', has summarized that higher education institutions have not addressed local problems articulately despite available the resources and expertise. The universities have not only an obligation to address economic and social needs broadly, but have a particular responsibility to interface with the needs of the citizens and communities where they are situated. This responsibility includes students, staff, and administrators in addressing community challenges through research, education, and public service activities. The net expected result is closer relationships, improved quality of life in the community, applied learning opportunities for students, and satisfaction for staff members interested in experiencing tangible impacts of their scholarly work.

Engagement through partnerships with the community has been shown to generate new knowledge and enhance the teaching and learning process (Bernardo et al., 2013). Communities gain various benefits through their productive interactions with universities. These include improved human and social capital development, faster economic growth, better-quality professional and intellectual infrastructure, and progress towards sustainability and research outcomes that can benefit the various dimensions of society (Australian Universities Community Engagement Alliance, 2006).

Community engagement provides one of the most effective ways of providing key skills as envisioned in experiential learning. The student gains the skills while the communities gain the technologies. This exposure to technologies is significant as a farmer typically views their farm through the structural complexity and interrelationships between various components (Caldwell, 2015). Individual farms have specific characteristics arising from variations in resource endowments and family circumstances organized to produce food and to meet other household goals. The functioning of any individual farm system is strongly influenced by the external rural environment, including policies and institutions, markets and information linkages (Agustina, 2008). University community engagements with individual farmers can influence their farming systems be it at production, value addition or even market linkages.

2.4 Challenges Facing University Community Engagement

Amongst the three university roles, teaching and learning, research and community engagement, community engagement is given the least priority. The first challenge facing university community engagement is the increasing disconnect from the outreach/community

engagement role and focusing more on publishing due to the incentives structure (Snyder-Hall, 2015). For example, in Kenya, in the guidelines for appointment and promotion of staff, the Commission for University Education (CUE, 2014), has specific weighted publication points giving heavy emphasis on publications while leaving individual universities to set up guidelines for community engagement.

Secondly, the world university rankings also place emphasis on number of publications and thus the university resources are skewed towards the same. This leads to students as the major contact from the university to the communities. The student focus more on their learning as it is an academic requirement as opposed to the change it brings to the community. The staff who are the experts rarely engage directly with the communities and the communities do not benefit from the wealth held by the staff who should be community partners capable of changing their environment (Weerts & Sandman, 2010).

Thirdly, a farmer is currently faced by lack of coordination among the different actors working on a similar issue and giving different messages leading to confusion rather than a solution and in the end, farming communities may develop apathy towards all the stakeholders. The TAGDev programme is championing community outreach through the agricultural programme at Egerton Radio (101.7 FM). The programme brings together action and reflection, theory and practice, in collaboration with research participants as stakeholders, to explore practical solutions for the challenges faced by the two value chains (seed potato and cassava).

3. Methodology

3.1 Location of Study

The study was conducted in Nakuru County, which is one of the 47 counties of the Republic of Kenya established in the Constitution of Kenya 2010 (Appendix A). It is located between; longitudes 35°28' and 35°36' East, and on latitudes 0°13' North and 1°10' South. The County has a surface area of 7,495.1 km² and has a human population of 2,162,202 persons (Kenya Population and Housing Census, 2019). Nakuru County is divided into 11 administrative Sub-Counties/constituencies with 55 electoral wards.

Agriculture is the lifeline of the economy of Nakuru County as 70 percent of the 7,495.1 Km² of the county's land which translates to 5,039.40 Km² is arable and highly productive land. The County is endowed with a wide range of Agro Ecological Zones thus accommodating a wide range of crops. The Acreage under food crops and cash crops in Nakuru County is 243,711.06 (Ha) and 71,416.35 (Ha) respectively. The main cash crops grown are wheat, pyrethrum, and horticulture and the main food crops are maize, beans, Irish potatoes and sweet

potatoes. Horticulture is a major enterprise both for local and export markets. Horticultural crops are fruits, vegetables and flowers. The main livestock reared include cattle, poultry, sheep and goats. Dairy industry is the leading livestock enterprise. The three major fisheries activities carried out in the eleven sub-counties of Nakuru are; fish farming (aquaculture), inland and capture (Lake Naivasha, public and privately owned dams), fish inspection, quality assurance and marketing.

3.2 Research design

Action research is achieved through a reflective cycle, whereby participants collect and analyse data, then determine what action should follow. The resultant action is then further researched and an iterative reflective cycle perpetuates data collection, reflection, and action (Baum, MacDougall, & Smith, 2006). Action Research is envisioned useful for facilitating participatory monitoring and evaluation by collaborating and involving all the stakeholders in the entire process of diagnostic, problem identification, experiential learning, and problem-solving process. Through collaboration, action research aims at improving practice and as a participatory approach in problem identification, in collecting data, analysing data, and if need be, re-defining the research questions and the research method. The purpose of using the AR design in this study is enhancing capacity in PM&E for agricultural programme at Egerton Radio (101.7 FM) for experiential learning and adoption of agricultural technologies. After the intervention, an end-line survey was carried out to assess any changes resulting from the enhanced capacity of stakeholders in PM&E in the treatment 1 while in treatment 2, only a baseline and end-line survey were administered with no intervention as illustrated in Table 1.

Table 1: Treatments and activities

		Interventions	
		Treatment 1	Treatment 2
Activities		-Baseline survey	-Baseline survey
		-Training needs assessment	-Training needs assessment
		-Capacity building on PM&E	-No activities
		-End line survey	- End line survey

Note: The issue of how diffusion of information may affect treatment 2 should be considered during implementation

3.3 Target Population

Target population was the population that the researcher wants to generalize the results of the study (Kothari, 2004). The study targeted farm households in Kihingo ward of Njoro Sub-county, Nakuru County where the agricultural programme at Egerton Radio (101.7 FM) radio's frequency is heard. The second category were Egerton university students and Egerton Radio staff involved in the agricultural programme and key informants of the 'Kilimo Bora' programme. This is because Egerton Radio (101.7 FM) mostly covers Njoro sub county and its environs. The accessible population were all smallholder farmers who listen to the agricultural programme at Egerton Radio (101.7 FM).

The accessible population for the second category were students involved in the radio show (35), and key informants who included the Program Coordinator, TAGDev; representative Research and Extension Division; radio hosts. This population participated in the baseline survey.

The target population of the study is as shown in Table 1.

Table 2: Target Population

Category	Total
Farmers	3456
Students	35
Key Informants	5
Total	239

3.4 Sampling Procedure and Sample Size

Sampling is the technique of selecting a subset of the population whose attributes were determined and generalized to the entire population. The process of sampling must be scientific to ensure that the sample selected is a good representation of the entire population (Bhattacharjee, 2012). Egerton University was involved in community engagement through Egerton Radio among them the "Kilimo Bora" program. Kihingo ward of Njoro Sub-County in Nakuru County, was purposively selected due to the reach Egerton Radio's frequency. The farmer respondents were sampled from groups working with the Ministry of agriculture.

Since the recommended minimal sample size in a survey research for social studies is 100 (Conroy 2016; Delice 2010). This study employed simple random sampling to select farmers to participate in the household survey. Since a farmer group consists on average 30 farmers, four groups (two in each ward) were randomly selected from the participating groups stratified along

the value chains to give a sample of 120 farmers. A census was used for the student respondents implementing the “Kilimo Bora” program; 35 students.

The researcher adopted the census for key informants; three staff under the program, and the Ministry of agriculture officers (2). Therefore, the total sample size for this study was 160 as shown in Table 3.

Table 3: Sample Size

Category	Population	Sample
Staff involved in ‘Kilimo Bora’ programme	3	3
Students involved in ‘Kilimo Bora’ programme	35	35
Farmers groups (Kihingo & Mauche wards)	3456	120
Key informants (Ministry of agriculture extension staff)	2	2
Total	3498	160

3.5 Instrumentation

The study used quantitative and qualitative methods of data collection. The study used the following instruments: Questionnaires for students and farmers; key informants interview guide; and focus group discussion guides.

A questionnaire or interview schedule is a series of questions asked to individuals to obtain statistically useful information about a given topic (Roopa & Rani, 2012). The study used two questionnaires to collect data from the students and farmers. A semi-structured questionnaire was used during the baseline survey for face-to-face interviews with the participating farmers to get data on the social-economic background of the respondents, challenges within the value chain, knowledge on university engagement and capacity in participatory monitoring and evaluation.

4. Results and discussion

4.1. Characteristics of the respondents

The questionnaires were purposefully distributed to the ward ensuring coverage of farmer beneficiaries in the targeted value chains. The study managed a total of 144 respondents out of the expected 120 sample size with 53% (77 respondents) females and 47% (67 respondents) males.

On the relationships of individuals within households to the household head, 47% of individuals interviewed were the household head followed by the wife of the household head at 33% and a smaller number of sons (11%) and daughters (9%) of the household head.

Distribution of farmer beneficiaries respondents by age

The age distribution of the farmer beneficiaries respondents ranged from <20years (19.89%) to >70 years (4.86%), with the majority of individuals falling within the 21-50 age range as detailed in **Table 4** indicating good representation across the age groups. This is a relatively youthful population as compared to Kenyan ministry of agriculture reports that places the average age of a farmer at 60.

Table 4: Age distribution

Range	Frequency	Percentage
<20	2	0.69
21-30	29	20.14
31-40	31	21.53
41-50	30	20.83
51-60	24	16.67
61-70	21	14.58
70+	7	4.86

Educational level of farmer beneficiaries respondents

The educational levels varied from none (5.56%) to post-secondary (17.36%) as shown in **Table 5** below. This indicates that proposed training methods would require to be tailored in order to meet the needs of this diverse target group which has 63.33% of its members with formal training and 36.67% with none.

Table 5: Level of Formal Education

Level of formal education	Frequency	Percentage
Primary Level	66	45.83
Secondary Level	45	31.25
Post-secondary	25	17.36
None	8	5.56
Total	144	100

Economically, majority of the population farm size falls within the range of 0.1 to 2.0 acres, with the highest frequency and percentage occurring within the range of 0.6 to 1.0 acres as shown in Table 6. This clearly indicates that the majority of the population are real small-scale farmers. While there is a relatively even distribution within this lower range, the frequency and percentage decrease significantly for those in the higher range of 2.1 to 3.6.

Table 6: Farm size in acres

Farm acres range	Frequency	Percentage
0.1-0.5	25	17.36
0.6-1.0	39	27.08
1.1-1.5	16	11.11
1.6-2.0	35	24.31
2.1-2.5	12	8.33
2.6-3.0	11	7.64
3.1+	0	0.00
3.6-4.0	6	4.17
Total	144	100

In terms of land tenure, Table 7 shows 66.45% of the population owning land with a title deed, 23.68% renting land, and 9.87% owning land without a title deed. This is positive in terms of investment on the land as often people with secure tenure are more motivated to invest in farming practices.

Further analysis shows the distribution of the size of land owned with a title deed in acres in the population with the average acreage at 0.96, and 43.42% of the population owning land in the 0.6-1 acre range, 42.11% owning land in the 1.6-2.0 acre range, 6.58% owning land in the 2.6-3.0 acre range, 5.26% owning land in the 3.6-4.0 acre range, and 2.63% owning land larger than 4.1 acres.

Table 7: Land tenure

Land tenure	Frequency	Percentage
Owned with Title Deed	101	66.45
Rented	36	23.68
Owned without Title Deed	15	9.87

A look at years of farming experience in the study population, shows the majority of farmers having between 1 and 10 years of experience, comprising 34.72% and 17.36% of the population, respectively. There is a relatively even distribution of farmers with more than 10 years of experience, with those having between 11 and 25 years comprising between 7.64% and 9.72% of the population. There are fewer farmers with more than 25 years of experience, making up between 2.08% and 4.16% of the population.

Economically, crop farming is the most common source of income, comprising 50.81% of the population, followed by livestock farming, at 33.47% of the population as shown in Table 8. The remaining income sources make up smaller proportions of the population, with salary from employment being the third most common at 6.45%.

This means that efforts towards agriculture (crops and livestock) development will be directly improving the population livelihoods.

Table 8: Household income sources

Income sources	Frequency	Percentage
Crop Farming	126	50.81
Livestock Farming	83	33.47
Salary from employment	16	6.45
Small-scale business (Hawking kiosk hotel retail shop bar)	10	4.03
Assistance from relatives	6	2.42
Casual employment	6	2.42
Others	1	0.40

Farmer beneficiaries sources of agricultural information

Overall, this data suggests that the population relies on a variety of sources for information, with radio as the most common source of information, comprising 25.95% of the population, followed by television at 22.60% as shown in Table 9. Government agricultural extension officers and agricultural shows are also relatively common sources of information, making up 14.32% and 6.71% of the population, respectively. The remaining sources of information make up smaller proportions of the population, with the least common being community-based organizations, which make up just 0.67% of the population. This agrees with the Karkade, 2013 who found radio very effective in helping to disseminate agricultural information. The great potential of

radio for dissemination of information including agricultural messages has been universally acknowledged.

The most value chain information sought for is local chicken farming, comprising 29.38% of the population. Dairy cow farming and Irish potato farming information also make up 28.75% and 28.12% of the population, respectively as shown in Table 10. Beekeeping information at 11.88% of the population is less sought for. Other value chains information make up a small portion of the population, comprising just 1.88% of the total. Overall, this data suggests that local chicken farming, dairy cow farming, and Irish potato farming are popular value chains whose information is sought among the population.

Table 9: Sources of Agricultural Information

Sources of agricultural information	Frequency	Percentage
Radio	116	25.95
Television	101	22.60
Government Agricultural extension officers	64	14.32
Agricultural Shows	30	6.71
Field day/exhibition	30	6.71
Research Institutions and universities	28	6.26
Common Interest/Self-help groups	25	5.59
Social media (Facebook and Twitter)	19	4.25
News Paper	19	4.25
Private companies and agro-dealers	8	1.79
Non-Governmental Organizations (NGOs)	4	0.89
Community-based organizations (CBOs)	3	0.67
Total	144	100

Table 10 shows the distribution of sources of information among the population.

Table 10: Information from Sources

Information sources	Frequency	Percentage
Local chicken	94	29.38
Dairy Cow	92	28.75
Irish Potatoes	90	28.12
Beekeeping	38	11.88

Other	6	1.88
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4.2 A detailed curriculum on the areas of capacity building for farmers

Table 11: Training and Knowledge areas

Training and knowledge areas	Frequency	Percentage
Dairy Cow	72	30.13
Local chicken	56	23.43
Beekeeping	49	20.50
Irish Potatoes	38	15.90
Other	24	10.04
Total	144	100

Table 11 shows the distribution of training needs among the population. Dairy cow farming is the most common training need, comprising 30.13% of the population. Local chicken farming is the second most common training need, making up 23.43% of the population. Beekeeping and Irish potato farming are also relatively common training needs, representing 20.50% and 15.90% of the population, respectively. The remaining training needs make up a smaller proportion of the population, comprising 10.04% of the population.

The others were pig farming, dairy goat rearing, and green house

Table 12: Training in Local Chicken

Training in local chicken	Frequency	Percentage
Increased poultry production by use of Incu-brooder	11	36.67
Quality feed formulation for improved poultry production	11	36.67
Improve poultry production and productivity through feed formulation	3	10.00
Upgrading local chicken through the use of KALRO-improved breeds and proper nutrition	2	6.67
Increased production and improvement of local chicken by use of improved eggs	1	3.33
Upgrading local chicken for high yield through proper feeding housing incubators and brooder	1	3.33
To improve local chicken production through proper feeding	1	3.33

brooding and housing		
Total	144	100

Table 12 shows the training needs of the population in chicken farming. The most common need identified is increasing poultry production through the use of incu-brooders, with 36.67% of the population indicating this as a training need. Quality feed formulation for improved poultry production is also a common need, identified by 36.67% of the population. The remaining training needs are identified by smaller proportions of the population, with the highest being 10.00% for improving poultry production and productivity through feed formulation.

Table 13: Training in Dairy Cow

Training in dairy cow	Frequency	Percentage
Increasing milk production through feeding and nutrition	18	24.00
Animal feed formulation to increase milk production	17	22.67
To improve dairy production through feed and fodder conservation	11	14.67
Increased milk production through fodder conservation and on-farm feed formulation	10	13.33
Feed Formulation For Increased Dairy Productivity	10	13.33
Increase milk production through improved feeding and nutrition	8	10.67
Other	1	1.33
Total	144	100

Table 13 shows the training needs of the population about dairy cow farming. The most common training need is increasing milk production through feeding and nutrition, which is identified by 24% of the population. Other common training needs include animal feed formulation to increase milk production and improve dairy production through feed and fodder conservation, each identified by 22.67% and 14.67% of the population, respectively.

Table 14: Training in Beekeeping

Training in Beekeeping	Frequency	Percentage
Production of quality honey using modern bee hive for increased incomes	4	22.22
Increase quality honey production by use of modern bee hives and processing equipment	3	16.67
Increase quality honey production by use of modern hives and	3	16.67

equipment		
Increase honey production through the introduction of modern hives and value addition	3	16.67
Use of modern bee hives for increased honey production	2	11.11
Increased quality honey production by use of modern beehives and harvesting equipment	2	11.11
Increased quality honey production by use of modern bee hives and processing equipment	1	5.56
Total	18	100

This table 14 shows the training needs among the population for beekeeping farming. The most common training need is related to the production of quality honey using modern bee hives, with four individuals (22.22% of the population) expressing this need. The remaining training needs are also related to increasing quality honey production through the use of modern bee hives and equipment, each comprising between 16.67% and 11.11% of the population.

Table 15: Training in Irish Potatoes

Training in Irish potatoes	Frequency	Percentage
Multiplication of clean potatoes seeds through positive selection	13	52.0
Increased potato production through the production of certified seed potatoes and storage	12	48.0
Total	25	100

Table 15 shows the distribution of training needs among the population in Irish potato farming. The majority of the population (52%) has a training need in the area of multiplying clean potato seeds through positive selection. The remaining 48% of the population has a training need in the area of increasing potato production through the production of certified seed potatoes and storage. These training needs suggest that the population is interested in improving their potato farming practices to increase production and improve the quality of their potato crops.

4.3 Challenges to Agriculture Technology adoption

The study sought to understand the distribution of challenges faced by the population in relation to adoption of agriculture technologies. The most common challenge is a lack of capital or money, which affects 53.75% of the population. The second most common challenge is the

availability of promoted products locally, which affects 29.64% of the population. The remaining challenges, grouped under the category "Other," affect 16.60% of the population.

5. Conclusions and recommendations

This study identified performance requirements and the knowledge, skills, and abilities gaps along four selected value chains in Nakuru County that the agricultural programme at Egerton Radio (101.7 FM) can address for farmers to improve adoption of technologies. The study comprised of more female participants who are middle-aged with enough experience and attained formal education to only primary level but which can negatively impact adoption as the community is male-headed and thus the wives may not be the major decision makers. The population falls within the lower range of the scale being measured in terms of land size ownership. Most of the individuals had enough experience in different farming activities.

The most common source of income is crop farming hence elevating agriculture as the major source of income for the study population. The common source of information is radio which demonstrates the role of radio in the study community. With the university ranking at 6% as an information source, the radio could play an integral part in university-community engagement to transform the farming communities. Regarding training and knowledge areas, dairy cow stands out to be most common training need/gaps for the radio programme. The programming should therefore be well aligned to the farmer's needs.

In this regard, the study recommends that, the government and non-governmental organizations should empower farmers practicing various farming activities through offering more of radio programmes, trade fairs, and capacity building to impart more knowledge and skills to the farmers to transform agriculture.

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References

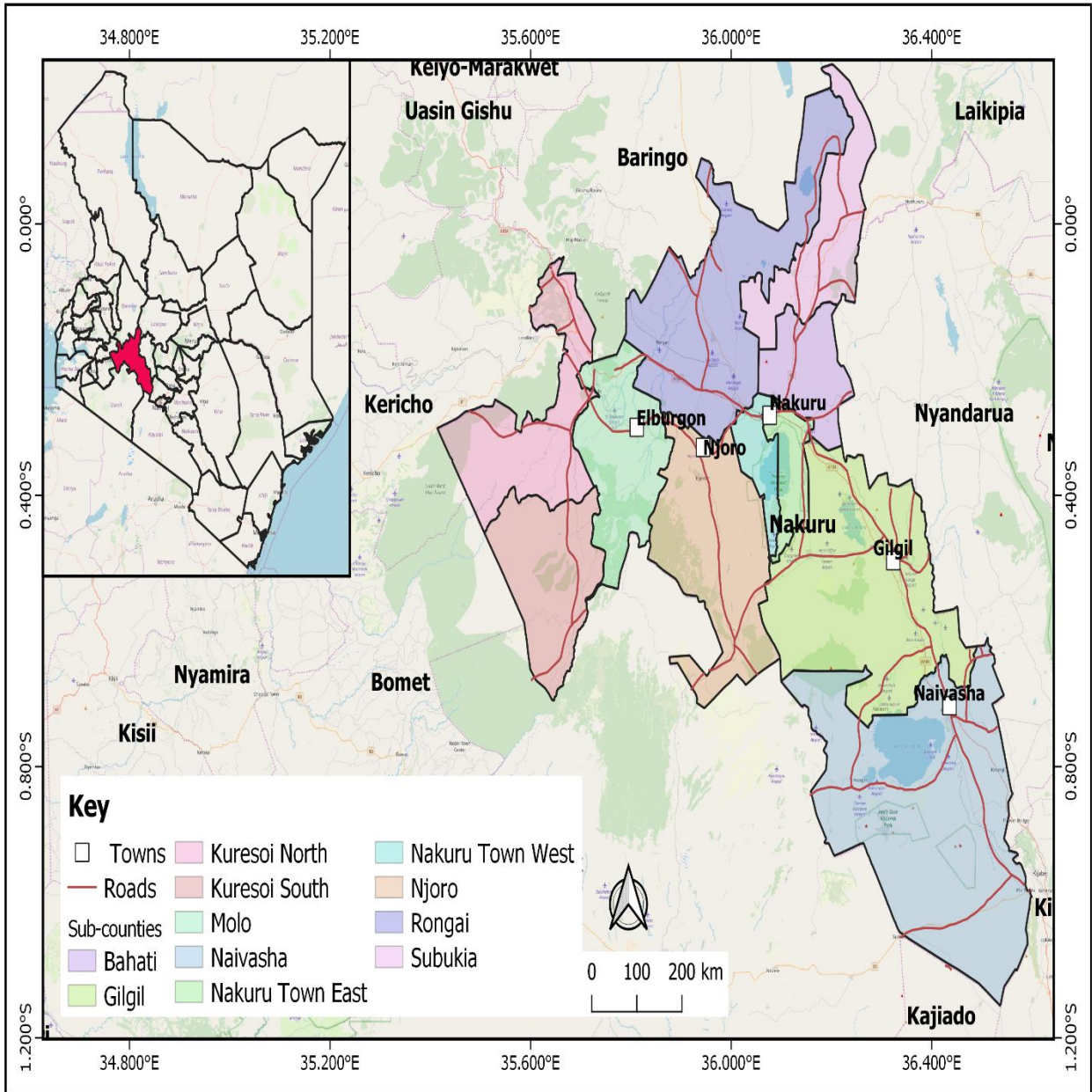
AGRA. (2018). Africa Agriculture Status Report: Catalyzing Government Capacity to Drive Agricultural Transformation (Issue 6). Nairobi, Kenya: Alliance for a Green Revolution in Africa (AGRA)

- Bandewar, S. V., Wambugu, F., Richardson, E., & Lavery, J. V. (2017). The role of community engagement in the adoption of new agricultural biotechnologies by farmers: the case of the Africa harvest tissue-culture banana in Kenya. *BMC biotechnology*, 17(1), 1-11. <https://doi.org/10.1186/s12896-017-0347-4>
- Bender, G. (2008). Exploring conceptual models for community engagement at higher education institutions in South Africa. *Perspectives in Education*, 26(1). <https://www.ajol.info/index.php/pie/article/view/76445>
- Bhattacharjee, A. (2012). Social Science Research: Principles, Methods, and Practices. Textbooks Collection. 3. http://scholarcommons.usf.edu/oa_textbooks/3
- Cano, J. (2005). Creating experiential learning. *Agricultural Education Magazine*, 78(3), 2.
- Cook, J. R., & Nation, M. (2016). Community engagement: Universities' roles in building communities and strengthening democracy. *Community Development*, 47(5), 718-731. DOI: [10.1080/15575330.2016.1226912](https://doi.org/10.1080/15575330.2016.1226912)
- CUE (Commission for University Education) (2014). Harmonized Criteria for Universities and Guidelines for Appointment and Promotion of Academic Staff in Universities in Kenya.
- Delice, A. (2010). The Sampling Issues in Quantitative Research. *Educational Sciences: Theory and Practice*, 10(4), 2001-2018. <https://files.eric.ed.gov/fulltext/EJ919871.pdf>
- Ekwamu, A., (2017, April-June). Training for Impact. *Africa Higher Education Insights*, 1 pages of article if paginated. <http://respository.ruforum.org>
- Fry, H., Ketteridge, S., & Marshall, S. (Eds.). (2008). *A handbook for teaching and learning in higher education: Enhancing academic practice*. Routledge. https://books.google.de/books?hl=en&lr=&id=5Rp9AgAAQBAJ&oi=fnd&pg=PP1&dq=Fry+H,+Ketteridge+S,+Marshall+S.+2008.+A+Handbook+for+Teaching+and+Learning+in+Higher+Education:+Enhancing+Academic+Practice.+Routledge+&ots=_elzges1Vo&sig=BJrKR4vTgnC6uOnjprocn04Fi4o&redir_esc=y#v=onepage&q=Fry%20H%2C%20Ketteridge%20S%2C%20Marshall%20S.%202008.%20A%20Handbook%20for%20Teaching%20and%20Learning%20in%20Higher%20Education%3A%20Enhancing%20Academic%20Practice.%20Routledge&f=false
- Hien, D. T. D., & Oanh, D. T. K. (2018). Experiential Learning Activities of Technical Students at Higher Education Institutions in Vietnam. *Universal Journal of Educational Research*, 6(10), 2310-2319. doi: 10.13189/ujer.2018.061030
- Howard, P., Cooke, S., & Butcher, J. (2007). Transformational learning: an aboriginal educator's aspirations, supports and celebrations. In J. Butcher, & L. McDonald (Eds.), *Making a Difference: Challenges for Teachers, Teaching and Teacher Education* (pp. 191-203).

- Rotterdam, The Netherlands: Sense Publishers. <https://www.sensepublishers.com/media/627-making>
- Kolb, D. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, N.J: Prentice-Hall. [https://books.google.co.ke/books?hl=en&lr=&id=jpbeBQAAQBAJ&oi=fnd&pg=PR7&dq=Kolb,+D.+\(1984\).+Experiential+learning:+Experience+as+the+source+of+learning+and+development.+Englewood+Cliffs,+N.J:+Prentice-Hall&ots=Vo8RmU-XNh&sig=yMGpzh6no6r-TYh4eS6HkH-eCIs&redir_esc=y#v=onepage&q=Kolb%2C%20D.%20\(1984\).%20Experiential%20learning%3A%20Experience%20as%20the%20source%20of%20learning%20and%20development.%20Englewood%20Cliffs%2C%20N.J%3A%20Prentice-Hall&f=false](https://books.google.co.ke/books?hl=en&lr=&id=jpbeBQAAQBAJ&oi=fnd&pg=PR7&dq=Kolb,+D.+(1984).+Experiential+learning:+Experience+as+the+source+of+learning+and+development.+Englewood+Cliffs,+N.J:+Prentice-Hall&ots=Vo8RmU-XNh&sig=yMGpzh6no6r-TYh4eS6HkH-eCIs&redir_esc=y#v=onepage&q=Kolb%2C%20D.%20(1984).%20Experiential%20learning%3A%20Experience%20as%20the%20source%20of%20learning%20and%20development.%20Englewood%20Cliffs%2C%20N.J%3A%20Prentice-Hall&f=false)
- Kothari, C.R. (2004) *Research Methodology: Methods and Techniques*. 2nd Edition, New Age International Publishers, New Delhi. [https://books.google.co.ke/books?hl=en&lr=&id=hZ9wSHysQDYC&oi=fnd&pg=PA2&dq=Kothari,+C.R.+\(2004\)+Research+Methodology:+Methods+and+Techniques.+2nd+Edition,+New+Age+International+Publishers,+New+Delhi.+&ots=1tZboFe5H0&sig=tFF-7jhkpJQSwl33HX1Tvw7nPU&redir_esc=y#v=onepage&q&f=false](https://books.google.co.ke/books?hl=en&lr=&id=hZ9wSHysQDYC&oi=fnd&pg=PA2&dq=Kothari,+C.R.+(2004)+Research+Methodology:+Methods+and+Techniques.+2nd+Edition,+New+Age+International+Publishers,+New+Delhi.+&ots=1tZboFe5H0&sig=tFF-7jhkpJQSwl33HX1Tvw7nPU&redir_esc=y#v=onepage&q&f=false)
- Laing S. (2016). Community engagement is what universities should be for. [Web log message]. <https://www.timeshighereducation.com/blog/community-engagement-what-universities-should-be>
- MacQueen, K. M., McLellan, E., Metzger, D. S., Kegeles, S., Strauss, R. P., Scotti, R., ... Trotter, R. T., 2nd (2001). What is community? An evidence-based definition for participatory public health. *American journal of public health*, 91(12), 1929–1938. DOI:10.2105/ajph.91.12.1929
- Mirza, R., Vodden K., & Collins G. (2012). *Developing Innovative Approaches for Community Engagement*. <https://www.vidya.ca/Developing-Innovative-Approaches-for-community-engagement.pdf>
- Moon, J (2004). *A Handbook of Reflective and Experiential Learning*. Routledge Falmer, London. https://www.perpustakaandeaajulia.weebly.com/.../a_handbook_of_reflective_and_experiential_learning_-_theory_and_practice.pdf
- Mulu-Mutuku, M., Tarus, R. J., Otieno, E. O., & Mungai, N. W. (2017). Farmers' perceptions regarding Egerton university community engagement activities. *African Journal of Rural Development (AFJRD)*, 2(1978-2018-4427), 523-534. <http://dx.doi.org/10.22004/aj.econ.280033>

- Nampala, P., Apio, J., Mkandawire, S., Osiru, M. & Adipala, E. (2016)/ Building effective convening power for higher education in Africa. RUFORUM Working Document Series (ISSN 1607-9345) No. 14 (1): 313-325. <http://repository.ruforum.org>
- Nampala, P., Kityo, R., & Adipala, E. (2016). Editorial: Differentiated Community Engagement Approaches but same mission: University Outreach programs in Africa. *African Journal Of Rural Development*, 1(3), i-v. Retrieved from <http://afjrd.org/jos/index.php/afjrd/article/view/216>
- Noble, M. (2002). 'Accrediting experience', paper given at NUCCAT Annual Conference, November, 2002, in, Moon, J (2004). *A Handbook of Reflective and Experiential Learning*. Routledge Falmer, London. <https://www.perpustakaanandeaajulia.weebly.com/.../a-handbook-of-reflective-and-experiential-learning-theory-and-practice.pdf>
- Roopa, S., & Rani, M. S. (2012). Questionnaire designing for a survey. *Journal of Indian Orthodontic Society*, 46(4_suppl1), 273-277. <https://journals.sagepub.com/doi/pdf/10.5005/jp-journals-10021-1104>
- RUFORUM (2017). University-Community Engagement Framework and Strategy Study Report, Kampala-Uganda
- Schwartz, M. (2012). Best practices in experiential learning. Learning and teaching office. Ryerson University. <https://www.ryerson.ca/content/dam/lt/resources/handouts/ExperientialLearningReport.pdf>
- Swanson, L. A. (2009). Value perceptions as influences upon engagement. *Innovative Higher Education*, 34(4), 269-281. <https://doi.org/10.1007/s10755-009-9113-4>
- Weerts, D. J., & Sandman, L. R. (2010). Community engagement and boundary – Spanning roles at research universities. *The Journal of Higher Education*, 81 (6). 632-657. doi:10.1080/00221546.2010.11779075

Appendix A: Map of Nakuru County, Kenya



Source: Owners impression using QGIS 3.4