Challenges to food security among households of community-based organizations implementing agroforestry in Rongai Sub-County and mitigation factors

Esther Cheburet ^(a) Wanjugu Wachira ^(b) Janerose Mayabi ^(c)

^(a,b,c) Department of Development Studies, St. Paul's University, Kenya

ARTICLE INFO

Article history:

Received 12 August 2021

Received in rev. form 20 Sep. 2021

Accepted 18 October 2021

Keywords:

Food, security, agroforestry, challenges, mitigation, Rongai, Nakuru, CBOs.

JEL Classification:

F40

ABSTRACT

The study sought to determine challenges to food security among households of CBOs implementing agroforestry in Rongai Sub County in Nakuru and mitigation factors. The study was anchored on the systems theory and employed a mixed research methods design with simple random sampling used to get the CBOs from which the respondents were drawn. The target population was 630 members of all forty-seven (47) CBOs implementing agroforestry in the study area. The sample size was 245 respondents selected using the proportionate random sampling method. Questionnaires comprising of both open-ended and closed-ended questions were used to collect the data. From the study, the food produced by the households is insufficient and has to be supplemented by those outside the households. The food produced is of quality controlled by factors including farm management practices and capital availability for production. There is food inaccessibility as those produced are a source of income for the households yet insufficient. However, there is an improvement compared to previous years. The households' food production is unstable as shown by variations in production and insufficiency of the food. Food security is challenged by the failure of all members of CBOs to take part in decision-making processes, reporting, roles, and responsibilities not being assigned appropriately. Mitigation factors are hardly employed by the CBOs to curb the challenges faced in implementing agroforestry. The study recommends building the capacity of CBOs implementing agroforestry in areas of resource mobilization, empowering them to harmonize governance processes, developing and implementing an M&E framework. It also recommends the development and implementation of sound policies that promote agroforestry expansion.

© 2021 by the authors. Licensee SSBFNET, Istanbul, Turkey. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

Introduction

According to FAO (2015b), food security is achieved when all people at all times have physical and economic access to safe, sufficient and nutritious food to meet preferences and dietary needs for healthy and active life at an individual, household, national, regional and global levels. Globally, food insecurity has continued to be a challenge with difference in the developing and developed countries being the magnitude in terms of its severity and the number of the population affected. 820 billion people globally are estimated to be affected according to (FAO 2019), majority of who are dependent on agriculture and living in developing countries, an indication that attaining United Nation's sustainable goal number 2 of zero hunger is still an issue that calls for attention in the developing countries.

Asia houses 60% of the world's hungry and poor population (ADB, 2013), majority of whom are the small-scale farmers in the rural areas. This is as a result of climate change impacting agriculture-related livelihoods and rural income (Piao et. al, 2010). (FAO, 2018b) reported that in Central Africa Republic, food insecurity has risen with about 1.6 million people being in urgent need of food.

* Corresponding author.

© 2021 by the authors. Hosting by SSBFNET. Peer review under responsibility of Center for Strategic Studies in Business and Finance.

<https://doi.org/10.20525/ijrbs.v10i7.1370>

The increased food insecurity can be attributed to the conflicts that has disrupted food production and as a result causing inflation in the price of food.

In Uganda, food insecurity can be linked to insufficient rainfall, crop and livestock pests and diseases that have lowered production contributing to heightened food prices according to (FAO, 2018b). Small scale farmers are unable to access markets for their produce because of challenges in the markets systems hence ending up selling the produce to the middlemen at much lower prices resulting to reduced income hence insufficient income for the households to obtain daily basic food for their members. The 33% of the population in Kenya suffer from chronic food insecurity (FAO, 2011). The main cause of food insecurity being poverty that results to inadequate food supply and lack of information regarding food cost variability (Sassi & Zucchini, 2018). In Western parts, the cause of food insecurity is multidimensional which include poor markets, lack of farm inputs poor agricultural structures and agricultural practices (Grimm, 2012). Nakuru County, where Rongai sub-county is part of reports more than a quarter of its population being insecure despite the county being know to supply the rest of the country with food (Sassi & Zucchini, 2018). Income has been denoted as key determinant of food accessibility and therefore low income people are exposed to food insecurity compared to their counterparts with high income. Almost half of agricultural land in the world is under tree cover of at least 10% (Buttoud et al. 2013). This suggests that agroforestry, a practice where trees are incorporated with crops and/or livestock in a managed farm system is significant to the livelihoods of many people. It offers opportunity to address the world's most complex problems related to development as it can be important in tackling food insecurity (Wekesa et al, 2018). If well done, it can mitigate climate change effects, enabling small holder farmers to adapt to extreme and variable weather. It also has the potential to increase the services rendered to the ecosystem by trees while improving farms' productivity making farmers less reliant on inorganic inputs.

Caron et al (2017) defined agroforestry as practices or systems where trees are purposively cultivated on the same land unit as crops and/or livestock. All the systems have a common feature of trees being linked to food production activities. Wekesa & Jönsson (2014) noted that agroforestry systems range from silvopastoral systems where livestock and trees are integrated; agro-silviculture that integrates annual or perennial crops with trees; agrosilvopastoral systems combining livestock, trees and crops; aqua silviculture where fish are combined with trees and entomo-silvicultural systems, which combines insects with trees. It is estimated that the number of people who depend on agroforestry systems in the world to be about 1.2 billion (World Bank, 2014). Communities have been instrumental in the implementation of agroforestry practices through their participation in the development and adoption of the technology (Nath, Jashimuddin & Inoue, 2016). This is through their involvement in planning and designing of agroforestry projects, resource mobilization and the engagement of both genders in the implementation processes. Community Based Organizations (CBOs) through democracy, accountability and defined roles and responsibilities have been able to successfully implement agroforestry projects as these aids decision making processes critical to the success of projects. However, the threats including resource constraints, policy and extension challenges have proven to be obstacles to successfully implement the practice. Strategies including building the capacity of all the stakeholders, collaboration and carrying out monitoring and evaluation for the projects implemented are key mitigation factors to the threats faced by the CBOs.

Dhyani, Nayak & Rizvi (2019) pointed out that the agroforestry concept got formally acknowledged as an acceptable practice by the global community in the late 1970s due to development of research in this area. The International Centre of Research on Agroforestry (ICRAF), with its headquarters in Nairobi Kenya, was created indicating the international development community's recognition of agroforestry as an important land use practice deserving intensified research. Nonetheless, trees have been an integral part in the farming systems to support agriculture for thousands of years. The history of agroforestry can be traced back to Europe, where until middle ages, it was a habit to integrate trees with agricultural crops (Nath et al., 2016).

Despite three decades of research and extensive services on agroforestry in some parts of Kenya, the adoption is still low (Yila, 2016). This poses the question of what is being done wrong that challenges the expansion of the practice across the country. FAO (2012) observed that there are factors that either acted as motivation or as barriers for the uptake of agroforestry. These factors include inadequate farm inputs, inadequate funds, labour, inadequate knowledge and availability of seeds. Muriuki (2015) also observed that attempts to promote agroforestry by the field projects are challenged by among other things, the unfavourable local arrangements including technical, social and economic factors (Muriuki 2015).

In Rongai Sub-County, the county government through the agricultural extension officers are encouraging farmers to practice agroforestry for natural resource conservation and efficient utilization to improve food productivity (County government of Nakuru, 2018). However, there are no clear guidelines on its implementation hence giving no department an official mandate to implement the practice. Few studies in the field of agroforestry have been carried out in the Sub County and therefore there is limited information on agroforestry practice in the area. The study therefore looks into challenges to food security among households of CBOs implementing agroforestry in the sub county and mitigation factors with the view to strengthen the CBOs capacity to implement agroforestry projects and enhance food security in the area.

Literature Review

Theoretical Background

The study is anchored on the systems theory developed by Ludwig Von Bertalanffy in 1962. The theory proposes that social systems such as families, schools, businesses, communities, CBOs implementing agroforestry are made up of different parts that work together

to produce outcomes that are greater than the sum of the output of individual parts (Strauss, 2015). For instance, a CBO may have a structure with different parts such as its leadership, rules and procedures, culture and norms, strategies, values, and staff. Optimal functioning of such a social system is thus dependent on ensuring that all parts are working optimally and that there is synergy between the parts leading to effective integration and coordination of activities (McGrath & Whitty, 2015). Failure in the functioning of any of these parts lead to challenges that affects the overall performance of the CBO as a system

Systems theory further opines those social systems have open boundaries and, thus, their operations are also shaped with actors within their environment (Cornell & Jude, 2015). For instance, CBO's operations may be shaped by government agencies/ regulators, financiers or benefactors, research institutions, the media, and local communities among other players that exist in the environment in which they operate. Optimal functioning of a social system is dependent on its ability to maintain dynamic exchanges with the actors in the environment in process of learning and adapting. Effective functioning of a system is also depended on the efficiency of the actors and systems within its environment (McGrath & Whitty, 2015). Failure of one system leads to failure of another interacting together hence emergence of challenges faced.

The theory was useful to the current study as it directed the researchers on areas that the study should focus when evaluating challenges and mitigating factors. From the theory, the study focus on the functioning of different components of the CBOs implementing agroforestry practices as well as environmental factors that have the potential of affecting the CBOs. The study also examined factors that determine the CBO's capacity to adapt to challenges in their environments.

Empirical Review

Challenges in Implementation of Agroforestry

Challenges are issues that arise in development initiatives, programs, or organizations that can be solved or their effects lessened with the correct tactics. Unfavourable policies are one of the issues that impede the development of agroforestry practices that would improve food security. Policy, as defined by Buttoud et al. (2013), is a set of principles produced and adopted by a project, program, or organization to govern the management, decision-making, and implementation of an intervention. According to (FAO, 2013), many jurisdictions lack a separate framework for agroforestry implementation, and sectors with added responsibilities for agroforestry implementation work in an uncoordinated manner with other agroforestry players, leaving the practice unattended.

According to Mbow et al. (2014), successful agroforestry implementation necessitates improvements in policy activities such as the development of relevant institutions, local capacities, and gender and governance issues. Unfavourable policies make it difficult for grassroots organizations to connect and network with relevant stakeholders for research, input supply, credit, and market access (Degrande, et al. 2012). Farmers are only entitled to claim ownership of their crops, not their trees, according to Buttoud et al (2013), because they have informal rights to the land they are farming. Women are the ones who suffer as a result of this, as their rights to the land they manage are in general far lower than men's. Agroforestry implementation is hampered by such measures. Guiney (2016) discovered that, despite the lack of agroforestry regulation, none provides precise, useful guidelines on how to apply or develop it. Policies that overregulate agroforestry methods, according to Basamba et al. (2016), may lead to rejection of the practice, resulting in unsuccessful scaling up procedures. Policies encouraging smallholder farmers to join groups and focusing on mobilization for agroforestry adoption should be promoted. Because agroforestry interventions have only been demonstrated to be successful when farmers benefit, policymakers should promote techniques that fulfil the needs of farmers (Buttoud, 2013).

Another issue is the limited availability of extension services. Extension services are systems and activities that provide development actors operating in a specific area with the information, expertise, and technologies they need to improve their capacity (Christoplos, 2010). Agroforestry requires specialist extension services as well as internal and external support (Buttoud, 2013). Despite the government employing a large number of extension agents in developing countries, Feder, et al (2010) found that farm-related extension services have performed poorly. Technical skills and expertise, according to Zerihun, Muchie & Worktu (2014), are barriers to successful Agroforestry implementation by communities. According to Basamba et al. (2016), for extension services to be effective in conjunction with the dissemination process, they must work in tandem with agroforestry promotion initiatives. Demonstrations are given to the locals so that they can readily grasp the topics.

Another impediment to the development of agroforestry initiatives is a lack of resources. The term "resource constraint" refers to the lack of necessary inputs to achieve development goals. Agroforestry necessitates an initial investment, but the return on that investment takes longer (Sharma et al., 2016). Due to higher installation costs and investment returns that are often years later than annual crops, agroforestry systems have been overlooked in comparison to conventional agriculture (Sagastuy & Krause, 2019). Labour and material inputs are included in the establishment costs. Most agroforestry practitioners, particularly women, lack assets that might be transferred for capital to obtain supplies and labour, according to Flexen et al. (2014).

Poor farmers' interactions with other agroforestry players have been found to be hampered by a lack of time (Johansson, 2015). Insufficient time inhibits both formal and informal learning processes, as well as the efficacy of governance systems for local institutions. A study of the AFSP in Malawi found that transferring tree seeds and seedlings from tree nurseries to farmers was difficult due to a lack of cars (Beedy, et al., 2013). The spread of agroforestry was hampered by a lack of personnel to take on the

task and assure timely delivery of inputs. Late supplies of inputs to farmers caused delays in field reports, according to framers. Wafuke (2012) discovered that the cost of seedlings, farm labour, and extension services are all barriers to agroforestry adoption.

Mitigation Factors

Mitigation factors are ways for reversing or lessening the negative effects of problems encountered in development efforts. Building the capacity of CBOs is one of the mitigation strategies. Strengthening capacity building at the grassroots and institutional levels, according to Birhane (2014), is critical for successful and sustainable agroforestry. Extension staff should be trained, coached, and upgraded on a regular basis to assist local groups in successfully adopting agroforestry methods (Degrande, et al 2012). Capacity building is essential because it allows for the start of long-term, comprehensive development in environmentally sensitive areas.

Capacity building should be done frequently and extended to the members of CBOs so that they can be up to date with all the processes of agroforestry implementation. It should also be line with the needs and interest of the community involved as they are the centre of the projects, helping in building the knowledge base easing flow of information needed for successful implementation of agroforestry.

Creating and nurturing partnerships with key players is another significant mitigating strategy. Partnerships in planning, designing, and implementing agroforestry projects, according to Beedy et al. (2013), facilitate the scaling up of agroforestry programs. Coordination and collaboration among agroforestry stakeholders, including government, policymakers, researchers, extension providers, and practitioners, is essential because it ensures, among other things, resource mobilization, which can derail agroforestry implementation efforts if done ineffectively (Mwase et al., 2015). Collaboration makes certain that resources for agroforestry investments are pooled, lowering costs. It also facilitates the exchange of information among farmers by creating an environment in which farmers are encouraged to try out new ideas because operating as a group provides them with some stability (Malmer et al 2018).

The partnerships should be people oriented to enable pin point the areas where both the internal and external partner can partner in. It should also focus on agroforestry value chain as each sector is significant especially the marketing of agroforestry products where it is usually ignored. Farmers have been facing challenges in marketing their products which they term it as insufficient markets even though the demand for these products are high. This indicate insufficient knowledge and information on market hence the partners can help bringing about solutions or this challenge.

Monitoring and assessment are another potential mitigating strategy. Mbow et al (2014) found that improving policies and enhancing or introducing monitoring and evaluation aids in agroforestry development and implementation. The organizations' formal mandate to execute agroforestry is also critical to its success (Guiney, 2016). Most organizations are motivated to support agroforestry as a result of feeling acknowledged for their work. The public's awareness of agroforestry can be raised by sharing new information and experiences (Grin, Rotman & Schot 2010). Continuous evaluation generates fresh knowledge and experiences that help to raise agroforestry awareness. Brondizion, Ostrom, & Young (2012) emphasized the necessity of building trustworthy monitoring systems that provide continuous and timely feedback on changes and allow for unfettered information flow among project actors. It should also enable farmers to anticipate changes and respond rapidly to their feedback.

Building the capacity of the members of CBOs to be able to implement M&E framework is also necessary for its effectiveness. Furthermore, the involvement of the community in all the processes of the framework gives room to adoption and development of the relevant tool that is easy to use by the community hence facilitating decision making processes necessary for successful implementation of agroforestry for food security.

Research and Methodology

The study employed the mixed methods research design where both qualitative and quantitative research methods were involved. The study was conducted in Rongai Sub County. It is one of the eleven sub counties in Nakuru County which is located in the central part of Kenya. It is cosmopolitan with both urban and rural areas with rural areas taking the larger part of the sub county. The sub county like other sub counties in Kenya has CBOs which would be instrumental in scaling up agroforestry practices to help in curbing food insecurity hence chosen as the study site.

Target Population and Sampling

The study targeted a total of 47 CBOs implementing agroforestry projects in the study area. The appropriate sample size for the study was determined as 245 respondents using the Taro Yamane formula (Osahon & Kingsley, 2016). The 245 respondents were obtained from the 42 groups using Taro Yamane formula: $n = \frac{N}{1+N(e)^2}$

Where:

n was the required sample

N was the population size

e was the margin of error, which is 0.05

The 42 CBOs and the 245 respondents were selected using simple random sampling strategy. The officials, who are the chairperson, secretary and the treasurer of the CBOs were exempted from the selection because it was presumed that their positions in the groups could bias their views.

Data Collection and Analysis Procedures

Questionnaires comprising of both open-ended and close-ended questions were used to collect data. To ascertain the reliability of the questionnaires, a pilot study was conducted using the test-retest method. Piloting was conducted in two CBOs in the neighbouring Mogotio Sub-County. Validity was enforced by having an expert review it before collection of data commenced to ascertain whether the questionnaire was able to collect the required data.

After collection, the completeness of the questionnaires was checked in the field then later cleaned, sorted, entered into the SPSS software for analysis. Quantitative data was analysed using descriptive statistics while thematic analysis was used for qualitative data, where data was looked into, categorized into ideas, coded and entered into computer for analysis. Analysis of the data involved creating charts and tables of tabulations for the purpose of summarizing the data analysed.

Results

A sample of 245 respondents was targeted by the study from which 207 respondents filled and returned the questionnaires. This gave a response rate of 84.5% which is above average and representative according to (Glaser, 2011) who describes it as high enough to minimize biasness in the study related to non-response from some respondents. Male constituted 77.29% of the sample while 22.71 were female. These findings illustrate that male engages more on agroforestry practices compared to their female counterparts. Respondents of age between 35-60 years made 51.7% while those above 60 years made 32.9 % and those below 35% were 15.9%. This implies that respondents were not distributed evenly in terms of age rather majority of those engaging in agroforestry practices are made up of those between 35-60 years old. About 43% of the respondents had secondary school education, 28.99% had primary school education, 17.87% had college level of education, 6.28% recorded university level of education and 4.35% of the respondents recorded no level of education. This implies that majority of the respondents have basic secondary education. About 50% of the respondents have been members of CBO for between 3-6 years, 32.4% have been members for 7-10 years, those who recorded that they have members for less than 3 years are 16.9 % while those who have been members for more than 10 years form 1% of the respondents' implying that most respondents' years in CBOs lies between 3 to 6 years.

Food Security among Households Implementing Agroforestry

The dependent variable of the study was food security among community-based organizations implementing agroforestry in Rongai Sub County. The indicators used to assess the variable were: food sufficiency, food quality, and food accessibility. Respondent were presented with several statement and asked to respond with either No or Yes. Table 1 presents the findings:

Table 1: Respondents Views on various Aspects of Food Security

Statement	No (%)	Yes (%)
Food cultivated lasted through the planned period	75.36	24.6
Access to a balanced diet in your household has improved in the last one year	11.59	88.41
The food that we require in the household is easily accessible	73.91	26.09
There have been major changes in the prices of food that we buy in the market in the last one year	19.8	80.2

The findings show that 75.4% of the respondents indicated that the food cultivated does not last through the planned period while 24.6% indicated that the food bought last through the planned period. This implies that the food produced is not enough to supplement the food bought in order to last for the planned period by the household. The finding questions the effectiveness of the agroforestry projects implemented by the CBOs in Rongai Sub-County in improving food sufficiency in the area. Regarding food quality, results in Table 1 shows that 88.4% of respondents indicated access to a balanced diet in their household has improved in the last one year while 11.6% indicated that this has not improved. This implies the households have been able to improve their access to quality meals. These findings suggest that the agroforestry projects undertaken by CBOs in the study area have been effective in enhancing members' access to quality meals. This could either be through enabling members to cultivate variety of crops through or enabling them to purchase balanced food crops in the market using the income earned from agroforestry.

Regarding food accessibility, results in Table 1 shows that 73.9% of the respondents indicated that the food that they require is not easily accessed while 26.1% gave the contrary opinion. This implies that accessibility to food is a challenge to most of the CBO members. The findings contest the effectiveness of the agroforestry projects implemented by the CBOs improving members' access to food.

Challenges faced by CBOs implementing Agroforestry

The first objective of the study was to establish the influence of challenges faced on food security among CBOs implementing agroforestry in Rongai Sub County. Three parameters were used to assess the objective which included resource constraints, policy and extension service.

Resource Constraints

Resource constraints were assessed by presenting respondents with a set of items to which they were asked to respond with a No or Yes answer. Results are summarized in Table 2:

Table 2: Respondents views on Challenges faced by CBOs in Agroforestry Implementation

Questions	No	Yes
Does your CBO find it easy to access seeds and seedlings	61.4	38.6
Does your CBO find it easy to access credit for implementing agroforestry projects	76.3	23.7
Does your CBO have access to land for agroforestry projects	12.1	87.9
Do the members of your CBO have adequate knowledge on agroforestry projects implementation	64.3	35.7
Does your CBO have access to the labour required to work in the agroforestry projects	13.0	87.0
Do members of the CBO have the time required to work in agroforestry projects	50.2	49.8

Results in Table 2 illustrate that 38.6% of respondents pointed out that seeds and seedlings cannot be accessed easily while 38.6% pointed out that they can be accessed easily. This agrees with studies by (Wafuke, 2012) that seeds and seedlings act as hindrance to agroforestry scale up by farmers. The inability to easily access seeds and seedlings is due to insufficient knowledge and time for farmers to raise these resources. This is because nursery management is time consuming and requires knowledge to produce viable seedlings. Since farmers also engage in different agroforestry systems, the type of seeds and seedlings differ as each requires different trees for different purposes to be incorporated into the farming systems.

The results in Table 2 further revealed 76.3% of the respondents indicated credit for agroforestry implementation cannot be accessed easily while 23.7% indicated it can be accessed easily. The findings reinforce studies by (Flexen et. al, 2014) that credit is a major challenge to agroforestry development which can be attributed to lack of collateral for its acquisition. There is no credit tailored for agroforestry that farmers can acquire for the implementation of the practice. The terms and conditions for the credit that is available are not farmer friendly hence discouraging farmers from acquiring it.

Regarding access to land, results in Table 2 shows that 87.9% of the respondents indicated land for agroforestry implementation can be accessed easily while 12.1% indicated it cannot be accessed easily. This suggests that land is not a challenge rather the resource fails to provide other resources needed attached to it. This is as a result of fewer incentives attached to it, supporting (Flexen et al 2014) observation that land has proven to be a constraint due to failure to provide credit for the poor farmers through acting as a collateral due to less financial incentives attached to it. In addition, 64.3% of the respondents indicated knowledge for agroforestry implementation cannot be accessed easily while 35.7% indicated it can be accessed easily. As pointed out by (Roiz-Diaz et al, 2011), insufficient knowledge has been a challenge for farmers which is contributed by difficulty in information access. Success stories from which the CBOs implementing agroforestry can draw lessons from are limited. The inability of extension services to cover different aspects of agroforestry also limits knowledge enrichment that can help in agroforestry expansion by the CBOs. Moreover, 87.0% of the respondents indicated labour for agroforestry implementation can be accessed easily while 13.0% indicated it cannot be accessed easily. The findings imply that labour can be accessed easily to support implementation of agroforestry. The findings support (Sagastuy & Krause, 2019) who describe labour as part of establishment cost in implementation of agroforestry. The technical nature of agroforestry requires intensive labour which is required in the farm for crop and tree management which many do not have knowledge about. Due to intensive labour required, the community can derive financial benefits from being employed to work on farms hence readily available labour.

Likewise, 50.2% of the respondents indicated that time for agroforestry implementation cannot be accessed easily while 49.8% indicated it can be accessed easily. These findings reinforces (Johasson, 2015) arguments that time for participation in agroforestry related by farmers is limited due to its technicality. Mobilizing the community to create time is challenging as they engage in other farm-related activities. As pointed out by (Sharma et al., 2016), agroforestry investments takes longer to come hence farmers prefer channeling their energies on other farm activities that bear profits in a shorter time limiting labour to agroforestry.

Policy

Policy has proven to be a challenge in implementation of agroforestry as most of them points away from the interventions that meets the needs of the people. Failure to improve and develop proper institutional policies related to gender, governance and local capacities derails networking efforts hence limiting resource mobilization efforts. To assess the influence of policy as a challenge, respondents were asked whether there is existence of policies for agroforestry implementation and agroforestry phases that are included in their organizations' policies. The findings are as shown below:

Figure 1: Existence of organization's policies for agroforestry implementation

From Figure 1 above, 72.7% of the respondents indicated that there is existence of organization's policies for agroforestry implementation while 27.5% indicated that are not in existence. Guiney (2016) argued that presence of agroforestry policies in an organization do not guarantee its success as they may not give guidance on their implementation. This can result from lack of goodwill to implement the policies or a body with expertise that is mandated to implement them in the organizations. Even when implemented without accountability feature attached to it, its effectiveness is minimal and therefore may not drive the realization of food security among the CBOs implementing agroforestry.

Figure 2: Agroforestry Phases included in Organization's Policy

The results in Figure 2 showed 37.2% of respondents noted that execution phase is included in the organizations' policies, 27.1% indicated planning and design stage, 20.8% indicated initiation, 9.2% indicated termination and 5.8% indicated monitoring and evaluation. The findings are consistent with (Mbow et al., 2014) observations that there is need to develop appropriate institutional policies that sufficiently ensure networking and collaboration for the needs of the farmers to be met. This is possible when all the phases of agroforestry projects are covered by the organization's policies creating favorable environment for the implementation of the projects.

Table 3: Ministries helping CBOs implement Agroforestry

Ministry	Frequency	Percent
Ministry of agriculture	136	65.7
Ministry of livestock and Fisheries	37	17.9
Ministry of Environment	34	16.4
Total	207	100.0

The findings in Table 3 indicate 65.7% of respondents noted ministry of agriculture helps the CBOs in implementing agroforestry, 17.9% of respondents noted ministry of livestock and fisheries, 16.4% of respondents noted ministry of environment. This indicates that there is no ministry that specifically implements agroforestry and that the departments that help in implementing agroforestry have other responsibilities and therefore they work in uncoordinated way as they strive to meet their core mandate first hence supporting (FAO, 2013) observation that there is no favourable national policy creating conducive environment for the implementation of agroforestry. This creates barriers to fully exploiting agroforestry for its development, which includes legal, political and socio-economic barriers.

Extension Services

Extension services build the capacities of those involved in implementing agroforestry as they provide knowledge and information needed. Due to technical nature of agroforestry, specialized extension services from both external and internal environment are

needed and therefore government alone cannot provide community extension service needs. To assess extension service as a challenge, the areas looked into included extension service providers, strategies employed by extension service providers and features extension service providers take into account.

Table 4: Extension service providers

Extension service providers	Frequency	Percent
CBO	1	.5
Government	159	76.8
NGOs	35	16.9
Community	12	5.8
Total	207	100.0

Table 4 shows 76.8% of respondents indicated the extension service provider are from government departments, 16.9% indicated they are from NGOs, 5.8% indicated they are from the community and 5% indicated they are from the CBOs involved in implementing agroforestry. The findings shows government as main extension provider agreeing with studies by (Feder et al., 2010) that government has been the lead extension service provider in most developing countries employing many extension service providers to take on the work. However, the sector has been doing poorly. This can be attributed to many tasks emerging as a result of dependence on the extension services from the government. The community is not empowered enough to take up the extension service work limiting the applicability of the intervention and in the long run, their satisfaction.

Table 5: Strategies employed by Extension Service Providers

Strategies	Frequency	Percent
Trainings	120	58.0
Demos	84	40.6
Others	3	1.4
Total	207	100.0

As Table 5 exemplifies, 58% of the respondents as shown noted trainings as the main strategy used by extension service providers, 40.6% indicated they use demonstrations and 1.4% noted they employ other strategies. This suggests that extension service providers do not employ variety of strategies. As pointed out by (Basamab et al, 2010), combining agroforestry extension services with variety of strategies strengthens its effectiveness. This is due to different needs and preferences of the farmers as well as the physiological and socio-economic aspects of agroforestry hence ensuring all farmers are covered by the services provided.

The results of the study shows 88.4% of the respondents indicated extension service providers take into consideration peoples' needs and interests in extension services, 7.7% indicated beliefs and values of farmers taken into consideration, 3.9% noted other features taken into account while no respondent indicated that no feature is taken consideration in extension services. The findings support studies by (Basamba et al 2010) that extension service should take into account the needs of the farmers. This ensures both the illiterate and the literate are attended to for all to grasp and retain the information required for agroforestry development. Also, agroforestry with variety of systems translates to different needs for farmers and therefore the extension services should not focus on one system neglecting other systems which are some farmers' preferences.

Figure 3: Features that Extension Service Providers take into Account

Table 6: Influence of Challenges experienced in agroforestry implementation process on changes in food sold in the market in the last one year

		Type of changes in what is sold in the market in the last one year					
		Availability of different types of food stuffs	of Increase in quantity of food stuffs	Decrease in quantity of food stuffs	Unavailability of some type of food stuffs	N/A	
Challenges experienced in agroforestry implementation process	Policy	27.4%		28.6%	28.6%	22.2%	27.5%
	Resources	47.9%		50.0%	45.2%	44.4%	55.0%
	Extension services	8.2%		9.5%	14.3%	11.1%	5.0%
	Others	16.4%		11.9%	11.9%	22.2%	12.5%

Table 6 indicate that 28.6% of the respondents indicated that there is decrease in food quality when policy challenges is experienced in agroforestry implementation, 28.6% noted increase in quantity of food stuffs, 27.5% had no opinion, 27.4% indicated availability of different types of food stuff while 22.2% noted unavailability of some type of food stuffs. 55.0% of the respondents on influence of resource constraints experienced in agroforestry implementation, 50.0% noted increase in quantity of food stuffs, 47.9 % noted availability of different types of food stuffs, and 45.2% indicated Decrease in quantity of food stuffs while 44.4% noted unavailability of some type of food stuffs. 14.3% of the respondents indicated that there is decrease in food quality when extension challenges is experienced in agroforestry implementation, 11.1% noted unavailability of some type of food stuffs, 9.5% noted Increase in quantity of food stuffs, 8.2% indicated availability of different types of food stuff while 5.0 % had no opinion. On other challenges experienced in agroforestry implementation by CBOs, 22.2% of the respondents indicated that there is unavailability of some type of food stuffs, 16.4% noted availability of different types of food stuffs, 12.5 % had no opinion, and 11.9 % indicated decrease in quantity of food stuffs, while 11.9% also indicated Increase in quantity of food stuffs. This imply that constraints including policy, resources and extension services among other challenges affects food stability, quality and availability negatively. They cause fluctuation in the food prices, unavailability of food and unavailability of quality food for household consumption.

Mitigation Factors for Challenges Faced.

The second objective of the study was to analyse the influence of mitigation factors on food security among community-based organizations implementing agroforestry in Rongai Sub County. Three factors were assessed including partnerships, capacity building, monitoring and evaluation.

Partnership

Collaboration of stakeholders in implementing agroforestry enable pooling up of resources required creating environment where scaling up agroforestry by the communities is favorable. The respondents were asked to note their partners in agroforestry implementation; areas the partners are collaborating in, whether there is joint ownership of challenges and success of agroforestry implementation process among the partners. The results are as shown below:

Table 7: CBOs' partners in Agroforestry Implementation

Partners	Frequency	Percent
Government departments	151	72.9
NGOs	46	22.2
Private companies	1	0.5
Others	9	4.3
Total	207	100.0

Table 7 shows that 72.9% of the respondents indicated that their partners are government departments, 22.2% indicated NGOs, 4.3% indicated other different partners and 0.5% indicated private companies as their partners. These results show that CBOs collaborate mostly by government departments leaving out other significant actors who would be helpful in resource mobilization. Different partners have strengths in different areas and therefore, collaborating with various relevant partners ensures all the areas critical to successful implementation of agroforestry is attended to. As (Mwase et al, 2015) put it, poor partnerships strategies derails

agroforestry due to failure to include relevant partners with potential to fully exploit agroforestry including researchers, policy makers, extension service providers and practitioners.

Table 8: Areas in which Partners Collaborate

Areas of collaboration	Frequency	Percent
Extension services	134	64.7
Input provision	60	29.0
Financial support	10	4.8
Others	3	1.4
Total	207	100.0

Table 8 shows that 64.7% of the respondents indicated partners collaborate in extension services, 29% indicated input provision, 4.8% indicated financial support and 1.4% indicated other areas sparsely distribute. In essence; these areas are resources which the CBOs use to implement agroforestry. These findings therefore suggest that extension services are given more weight by the partners while other areas are not fully focused on. As (Mwase et al., 2015) pointed out, if partnerships are not well aligned into the needs of the organization, it may derail agroforestry development. This is so as mobilization of all the required resources is limited giving more focus to mobilization of few resources.

Table 9: Joint Ownership of Challenges and Success of among the Partners

Opinion	Frequency	Percent
Strongly agree	5	2.4
Agree	30	14.5
Neutral	88	42.5
Disagree	58	28.0
Strongly disagree	26	12.6
Total	207	100.0

From Table 9, 42.5% of respondents had no opinion on whether there is joint ownership of challenges and success of among the partners, 28% disagreed on the matter, 14.5% of the respondents agreed that there is joint ownership of challenges and success, 12.6% strongly disagreed on the issue and 2.4% strongly agreed. This suggests that partners collaborating with CBOs in implementing agroforestry hardly have joint ownership of challenges and success experienced in the implementation process. Joint ownership of challenges and success drives the achievement of positive results. This is due to motivation associated with success and pooling of resources that is driven by challenges in order to solve the problems associated. As (Mc Keown & Mc Gearty, 2010) explain, partners are supposed to share commitments and vision for the success of projects they are engaged in, which in this case is through joint ownership of challenges and success experienced in implementing agroforestry projects.

Table 10: Influence of CBOs' partners in implementing agroforestry on factors preventing the improvement of daily food intake in household

		Factors preventing the improvement of daily food intake in household				
		Insufficient knowledge on farm management	Insufficient land for cultivating	Insufficient finances	Unavailability of food stuffs	crop failure
Partners of the CBO in implementing agroforestry	Government departments	74.3%	74.2%	79.0%	90.0%	63.8%
	NGOs	22.9%	19.4%	16.1%	10.0%	30.4%
	Private companies	0.0%	3.2%	0.0%	0.0%	0.0%
	Others	2.9%	3.2%	4.8%	0.0%	5.8%

Table 10 shows that with government departments as partners, 90.0% of respondents indicated unavailability of food stuffs as factor preventing improvement of daily food intake in households, 79.0% indicated insufficient finances, 74.3% indicated insufficient knowledge on farm management, 74.2% indicated Insufficient land for cultivating while 63.8% indicated crop failure. With NGOs as partners, 30.4% of respondents indicated crop failure as factor preventing improvement of daily food intake in households, 22.9%

indicated insufficient knowledge on farm management, 19.4% indicated insufficient land for cultivating, 74.2% indicated insufficient land for cultivating while 10.0% indicated insufficient finances. With private companies as partners 3.2% of respondents indicated insufficient land for cultivating as factor preventing improvement of daily food intake in households, 0.0% indicated insufficient finances, 0.0% indicated insufficient knowledge on farm management, and 0.0% indicated unavailability of food stuffs while 0.0% indicated crop failure. With other organizations as partners 5.8% of respondents indicated crop failure as factor preventing improvement of daily food intake in households, 4.8 % indicated insufficient finances, 3.2 % indicated insufficient land for cultivating, and 2.9 % indicated insufficient knowledge on farm management while 0.0% indicated unavailability of food stuffs. This implies that CBOs implementing agroforestry collaborating with few partners reduces the effectiveness of agroforestry intervention to solve food security problem among the households. This is because few partners may not provide all the required resources for implementation of agroforestry but several of them come with resources, they are rich in hence complementing each other for the success of agroforestry implementation. This requires that CBOs partner strategically by collaborating with partners who would provide what the CBOs need for agroforestry implementation that would translate to food security among the households.

Capacity Building

Developing the capacity of the stakeholders involved in the projects at all levels throughout the agroforestry value chain is key to sustainable and profitable interventions. This parameter was assessed with tests on frequency of training of the stakeholders involved, areas capacity building focuses on and whether the process takes into consideration the ability of the participants to understand and retain information. The findings are as shown below:

Table 11: Frequency of Training

Frequency	Frequency	Percent
Monthly	6	2.9
After every 3 months	91	44.0
After 6 every months	57	27.5
Annually	53	25.6
Total	207	100.0

Table 11 illustrates that 44% of the respondents noted that training takes place after every three months, 27% indicated it takes place after six months, 25.6% takes place annually and 2.9% noted it takes place monthly. According to Beedy et al., (2013), the ability of the target group to organize themselves into groups eases capacity building activities enabling ease in flow of information. The findings therefore suggest that the nature of the frequency of trainings depends on the ease members to group in order to get trainings in their areas of interest. The ability of the members to group comes around as a result of empowerment that enable them point out the problems they are facing and the relevant solutions to solve them hence the grouping. This way, the service providers' work becomes easy enabling them have a wider coverage reaching out to many farmers.

Table 12: Capacity Building Areas in the CBOs

Areas of capacity building	Frequency	Percent
Farm management	168	81.2
Organizational management	29	14.0
All of the above	8	3.9
Others	2	1.0
Total	207	100.0

Table 12 shows 81.2% of the respondents noted that capacity building focuses on farm management areas, 14% indicated it focuses on organizational development, 3.9% indicated it focuses on both farm management and organizational development and 1% of the respondents indicated other areas which are not popular to those involved. Respondent number 19 pointed out that:

“Members of CBO can stay for almost a year without any training and if it happens, it is conducted by Ministry of Agriculture who are focused on farm management for crop productivity. It is because crop management is its main area of focus and may have insufficient knowledge on other areas touching on development of CBOs implementing agroforestry”.

The findings suggest capacity building focuses more on farm management aspects giving less attention to other areas. As (Birhane, 2014) pointed out that capacity building should touch on all areas and levels relevant to the intervention in play, this is challenged by failure to harmonize the mandates of government departments to meet the capacity building gaps of the CBOs implementing agroforestry.

Figure 4: Capacity Building takes into consideration the ability to understand and retain information

From Figure 8, 59.4% of the respondents noted that capacity building takes into consideration that ability to understand and retain information while 40.6% differs with the statement. As Birhane 2014 points out importance of information access in ensuring success of an intervention, it is supported by the findings which suggest that information is usable only when those involved can understand and retain it. This is crucial for the illiterate farmers where those involved in capacity building need to allocate time to the farmers in order to ensure they grasp the concepts put across and be able to be used as intended.

Monitoring and Evaluation

Monitoring and evaluation as a mitigation factor to the challenges faced in implementing agroforestry by the CBOs is important as it informs decision making processes and ensures all procedures related to the intervention are followed. The study assessed the use of M&E by looking onto whether the tools are used in the implementation of agroforestry projects, whether community is involved in preparation of the framework, data collection, data analysis, reporting and feedback. The findings are as shown below:

Figure 5: M&E tools used in Agroforestry Project

Figure 5 illustrates that 77.1% of the respondents noted they do not use M&E tools in agroforestry projects while 22.7% noted they use the tools. The findings show that most agroforestry projects do not use M&E framework which according to (Mbow et al, 2014) are characterized by failure. This is attributed to implementing the practices without testing their practicality and relevance to the farmers. The performance of the intervention fails to be measured hence limiting the availability of information that is helpful for improvement that leads to success.

Table 13: Community is involved in Preparation of M&E framework

Opinion	Frequency	Percent
No	47	22.7
Yes	13	6.3
N/A	147	71.0
Total	207	100.0

Table 13 demonstrates that 71% of the respondents indicated the question as not applicable as they do not use M&E tools while for those who employ M& E in their projects, 22.7% revealed community is not involved in preparation of the framework and 5.8% noted the community is involved in preparing the framework. Involvement of community in developing the framework gives the members a sense of ownership of the project facilitating development of indicators. This way therefore, (Mbow et al, 2014) suggested that it helps in gauging how relevant and practical the projects are to the targeted community enabling the community to own the challenges associated with the intervention.

Table 14: Community is involved in Data Collection Procedures

Opinion	Frequency	Percent
No	69	33.3
Yes	7	3.4
N/A	131	63.3
Total	207	100.0

Table 14 illustrates that 63% of the respondents noted the question as not applicable as they do not use the M&E framework. 33% noted that the community is not involved in data collection procedures while 3.4% noted that the community is involved in data collection procedures for agroforestry projects. These findings suggest that few individuals take part in data collection procedures. Once community is exempted in preparation of M&E framework, it becomes difficult involving them at data collection phase hence the involvement of few players. This limits sharing of knowledge and experience challenging community empowerment where community members can take part and in process getting to understand underlying problems inhibiting success of the projects. Guiney (2016) points that sharing of information and experience, which in this case is through data collection procedures, supports development of agroforestry by aiding easy flow of information.

Table 16: Community are involved in Reporting and Feedback

Opinion	Frequency	Percent
No	20	9.7
Yes	40	19.3
N/A	147	71.0
Total	207	100.0

Table 21 shows that 71% of the respondents noted the question as not applicable as they do not use the M&E framework. 19.7 % of the respondents noted the community is involved in reporting and feedback while 9.7% noted that the community is not involved. The findings support (Guiney, 2016) observation on the need to involve the community in reporting and feedback to aid flow of information among stakeholders. Nevertheless, the findings suggest that the community involvement in reporting and feedback by the CBOs implementing agroforestry is significant despite being exempted in the preparation of M&E framework and data collection procedures.

This culture in the organizations where the community is exempted in development of M&E framework and data collection but involved in reporting threatens motivation felt by community members by being involved in M&E framework's processes.

Table 17: Influence of use of M&E tools in agroforestry projects on source of food for the households

		Source of food for the household		
		Household's farm	Market	Household's farm and market
M&E tools are used in agroforestry projects	No	82.1%	83.3%	75.9%
	Yes	17.9%	16.7%	24.1%

Table 17 show 83.3% of the respondents indicated market as source of food for the households when M&E tools are not used in agroforestry implementation, 82.1% indicated households' farm while 75.9% indicated households' farms and market. 24.1% of the respondents noted that households' farm and market are source of food for households when M&E tools are used in agroforestry implementation, 17.9% indicated households' farms while 16.7% indicated market. These findings imply low effectiveness of M&E tools used in the implementation of agroforestry in ensuring food security among the households as households mainly source food from market implying ineffective agroforestry in regards to food security. This may be attributed to failure to involve the community in all processes of M&E as well as lack of knowhow in the use of M&E tools.

Conclusions

The study concludes that CBOs implementing agroforestry in Rongai faces resource constraints ranging from seeds and seedlings, capital, knowledge to insufficient land. Organizational policies though exist doesn't include all the phases of the project rendering it ineffective. Involvement of both internal and external extension service providers is limited since government departments are mainly involved in extension service provision. Extension service providers also use mainly trainings and few demonstrations as strategies in their activities, thus extension services are rendered ineffective hence places extension services as challenges for the CBOs implementing agroforestry. For the extension service strategies applied, farmers' needs and interests are taken into account helping the parameter meet some of its objectives. The constraints experienced challenges successful implementation of agroforestry by CBOs hence an uphill lowering farm production hence food insecurity among the households of CBOs implementing agroforestry intervention.

Mitigation factor are hardly employed and maximized by the CBOs implementing agroforestry in Rongai sub county hence their effectiveness is minimal. There is need for the CBOs to expand their cycle of partners to enable all the areas of agroforestry be attended to since every partner come with own strength in a given area. Capacity building is not maximized as it focuses mainly on farm management. Other areas critical to the effectiveness of CBOs such as resource mobilization, marketing of agroforestry products and organizational management should be examined. Failure to use M&E framework limits availability of the information to be used in decision making processes. Inability to involve community for the CBOs using the framework cuts out ownership feature critical for resource mobilization for the success of the intervention.

Mitigation factors influences food security of the households of CBOs implementing agroforestry positively only when these involved have the capacity to implement them. Capacity building affects the quality of interventions implemented affecting their effectiveness among the households. Right partnerships also are resourceful hence poor collaborations results to poor results regarding agroforestry implementation by CBOs hence food insecurity among the households. Without knowledge and skills on how to implement M&E, the tools become ineffective on food security among the households hence capacity building on it is vital to ensure they are used appropriately for food security

References

- Asian Development Bank (2013). Food security in Asia and the Pacific. Manila: ADB. Food security. Poverty. Sustainable development. Asia and the Pacific.
- Basamba, T.A., Mayanja, C., Kiiza, B., Nakileza, B., Matsiko, F., Nyende, P., ... Ssekabira, K. (2016). Enhancing adoption of Agroforestry in the Eastern Agro-Ecological zone of Uganda. *International journal of Ecological Science and Environmental Engineering* Vol.3, No. 1, 2016, pp-20-31
- Beedy, T.L., Ajayi, O.C., Sileshi, G. W., Kundhlande, G., Chiundu, G. & Simons, A.J. (2013). *Scaling up Agroforestry to achieve food security and environmental protection among smallholder farmers in Malawi*. Special issue 7/2013: Livelihoods
- Birhane, E. (2014). Agroforestry governance in Ethiopia. Case study: Agroforestry governance in Ethiopia. *Final Report*.
- Brondizion, E., Ostrom, E. & Young, O.R. (2012). Connectivity and governance of multilevel social-ecological systems. The role of social capita. In: Christophe, B. Perez, R. (eds) *Agro-ressours et ecosystemes: enjeux societaux et pratiques manageriales*. Paris. Septentrion Presses Universitaires
- Buttoud, G., Detlefsen, G., Torquebiau, E., ayaji, O. & Place, F. (2013) .*Advancing Agroforestry on the policy agenda. A guide for decision makers*. Food and Agriculture Organization of the United Nations, Rome 2013. Agroforestry working paper no.1
- Caron, P., Kalafatic, C., Allahoury, A., Frecso, L., Kennedy, E., Khan, M.A., ... Widmark, C. (2017). HLPE (High Level Panel of Experts on Food Security and Nutrition). Sustainable forestry for food security and nutrition. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome. pp 24
- Christoplos, I. (2010). Mobilizing the potential of rural and agricultural extension. Rome: Food and Agriculture Organization of the United Nations and the Global Forum for Rural advisory services. www.fao.org/decrep/012/i1444e/i144e.pdf .1-57
- Cornell, C. & Jude, N. (2015). The Systems Theory of Management in Modern Day Organizations- A Study of Aldgate Congress Resort Limited Port Harcourt. *International journal of scientific and research publications*, Volume5, Issue 9. ISSN 2250-3153
- County government of Nakuru (2018). *Nakuru County integrated development plan (2018-2022). Vision 2030*. www.nakuru.go.ke 96
- Degrande, A., Franzel, L., Siohdjie, Y., Asaah, E., Tsobeng, A. & Tchoundjeu, Z. (2012). *Effectiveness of grassroots organizations in the dissemination of agroforestry innovations*. <https://doi.org/10.5772/33283>.
- Dhyani, S.K., Nayak, D. & Rizvi, J. (2019). Historical development of Agroforestry and overview of global agroforestry systems. ICRAF.
- FAO (2012). Socio-economic survey EADD-MICCA pilot project in Kenya, MICCA. Programme pilot project: Enhancing Agricultural mitigation within the East Africa Dairy Development (EADD) project in Kenya. Food and Agricultural Organizations of the United Nations (FAO) Climate Energy and Tenure Division (NRC), Rome.
- FAO (2013). *Advancing agroforestry on policy agenda. A guide for decision makers*. Agroforestry working paper no. 1. Rome: FAO, Italy

- FAO. (2015b). Food security indicators. <https://www.fao.org/economic/ess/ess-fs-fadata/en/#.Vd0RokZrFNE>
- FAO. (2019). *The state of food insecurity in the world. Safeguarding against economic slowdowns and downturns*. Rome: Food and Agricultural Organization of the United States.
- Feder, G., Anderson, J.R., Birner, R. & Deininger, K. (2010). *Promises and Realities of community-based agricultural extension*. IFPRI. Discussion paper No. 00959. IFPRI, Washington DC, USA. 32p
- Flexen, M., Mc Adam, J.H. & Anderson, D. (2014). A survey of attitudes of framers in Northern Ireland to agri-environment schemes and woodland creation. Report to DARD.
- Grimm, O. (2012). Understanding Spatial Patterns of Food Insecurity in Kenya as a Contribution to Sustainable Rural Development Policies. M (Phil) Thesis. Center for Development and Environment, University of Berne.
- Guiney, I. S. (2016). Agroforestry development and implementation in South Africa. An assessment of selected case studies. MFor Thesis. Stellenbosch University.
- Malmer, A., Schaffer, C., Brundin, H., Björklund, J., Höök, K., Hansson, L., ... Elfstrand, S (eds) 2018: Scaling up Agroforestry: Potential, Challenges and Barriers. *A review of environmental, social and economic aspects on the farmer, community and landscape level the Agroforestry Network*.
- Mbow, C., Neufeldt, H., Minang, P.A., Luedeling, E. & Kowero, G. (2014). Agroforestry solutions to address food security and climate challenges in Africa. *Current opinion in Environmental Sustainability*, 6: 61-67
- McGrath, S.K. & Whitt, J. (2015). "Redefining governance: from confusion to certainty to clarity". *International journal of managing projects in business*. Vol.8 No4, pp. 755-787.
- Mwase, W., Sefasi, A., Njuloma, J., Nyoka, B.I, Mundwa, D. & Nyaika, J. (2015). Factors affecting adoption of agroforestry and evergreen agriculture in Southern Africa. *Environment and Natural Resources Research*, 5:148-157.
- Nath, T.K., Jashimuddin, M. & Inoue, M. (2016). Community- Based Forest Management (CBFM) in Bangladesh, 125-154.
- Omair, A. (2014). Sample size estimation and sampling techniques for selecting a representative sample. *Journal of Health specialties*, Vol. 2: 142-147 <https://doi.org/10.4103/1658-600X.142783>
- Osahon, O.J & Kingsley, O. (2016). Statistical approach to the link between internal service quality and employee job satisfaction. A case study. *American journal of applied mathematics and statistics*. 4(6): 170-184. <https://doi.org/10.12691/ajams-4-6-3>
- Piao, S.P., Ciais, Y., Huang, Z., Shen, S., Peng, J., Li, L....(2010). The Impacts of Climate Change on Water Resources and Agriculture (in the People's Republic) of China. *Nature*. 467(7311). pp 43-51
- Sagastuy, M. & Krause, T. (2019). Agroforestry as biodiversity conservation tool in the Atlantic forest? *Motivation and limitations for small-scale farmers to implement agroforestry systems in North- Eastern Brazil*. *Sustainability* 2019, 11, 69; <https://doi.org/10.3390/su11246932>
- Sassi, M. & Zucchini, E. (2018). Food insecurity in the Rural Lake Naivasha Basin: Evidence and policy implications. *International working paper series*, No. 18/01. Pavia: University of Pavia.
- Sharma, N., Bohra, B., Pragya, M., Cianella, R., Dobie, P. & Lehmann, S. 2016. Bioenergy from agroforestry can lead to improved food security, climate change, soil quality, and rural development. *Food and Energy Security*. 5(3):165-183.
- Strauss, D. F.M. (2015). The scope and limitations of Von Bertalanffy's system theory. *Article in South Africa Philosophy*. December 2005. <https://doi.org/10.4314/sajpem.v21i3.31343>
- Wafuke S. (2012) Adoption of Agroforestry technologies among small scale farmers in Transzoia location Lugari District, Kenya. Masters dissertation. Egerton University.
- Wekesa, A & Jönsson, M. (2014). Sustainable Agriculture Land Management- A training manual. Vi Agroforestry, Stockholm (Illustrations used with permission from Vi. Agroforestry).
- Wekesa A., Malmer A., Schaffer C, Mwiyeria E., Nyberg G, Brundin, H., ...Elfstrand, S., (2018):Agroforestry Network .Scaling Up Agroforestry: Potential, Challenges and Barriers.
- World Bank (2014). *Kenyans Earn First Ever Carbon Credits From Sustainable Farming*. <https://www.worldbank.org/en/news/press-release/2014/01/21/kenyans-earn-first-ever-carbon-credits-from-sustainable-farming>
- Yila, O. (2016). A scoping study to document the agroforestry technologies, practices, systems and their characterization, release, adoption and use by farmers in Kenya, 42-64
- Zerihun, M.F., Muchie, M. & Worktu, Z. (2014). Determination of agroforestry technology adoption in Eastern Cape Province, South Africa. *Development Studies Research*, 1: 382-394

Publisher's Note: SSBFNET stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

© 2021 by the authors. Licensee SSBFNET, Istanbul, Turkey. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).

International Journal of Research in Business and Social Science (2147-4478) by SSBFNET is licensed under a Creative Commons Attribution 4.0 International License.