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Influence of Smallholder Farmers' Socio-economic Characteristics on and Perceived Benefits of Organic Agriculture Farming

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Abstract:
The decision to adopt an agricultural technology is categorized into characteristics specific to farmers and their households and socio-economic factors. The difference in factors influencing the smallholder farmers' adoption of Organic Farming (OF) practices varies across the world. Thus, this paper investigates the influence of smallholder farmers' socio-economic characteristics on the adoption of OF in Kisii Central, Kisii County. The study adopted mixed-method research that involved a household survey and key informants. The results indicate that the major socio-economic characteristics influencing smallholder farmers' adoption of organic farming were farm size (79%), income (73%), family size (67%), and age (66%). In addition, there is a positive correlation between education and the use of crop residues (r=0.113), animal manure (r=0.114), and cover crop (r=0.121). The study recommends that promoters of OF consider specific socio-economic characteristics of the farmers in adopting OF.

Keywords: *Smallholder farmers, socio-economic characteristics, organic agriculture*

1. Introduction

Organic Farming (OF) system is managed by integrating cultural, biological, and mechanical practices that foster the cycling of resources, promote ecological balance, and conserve biodiversity. This works under the four principles: health, care, fairness, and ecology (IFOAM, 2020). A wide range of studies has demonstrated the advantageous aspects of OF in terms of ecosystem functioning, soil fertility conservation, and economic impact (Ferreira et al., 2020). According to Adamchak (2021), the concept of OF practices refers to an organic farm as an organism in which all the component parts (the soil minerals, plants, organic matter, micro-organisms, insects, and animals, including humans) interact to create a coherent and stable whole.

Statistics by Food and Agriculture Organization (FAO) found that there are more than 608 million farmers around the world involved in OF (FAO, 2021). It is estimated that about 3.1 million producers were involved in the production of different organic crops globally on 72.3 million hectares in 2019 (IFOAM, 2021). It is also evident that the demand for organic products worldwide is on the increase. However, the demand remains subdued, partly because of high product prices, which are up to five times as much as conventional foods. FiBL and IFOAM (2021) indicate that in 2019 there were approximately 3.1 million organic sales growing globally to reach a market size of 106 billion euros.

The size of land under organic farming in Africa is more than 2.0 million hectares (0.2 percent of agricultural land). This involves mainly permanent crops such as olives, tropical fruits, nuts, coffee, cocoa, cotton, herbs/spices, etc. (IFOAM and FiBL, 2022). Comparative data on organic farming in 35 countries indicate that Tunisia has the largest organic area, with more than 290,000 hectares in 2020 (Willer et al., 2021). They further found out that Ethiopia had the largest number of organic producers (almost 220,000) while the island state of São Tomé and Príncipe had the highest percentage of land devoted to organic farming at 20.7% of its agricultural area. The main countries with certified organic farms are: Uganda (228,000 ha), Tunisia (178,500 ha), and Ethiopia (140,500 ha) (Willer & Kilcher, 2013). Most certified organic production is geared toward export markets, mainly the European Union (FiBL-IFOAM Report, 2017). The continent, therefore, offers great potential for the development of non-certified OF. This is based on improved agro-ecological management of traditional African agriculture practiced by smallholders who cannot afford expensive technologies and who lack functioning markets (KOAN Report, 2014).

Lauwere et al. (2004) identified four different categories of motives for organic conversion among Dutch farmers. The categories identified included idealistic, technical, institutional, and economic motives. Integrated model categorizes factors influencing the farmers' decision to adopt a given innovation or technology (Sodjinou, 2011). These include characteristics specific to farmers and their households (e.g., age, knowledge, education, gender, household size, and motivation/objective, among others) and economic factors (e.g., income, markets, and prices of outputs and inputs).

Kenya's organic sector is relatively small but expanding fast, especially in the growing of fruits and vegetables (IFOAM and FiLB, 2018). About 12,647 farmers are involved in the production of vegetables, fruits, chillies, coffee, tea, nuts, herbs, and spices cultivating 154,488 ha (IFOAM and FiLB, 2021). The most prominent Kenya Organic Agriculture partners include Kenya Organic Agriculture Network (KOAN), Kenya Institute of Organic Farming (KIOF), Nyumbani, Woodlands Trust 2000, Kenya Organic Farmers (KOF), Bridge Organic Health Restaurant and Green Dream Organic Shop (GEM, 2007). Various institutions and organizations, including Kenya Institute of Organic Farming, which promote organic and sustainable farming systems, started in the 1980s (Savala et al.,2003; Taylor, 2006; Mwaura, 2007). In addition, Non-Governmental Organizations, Faith Based Organizations, and Community-Based Organizations have made tremendous efforts to promote and spread OF in Kenya (KOAN, 2010-2014). This has been done through the diversification of food production at the household level and the use of intensive ecological methods. However, this has changed over time to integrate commercial approaches and adoption by large-scale farmers (KOAN 2010-2014).

Agriculture is the mainstream of Kenya's economy (GoK, 2017). Thus, the government of Kenya, in collaboration with the county governments of the rich agricultural areas, KOAN, and agricultural agencies, need to support organic agriculture for the sector to develop its full potential. Kisii County is a high-potential agricultural area in Kenya and is known for its diverse agricultural practices. However, little information is available on sustainable agriculture practices, including OA and components. Hence, this paper examines the influence of smallholder farmers' socio-economic characteristics on the adoption of organic agriculture farming in Kisii Central sub-County, Kenya.

2. Material and Methods

2.1. Study Area

This study was conducted in Kisii Central Sub-County of Kisii County (Figure 1). Data were collected in the eight sub-locations of Birongo and Ibeno locations Keumbu Division. Kisii Central sub-county lies in the Upper Midland agro-ecological zone of Kisii County, where farming is the main source of livelihood. The area exhibits a highland equatorial climate with a bimodal rainfall pattern averaging approximately 1,500 mm per annum. The western part of the study area has an elevation of between 1500–1800 ms above sea level, while the eastern and south-eastern are 1800 m above sea level (Kisii County Integrated Development Plan, 2018-2022).

Kisii Central Sub–County had a population of 166,906 people with a population density of 1,229 persons per square kilometer (KNBS, 2020). The population growth rate for Kisii Central Sub–County is 2.0 percent. Children below 5 years make up about 18.5%, the youth of the age group between 15 years and 30 years comprise 31.8% of the total population, while the labour force comprises 56.7% of the population (KNBS, 2019).

Agriculture is the predominant occupation of the people in the study area. This can be attributed to the favourable climate and soil. Cash crops grown in the study area include tea, coffee, pyrethrum, bananas, avocadoes, and sugar cane, while subsistence crops include maize, beans, potatoes, and finger millet. Dairy farming is another important activity practiced in the sub-county. The area has a diversity of 20 different types of soils. Some of these soils are:

- Nitosols (49%),
- Pheozomes (13%),
- Planosols (8%),
- Greyzems (4%),
- Vertisols (2%),
- Gleysols (2%), and
- Solonetz (0.8)

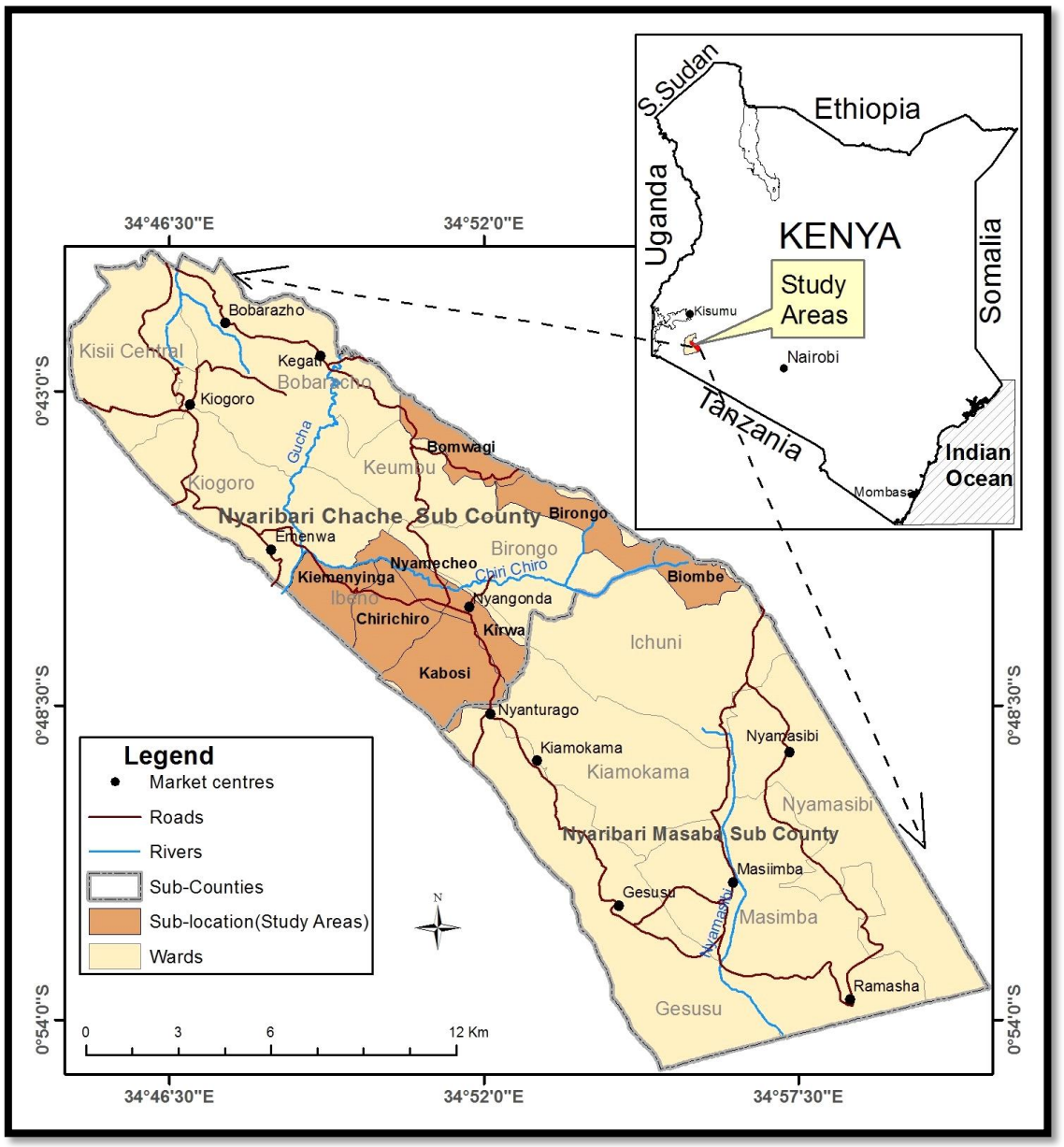

Figure 1: Map Showing the Study Area in Kisii Central Sub-County
Source: KNBS, 2020

2.2. Methodology

The multi-stage sampling design was used in this study to select two study locations in Kisii Central Sub-County; Birongo and Ibeno. In stage 1, Kisii County was purposively sampled from the 47 counties in Kenya because of the suitability of the area for diverse agricultural activities. In stage 2, Kisii Central Sub-county was purposively sampled because of its high population (166,906) and the agricultural intensity of the various farming practices (GoK, 2014; and KNBS, 2020). In stage 3, Keumbu Ward was also purposively sampled as a data collection area based on its high population density (6,025 smallholder farmers) and its proximity to the county headquarters (rural). In stage 4, Birongo and Ibeno locations, within Keumbu Ward were purposively sampled as data collection areas based on their high and low population densities, respectively. In stage 5, probability sampling procedures were used to select 306 smallholder farmers in Birongo (2,759) and Ibeno (3,265) Locations, which have several sub-locations, for study. Probability sampling is a sampling technique based on a random process. Probability sampling techniques used included proportionate sampling procedure, simple random sampling, and systematic sampling procedure. A proportionate sampling procedure was applied to collect data from smallholder farmers within the sub-locations in Birongo and Ibeno locations of Kisii Central Sub-county. The proportionate sampling technique is used when the population is composed of several sub-groups that are vastly different in number. The proportionate sampling technique was used to sample the smallholder farmers for the study. Simple random sampling was applied to randomly pick the smallholder farmers practicing aspects of organic farming for the administration of questionnaires within the sub-locations. Both primary and secondary data were collected from smallholder farmers and key agricultural informants. A structured questionnaire with both closed and open-ended questions was used. Statistical analysis of data was done using the statistical software (SPSS) version 22. Frequencies, percentages, chi-square test of association, and rank biserial correlation were used to analyze the influence of socio-economic characteristics (gender, age bracket, education, religion, family size, farm size, and source of income) and perceived effects (social, economic and environmental) of organic agriculture.

3. Results and Discussion

3.1. Influence of Socio-economic Characteristics on Adoption of Organic Farming

Socio-economic characteristics are hypothesized to influence the adoption of organic farming practices in this study, including age, gender, education, family size, income, religion, employment, and farm size.

Practice	Preference (%)			
	Most Preferred	Preferred	Least Preferred	None Preferred
Crop rotation	72.2	23.2	3.6	1
Biological pest management	17.3	37.6	23.9	21.2
Use of Legumes	36.6	31.7	15.4	16.3
Cover crop	45.1	41.8	5.9	7.2
Rotational grazing	34.3	26.8	22.9	16
Livestock-crop diversification	33.3	27.8	16.7	22.2
Use of crop residues	39.9	35	6.2	19
Use of Animal manure	70.9	19	2.6	7.5
Green manures	47.4	22.9	14.7	15
Water conservation	33	26.8	16	24.2
Off-farm organic wastes	27.1	28.4	20.9	23.5

Table 1: Smallholder Farmers' Preference on Organic Farming Methods (n=306)
Source: Survey Data (2019)

Organic farming involves various practices such as crop rotation, the use of cover crops, green manure, and off-farm organic wastes, among others. The most preferred practice was crop rotation at 72.2% and the use of animal manure at 70.9%. The least preferred practice was the use of biological pest management at 23.9%. Other OF practices that were most preferred included green manure (47.45), cover crops (45.1%), use of crop residues (39.9%), use of legumes (36.6%), rotational grazing (34.35) and water conservation (33.0%) as shown in table 1. On the other hand, key informants indicated that animal manure was the most preferred organic farming practice as they encouraged farmers to use it. This was because animal manure is easily available to farmers since most of them own livestock. According to Katayama et al., (2019), farmers who practiced organic farming embraced crop rotation. This is evidenced by a study done by Adesope et al. (2012) found that crop rotation and mixed cropping were the most preferred practices. Other practices in the study included hoeing and hand weeding, intercropping, and the use of organic manure. A review study done by Duong et al. (2018) found that livestock-crop diversification and biological pest management were practiced mostly by farmers as a response to curb production risks encountered by farmers.

Availability of information on OF and views of the farmers on the effects of OF, the market of OF products, present and future demand of OF products, and the various OF methods were used to determine the relationships between perception and adoption of OF.

Rank biserial correlation was applied to determine the relationship between age, level of education, family size, and farm size and adoption of organic farming. The results of Rank bi-serial correlation are presented in table 2.

Practices	Rank Biserial Correlation Coefficient (rrb and p-value)			
	Age	Education	Family size	Farm size
Practice organic farming	-0.028	0.087	-0.056	-0.031
Crop rotation	-0.179	0.011	-0.204	-0.260
Use of crop residues	-0.163	0.113*	-0.056	-0.095
Biological pest management	0.051*	-0.017	-0.140	-0.259
Animal manure	-0.094	0.114*	-0.148	-0.110
Use of legumes	-0.034	0.101	-0.055	-0.037
Green manures	0.005	0.100	0.011	-0.038
Cover crop	-0.032	0.121*	-0.041	-0.008
Water conservation	-0.016	-0.055	0.001	-0.045
Rotational grazing	-0.015	-0.075	-0.156	-0.217
Off-farm organic waste	0.022	0.044	-0.006	-0.055
Livestock-crop diversification	0.064*	-0.140	-0.090	-0.164

Table 2: Relationship between Selected Socio-economic Characteristics and Adoption of Organic Farming Practices (n=306)
** Correlation is significant, *p<=0.05; Estimate (+ direct, - inverse)*
Source: Survey Data (2019)

It is evident that there was a positive and significant correlation between education and the use of crop residues (r=.113), animal manure (r=.114), and cover crop (r=.121). This suggests that the more education one has, the more likely one will retain crop residue and apply animal manure. Thus, education contributes significantly to the smallholder

farmers' use of animal manure and cover crop components of OF. A study done in Nepal indicated that education did not influence the adoption of organic farming. However, the training of the farmers had an influence on the adoption of farming practices (Karki et al., 2011). Other studies found that farmers who are more educated were more likely to adopt organic farming compared to less educated farmers (Azam, 2015; Digal & Placencia, 2018; Nelson et al., 2019).

Further, the results show that age of respondents, family size, farm size, and education negatively but is significantly correlated with some of the organic farming practices (Table 2). The age of smallholder farmers is negatively correlated with the adoption of crop rotation (r=-.179) and the use of crop residues (r=-.163). Family size was found to significantly relate to the adoption of biological pests control (r = -.14) and the use of animal manure (r=-.148). In contrast, education was found to relate to farm size (-.14) and livestock-crop diversification (r =.164, respectively). It is possible that older farmers have lower education and, therefore, are unlikely to have knowledge of the benefits of organic farming practices such as crop rotation and the use of crop residue. It is possible that older farmers burn or clear farms instead of leaving crop residue on the farm. The findings of the study also imply that families with many members are unlikely to use animal manure. This can be attributed to many demands and the high cost of living, which would very often lead to the sale of livestock to meet these needs. However, it is unclear why there exists a negative but significant relationship between farm size and livestock-crop diversification and family size and biological pest management. A study by Digal and Placencia (2018) indicated that farmers with small farm sizes were more likely to adopt organic farming practices than those with large farms. This could be because small farms require less labour and farm inputs compared to large farms. However, another study done by Rittinon and Uruyos (2017) found that farmers with large farms were likely to adopt organic farming practices.

Respondents were then asked to state how the selected socio-economic characteristics influenced the adoption of organic farming, and the results are presented in figure 2.

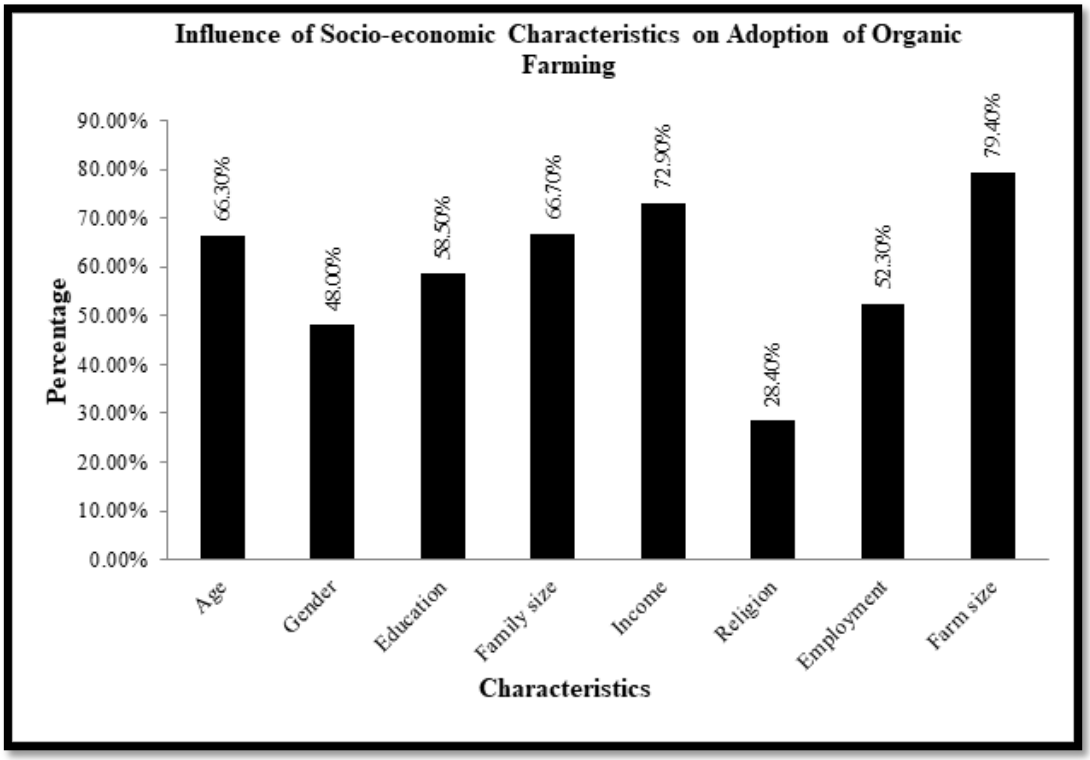

Figure 2: Perceived influence of Socio-economic Characteristics on the Adoption of Organic Farming (n=306)
Source: Survey Data (2019)

To a majority of respondents, farm size (79%), income (73%), family size (67%), and age (66%) are the leading socio-economic characteristics influencing the adoption of organic farming.

Table 3 presents results on specifics of how each of the socio-economic characteristics influences the adoption of organic farming. The findings on the influence of farm size on OF are in tandem with the socio-economic characteristic of the respondents that most smallholder farmers in Kisii Central have less than one acre under organic farming. Thus since the farmers own relatively small farms, they engage in organic farming to maximize farm production. The result on age concurs with the finding by Kariyasa and Dewi (2011) that the age of the farmer can be a determinant of the adoption of organic farming in that older farmers are assumed to have gained knowledge and experience over time and are better able to evaluate organic farming practices than younger farmers. According to Muchagi (2016), an increase in a farmer's income would probably raise the level of adoption of organic farming practices by improving the ability to buy farm inputs. Income associated with organic farming, compared with conventional farming (IFOAM, 2015), significantly improve income among smallholder farmers in the study area. Thus the statement backs the highest percentage that influences the adoption of organic farming.

Characteristic	Explanation	Yes (%)
Age	Efficiency of young and older organic farmers is lower than that of middle age	67.6
	Farmers' managerial ability in organic farming increases with an increase in age	73.2
	Farmers' experience in organic farming increases with age	73.9
	Ages of farmers affect the labour force engaged in agricultural production	81.4
Family size	Family members are the source of labour for organic farming hence reducing the cost of production	86.9
	It influences the type of organic farming method to be employed	79.7
	Large family size encourages a variety of organic farming to be practiced	73.2
Education	Training on organic farming increases the farmers' knowledge of the adoption of organic farming practices	87.9
	Time taken to acquire knowledge on organic farming affects the farmers' interest in adopting organic farming methods	57.2
	Formal and informal education affects the farmers' likelihood of adopting organic farming practices	71.9
	Availability of information on organic farming influences the farmers' choices of organic farming practices	92.5
	Knowledge of the benefits of organic farming influences the farmer to adopt organic farming practices	88.9
Gender	More women are involved in farming than men; hence, more women adopt organic farming easily	73.2
	Organic agriculture is mostly done on a small scale; hence, more women who own small farms easily adopt it	80.4
	More female smallholder farmers are flexible in the adoption of organic farming practices than men	80.1
	More males than females are involved in other occupations; thus, women tend to concentrate on small-scale organic farming practices	79.4
Income	Other sources of income for the farmer play an important role in the adoption of organic farming	82.7
	High income from organic products influences the adoption of organic farming practices	72.9
	High cost of conventional farming methods promotes the adoption of organic farming practices	73.2
Religion	Most religious groups advocate for the adoption of organic farming practices	64.4
	Most religious leaders convey information on organic farming hence the adoption	59.2
	Most Christians regard organic products as natural and healthy hence leading to the adoption	80.7
Occupation	Business influences the adoption of organic farming	73.9
	Salary employment influences the adoption of organic farming	38.6
	Wage employment influences the adoption of organic farming	45.4

Table 3: How Socio-economic Characteristics Influence Adoption of Organic Farming Practices (n=306)
Source: Survey Data (2019)

Study results show that the age of a farmer influences the labour force (81%), experience (74%), and managerial ability (73%) in the adoption of organic farming. Labour force, experience, and managerial ability are interlinked attributes of age (Holcomb et al., 2009). Labour force refers to the working-age population engaging in various activities. On the other hand, experience is the interaction with the environment to get knowledge, skills, and understanding of aspects of farming. It is expected that much older farmers work less, resulting in low production. A study by Lapple and Van Rensburg (2011) indicated that younger farmers were more likely to adopt organic farming than older farmers. On the contrary, another study done in Benin indicated that older farmers were more open to the adoption of organic farming than younger farmers (Sodjinou et al., 2015).

Family members are a source of labour in organic farming; hence, lower cost of production was mentioned to be the reason family size affects the adoption of the practices at 86.9%. This meant that the larger the family size, the more people were available to offer labour in farming, hence a high production and low labour costs. In addition, the respondents were of the opinion that family size influences the method (79.7%) and variety (73.2%) of OF. The responses might be a result of the complexity and labour requirement of the specific OF practices. According to Guesmi et al. (2012),

organic farming is labour-intensive compared to conventional farming. However, it depends on the farm structure, that is, farm type and size. Labour is required during the weeding and turning off of the compost that will be used in the farm. Also, a study by Orsini et al. (2018) found that despite OF being labour intensive, organic farms that kept livestock had low labour requirements compared to farms that planted crops. According to Ullah et al. (2015), since organic farming is labour intensive, households with many family members were more likely to adopt organic farming.

Apart from having a formal education, other aspects of education of interest in this study were the influence of having formal or informal education, training on OF, time taken to train on OF, availability of OF information, and knowledge on OF. Table 3 indicates that the availability of information (92.5%), knowledge of the benefits (88.9%), and training (87.9%) on organic farming influence farmers' choices of farming practices. On the other hand, the time taken to acquire knowledge on OF was the least factor influencing (57.2%) the respondents' approval to influence interest in OF practice. Farmers who can access more information will be well-informed about the merits and demerits of organic farming practices, which will, in turn, influence their adoption of farming practices. A study done in Pakistan indicated that farmers who were aware of organic farming were more likely to adopt farming practices (Ullah et al., 2015). According to Suwanmaneepong et al. (2020), the level of education affects farmers' likelihood of adopting organic farming. The study found out that the likelihood of adopting organic farming doubled with an increase in farmers' level of education.

The respondents (80.4%) agreed that organic agriculture is mostly done in a small scale; hence more women who own small farms easily adopt the practices. In addition, 80.1% noted that female farmers more easily adopt OF than males. Thus, the finding shows that women embrace OF in the study area more than men. The study finding differs from a study in Nigeria which indicated that there are more male smallholder farmers than their female counterparts in the agricultural sector and concurs with finding in Uganda and Tanzania, where females account for 75.7% and 80% in the agricultural sector (Salami & Mukasa, 2015).

Income played a role in influencing the adoption of farming practices. As shown in table 3, most of the respondents agreed that other sources of income of the farmers (82.7%), the high cost of conventional farming (73.9%), and high income from organic products (72.9%) influence the adoption of organic farming. The findings agreed with IFOAM (2021) report that high income associated with organic farming (compared with conventional farming) encouraged smallholder farmers to adopt various OF methods.

The respondents (81%) indicated that most Christians regarded organic products as natural and healthy, leading to the adoption of farming practices. A study by Falvey (2005) showed that religion can influence the adoption of agricultural practices since societies' knowledge is controlled by spiritual wisdom. Another study in Cameroon found that different communities performed different spiritual rituals during land preparation, planting, weeding, and harvesting. Some of the rituals involved enhancement and soil fertility and promoted crop protection (Lang, 2018). The majority of the respondents (73.9%) indicated that engagement in business influenced the adoption of organic farming. Business, especially the sale of organic products, encourages farmers to adhere to organic farming practices to access the market (either local or International).

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There was a positive and significant correlation between education and the use of crop residues (r=.113), animal manure (r=.114), and cover crop (r=.121). This suggests that the more education one has, the more likely one will retain crop residue and apply animal manure. Thus, education contributes significantly to the smallholder farmers' use of animal manure and cover crop components of OF. A study done in Nepal indicated that education did not influence the adoption of organic farming. However, the training of the farmers had an influence on the adoption of farming practices (Karki et al.,

2011). Other studies found out that farmers who were more educated were more likely to adopt organic farming than less educated farmers (Azam, 2015; Digal & Placencia, 2018; Nelson et al., 2019).

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3.2. Perceived Socio-economic and Environmental Effects of Organic Farming as Perceived by Smallholder Farmers

Many factors influence organic farming practices. The respondents were asked to choose factors that motivated their adoption and practice of OF, and the results are presented in figure 3. It is observed that health benefits (61%) are the leading motivation for households to practice organic farming. This was followed by income (46%) and neighbour's influence (41%). The finding implies that most respondents are aware of the health benefits of OF products, thus leading to the adoption and practice of the various OF. According to IFOAM (2015), the first principle of OF is to ensure high-quality, nutritious food that contributes to preventive health care and well-being. The finding concurred with Safdar et al. (2016), who noted that awareness about negative health externalities generated by conventional farming was a factor in consumers' choice of organically produced food products in the United Arab Emirates.

The second motivational factor to organic farming by the smallholder farmers in the study area was income from the organic products. Organic food products are valued more by consumers since they perceive them as healthier and more environmentally friendly, thus making consumers willing to pay a premium price for them (Rickie et al., 2012). Hence, a higher income associated with the sales of OF products attracts most farmers to adopt OF practices.

Neighbour's influence was the third factor found to motivate OF practices. According to Métouolé et al. (2018), farmers who know other organic farmers were more likely to adopt organic agriculture. Their social influence and sharing of relevant organic farming information and experience pertaining to OF practices play a role in motivating the neighbours to adopt the practice (Sapbamrer & Thammachai, 2021).

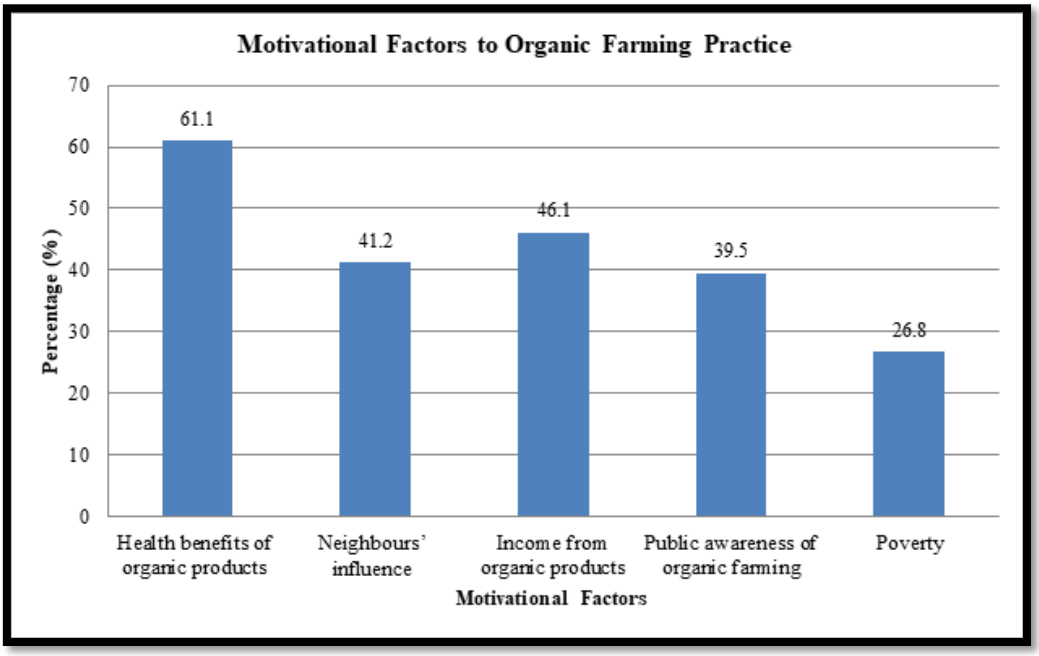

Figure 3: Motivational Factors to the Adoption of Organic Farming Practice (N=306)
Source: Survey Data (2019)

Further, the respondents were asked to state the social, economic, and environmental effects of organic farming, and the results are presented in table 5.

Effects	Categories	Frequency	Percentage
Social	Improved human health	252	82.4
	Improved livelihood and welfare	209	68.3
	Promotion of food quality and safety	227	74.2
	Protection against diseases	207	67.6
	Ensuring food security	202	66.0
Economic	Increased income from sales of organic product	250	81.7
	Reduced expenditure on chemicals farming	210	68.6
	Creation of employment	177	57.8
	Increased access to healthy food	223	72.9
Food insecurity mitigation	Increased organic farm output	295	96.4
	Diversify crops	209	68.3
	Improved nutrients contents	293	95.8
Environmental	Soil fertility and restoration	305	99.7
	Mitigate climate change	136	44.4
	Reduce surface runoff	226	73.9
	Water conservation	229	74.8
	Energy conservation	122	39.9
	Soil conservation	270	88.2

Table 5: Socio-economic and Environmental Effects of Organic Farming (n=306)
Source: Survey Data (2019)

The respondents indicated that the social benefits of OF include improved human health (82.4%) and promotion of food quality and safety (74.2%). Economic benefits indicated by most respondents included increased income from sales of organic products (81.7%) and increased access to healthy food (72.9%). Organic farming was also associated with mitigating food insecurity through increased organic farm output (96.4%).

According to Singh (2021), organic farming has a number of effects compared to conventional farming. The study identified various effects, such as improved human health due to access to healthy and safe food with minimum pesticide residues. Another effect mentioned in the study was improved soil fertility, as most farmers use organic inputs that nourish the biotic component of the soil and microbes that release, transform and transfer nutrients. Organic farming has been found to improve the economic situation of farmers through the selling of their products and the provision of employment (Prihtanti et al., 2014). Also, organic farming reduces the exposure of people to pesticides and chemicals, which have been associated with various health issues and deaths, especially in developing countries (Thindiyil et al., 2008). Economically, organic farming has been found to be more profitable than conventional farming due to lower input costs and the high price of the products (Husnain et al., 2017). The monthly family income of households practicing OF was much higher than those practicing conventional farming (Husnain et al., 2017). Therefore, income earned through OF helps to improve the living standards of farmers. In a study by Parrott et al. (2006), organic farming was found to have the potential to improve food security through the diversification of livestock and crops, subsequently diversifying income sources and a variety of diets. Environmental effects mentioned by respondents included soil fertility and restoration (99.7%) and soil conservation at 88.2%, among other effects. According to Altenbuchner (2018), OF plays an essential role in improving soil fertility through reduced exposure to toxic chemicals and lower input costs, which in turn reduces dependency on money lenders. Farming activities affect various aspects of the environment. The study further sought to establish how specific organic farming practices affect the environment, and the results are presented in table 6.

Farming Practice	Aspects of the Environment (Percentage)							
	Soil Fertility	Soil Protection	Mitigate Climate Change	Water Conservation	Reduce Surface Runoff	Energy Conservation	All of Them	None of Them
Crop rotation	56.9	7.2	0.3	0.3	0.7	0.0	26.8	22.0
Biological pests management	9.8	31.4	10.5	2.9	4.2	4.9	6.5	29.7.
Use of legumes	41.15	15.05	6.9	4.9	3.6	0.7	18.0	9.8
Cover crop	16.85	14.25	6.5	23.5	8.2	0.3	18.3	12.1
Rotational grazing	14.8	12.6	5.9	5.2	17.6	2.3	12.7	28.8
Livestock-crop diversification	15.0	10.1	7.2	4.9	16.7	7.5	19.0	19.6
Off-farm organic wastes	19.45	14.25	8.8	4.2	6.9	5.2	15.4	25.8
Green manure	42.35	11.5	2.9	2.9	4.6	1.3	16.3	18.0
Use of animal manure	50.8	9.3	3.3	2.6	2.6	1.6	23.5	6.2
Mulching	6.7	8.7	3.9	33.0	8.8	2.0	24.8	12.1
Use of crops residue	18.6	11.5	3.3	18.6	11.1	1.3	22.5	13.1

Table 6: Organic Farming Practices that Improve Aspects of the Environment (n=306)
Source: Survey Data (2019)

The results indicate that most of the smallholder farmers were of the view that organic farming practices such as crop rotation (56.9%), use of legumes (41.15%), green manure (42.35%), and use of animal manure (50.8%) improved soil fertility. The finding implies that crop rotation, the use of legume, green manure, and animal manure add soil organic matter and nutrient availability by incorporating different crop residues. This concurs with Li et al. (2013) that crop rotation and use of animal and cover cropping enhances soil quality, disrupts weeds, insects, and disease cycle, and affects carbon and nitrogen sequestration. The respondents indicated that cover crops (23.5%) improved water conservation. Thus, when cover crops are used as an OF method, water loss on the farm is reduced. According to Delgado et al. (2021), cover crops play a role in the prevention of the evaporation of water from the soil. On the other hand, a section of respondents opined that crop rotation (22%), biological pest management (30%), rotational grazing (29%), and off-farm organic wastes (26%) did not improve any aspects of the environment. Very few farmers thought that organic farming practices can mitigate climate change and conserve energy. In addition, key stakeholders included in the study indicated that OF practices improved soil texture and enhanced its capacity to hold water due to high organic matter and cover crops. According to FAO (2008), organic farming contributes to energy conservation because it reduces the use of chemicals and fertilizers that use non-renewable sources of energy used for their manufacturing. According to Nejadkoorki (2012), organic farming improves various aspects of the environment, such as biodiversity conservation, prevention of water, air, and soil pollution, and climate change, as it reduces the use of chemical fertilizers and pesticides. In light of the findings, public awareness of the benefits of organic farming needs to go beyond health and income. The contribution of organic farming to climate change mitigation and energy conservation should be brought to the fore. For instance, the use of organic biomass as a substitute for fossil fuel helps reduce GHG emissions and enhances soil carbon sequestration (Goh, 2011).

To determine the relationship between the social, economic, and environmental benefits and knowledge and perception towards organic farming practice, correlation analysis between the choice of the type of organic method to practice and benefits associated with OF was undertaken, as shown in table 7.

Choice of Type of Organic Farming	Benefits Associated with OF		
	Economic Benefits	Social Benefits	Environmental Benefits
Crop rotation	0.154*	0.121*	0.132*
Biological Pests Management	0.10*	0.06*	-0.03
Use of legumes	0.07*	0.10*	-0.012
Cover crop	0.23*	-0.08	0.16*
Rotational grazing	0.02	0.09*	0.16*
Livestock-crop diversification	0.19*	0.02	0.15*
Use of crops residue	0.14*	0.09*	0.04
Use of animal manure	0.20*	0.06*	0.09*
Green manures	-0.08	0.10*	-0.07
Water conservation	0.22*	0.13*	0.140*

Table 7: Relationship between Benefits Associated with OF and Choice of Type of OF (n=306)
** Correlation is significant, *p<=0.05; Estimate (+ direct, - inverse)*
Source: Survey Data (2019)

Table 7 shows that awareness of the social benefits associated with OF is related more to the choice of crop rotation and water conservation OF methods (r=.121 and .13, respectively). In addition, farmers who were aware of environmental benefits associated with OF positively related to their choice of:

- Cover crop (r=.16),
- Rotational grazing (r=.16),
- Livestock-crop diversification (r=.15),
- Water conservation (r=.14),
- Crop rotation (r=.132), and
- Use of animal manure (r = .09)

There is a relationship between the economic benefits of OF and water conservation (r=.22) and any other type of OF. This implies that smallholder farmers practicing the water conservation method accrue the most economic benefits of OF. In addition, knowledge and perception of the social and environmental benefits associated with OF significantly influence the adoption of crop rotation and water conservation measures of OF. A similar finding in China revealed that there is a positive association between apple smallholder farmers' knowledge and perception of the environmental benefits of OF and the choice of some OF methods to practice (Ma et al., 2017). Further, the finding concurred with Sharifuddin et al. (2018) research finding that showed that the perceived usefulness, perceived ease, and environmental concern positively affected organic rice farming in Indonesia.

4. Conclusion and Recommendation

This study on the influence of smallholder farmers' socio-economic characteristics on and perceived benefits of organic agriculture farming conclude that farm size, income, education, family size, and age of the smallholder farmers are the main socio-economic characteristics that significantly influence the adoption of organic farming in Kisii Central Sub-

County. On the other hand, gender and religion are not very significant characteristics in the adoption of OF. In Kisii Central sub-County, the smallholder farmers practice organic farming with the aim of:

- Achieving good health,
- Increasing their income, and
- Conserving the environment

Based on the findings of this study, it recommends that the promotion of organic farming practices should consider the income, education, family size, and age of farmers, and in addition, creation of awareness among farmers on other effects, especially environmental benefits of organic farming, such as biological pest management, mitigation of climate change, and energy conservation.

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6. Abbreviations

FAO: Food Agriculture Organization
GoK: Government of Kenya
IFOAM: International Federation of Organic farming Movements
IFPRI: International Food Policy Research Institute
KIOA: Kenya Institute of Organic Agriculture
KOAN: Kenya Organic Agriculture Network
KOF: Kenya Organic Farming
MoA: Ministry of Agriculture
OF: Organic Farming
SHF: Smallholder farmers

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