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Factors that influences the adoption of horticultural innovations among farmers in Wareng sub-country, Kenya

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Abstract
This paper sought to determine the factors that influence the adoption of horticultural innovations currently practiced by farmers in Wareng Sub- County, Kenya. This study adopted a descriptive survey method. The sampling frame for this study was 1480 households and 35 technical staff from Ministry of Agriculture in Wareng Sub- County. Systematic random sampling technique was used in selecting 182 household heads and purposive sampling technique was used in selecting 6 technical staff from Ministry of Agriculture Livestock and Fisheries. Both primary and secondary data was obtained for the study. Interviews schedules, questionnaires and observation were used for data collection. The study utilized descriptive analysis techniques. Quantitative data was analyzed by use of measures of frequency distribution such as frequencies, and percentages while qualitative data was summarized and interpreted in line with the research objectives and questions. Results of data analysis were presented in form of figures and tables. It emerged that the most important factors that influenced adoption of horticultural innovations amongst the farmers in the Sub-County included training attended by farmers (16.3%) land size (14.3%,) yields associated(14.2%) and educational level of farmers (13.9%). Trainings for the farmers should be organized in such a way that most farmers can afford and should be at venues very convenient to most of the farmers.

Keywords: factors, adoption, horticultural innovations

1. Introduction
The Durban International Conference on Agriculture in Africa noted that "a significant reduction of poverty in Africa can be made possible via an increase in agricultural productivity rates of the agricultural sector. Thus, only adequate agricultural practices can augment the standard of living of two- thirds of the population in SSA practicing subsistent agriculture as well as the urban poor dwellers that spend approximately 60% of their budget on food expenditure" (IFPRI, 2003).

Agriculture is the mainstay of the Kenyan economy with an annual direct and indirect contribution to GDP of 24% and 27% respectively. Horticulture is among the leading contributors to the Agricultural GDP at 33% and continues to grow at between 15 and 20% per year. The horticultural industry is among the leading foreign exchange earners. Of the total horticultural production about 96% is consumed locally, while the remaining 4% is exported; yet in terms of incomes, the export segment earns the country huge amounts of foreign exchange. In 2011 the horticultural industry earned the country Kenya shillings 91.2 billion from exports and an estimated Kenya shillings 113.8 billion from the domestic market (Republic of Kenya, 2012). The horticulture industry is the fastest growing agricultural sub-sector in the country, and is ranked third in terms of foreign exchange earnings from exports after tourism and tea (HCDA, 2009) [5].

It also contributes enormously to food security and household incomes to a majority of Kenyan producers who carry out one form of horticultural production or another. The industry employs over six million Kenyans both directly and indirectly (GOK, 2012). There is an abundance of literature that brings out the possible negative effects of ignoring the different roles adopted by men and women in the innovation processes linked to rural agriculture. Indeed, it has been shown that reducing gender inequality in Africa could significantly improve agricultural production and poverty levels (FAO, 2007; World Bank, 2008). From innovation studies, it is now clear that both social and technological processes are important for putting research into use. What is important to point out is the highly-gendered nature of these processes. The dynamics around different activities and roles that poor communities engage in towards addressing their social and economic needs through agricultural production systems epitomized the gender dimension of agricultural innovation. Notably, agricultural innovation systems target poor farmers and consumers, based on their understanding of the working of systems they are involved in. This is value- based and is also impacted by social norms. Further, the decisions pertaining to innovation processes have a bearing on social notions and are also value-laden. These are areas that are bound to have gender differences (Berdegue, 2005).

2. Methodology
This study was conducted in Wareng Sub- County of Uasin-Gishu County. The content scope is to determine the factors that influence the adoption of horticultural innovations currently practiced by farmers. This study adopted a descriptive survey method. The sampling frame comprised of the targeted 1480 household heads drawn from 61866 households. The 35 agricultural staff in the sub-county was the sample frame to pick the staff. Kesses Sub-County has 10 locations and Kapsaret sub-county has 4 locations. From each sub-county half of the locations were sampled by simple random technique. The locations selected through simple random technique were Kapseret, Ngaria, Chagaiya, Kapkoi,

Tarakwa, Oleinguse, and Kesses. Six (6) Agricultural staff were purposively selected from 35 staff in the sub-county depending on subject matter specialist relevant to this study and the heads of both sub-county. The total sample size for this study was 182 household heads and 6 agricultural staff making a total of 188. From each location randomly selected 26 household heads were selected using systematic random sample design. The sample size was determined from the formula proposed by Yamane (1967) [14]. The tools used in collection of data relevant to this study were interview schedules, questionnaires. The study utilized descriptive analysis techniques. Quantitative data was analysed by use of measures of central tendencies such as frequencies and percentages.

3. Results

3.1 Gender of respondents

Farmers were asked to indicate their gender. The results are presented in Figure 4.1.

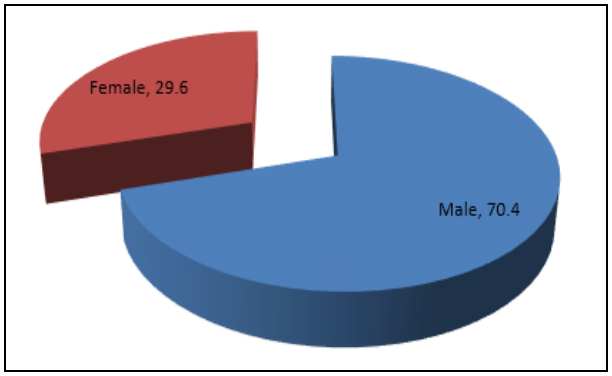

Fig 1: Gender of respondents

Figure 1 shows that 70.4% of the farmers were male while 29.6% of the horticultural farmers were female.

3.2 Age of Respondents

It was important for the farmers to indicate their age brackets in order to clearly understand the age group that is mostly involved in horticultural farming. The results showed that 41.3% of the respondents were aged 41-50 years, 29.6% respondents were aged 31 -40 years, 24.6% respondents were aged over 50 years while 4.5% respondents were aged less than 30 years as shown in Figure 2.

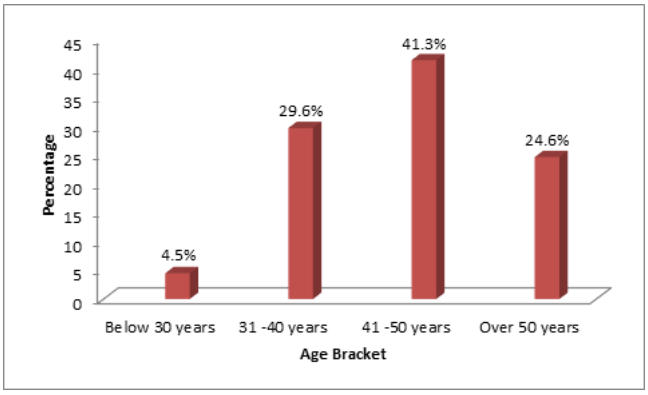

Fig 2: Age Bracket of the Respondents

3.3 Education Level of the Respondents

The level of education is important in horticulture since those with higher levels of education are expected to understand the importance of horticultural innovations. It was therefore important to understand the level of education of the respondents in order to relate it with adoption of horticultural innovations. The study found out that 34.6% respondents had secondary school level of education, 26.8% respondents had tertiary level of education, and 21.3% respondents had university level of education while 17.3% respondents had primary level of education as shown in Figure 3.

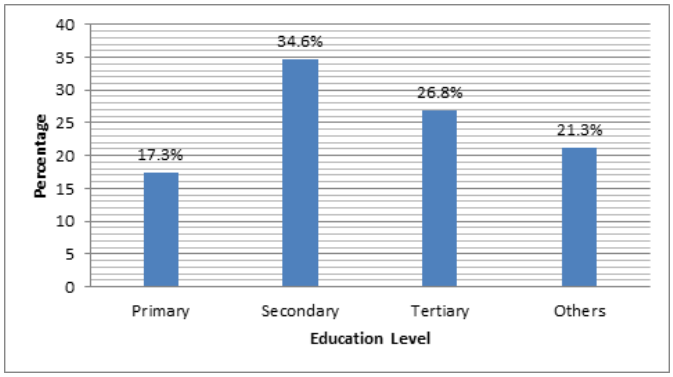

Fig 3: Education Level of Respondents

3.4 Family Size

Family size is an important determinant on the adoption of horticultural innovations. The respondents were therefore asked to indicate their family sizes. It emerged that 47.50% households had a family size of 4 -5 members, 35.20% households had 6-7 members while 17.3% households had less than 3 members as shown in Figure 4.

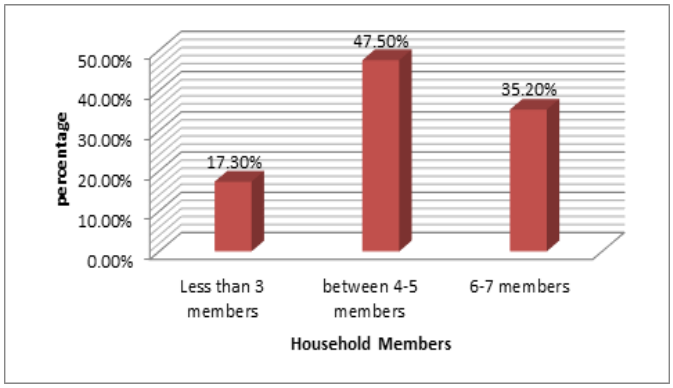

Fig 4: Family Size

4. Discussions

4.1 Gender of Respondents

The study findings indicate that most of the horticultural farmers in Wareng sub-county are male (70.7%) as compared to females (29.3%) and therefore gender influence the adoption of horticultural innovations in the area. This can be attributed to cultural land ownership practices where women have little access to land rights among the inhabitants. According to Berdegue, (2005), decisions pertaining to innovation processes have a bearing on social notions and are bound to have gender differences.

In this study therefore there is gender difference in horticultural practices as shown in table 1 where it indicates very low percentage of females in each innovation adopted, Entrepreneurship matters 4.3%, Biological innovations (new seed varieties) 3.4%, Economic collaboration 3.7% Integrated pest management 4.9%, Zero tillage 5.2% Chemical innovations (fertilizers & pesticides) 7.8%, Agronomic innovations (green 41 house) 0 % and also very low percentage of 29.3% females against 70.7% males of all the respondents who adopted all the innovations.

Table 1: Gender and Adoption of Innovations

	Responses			
	Males		Females	
	F	%	F	%
Entrepreneurship matters	55	8.1	29	4.3
Biological innovations (new seed varieties)	52	7.7	23	3.4
Economic collaboration	53	7.8	25	3.7
Integrated pest management	83	12.3	33	4.9
Zero tillage	78	11.5	35	5.2
Chemical innovations (fertilizers & pesticides	126	18.6	53	7.8
Agronomic innovations (green house)	31	4.6	0	0
Total	478	70.7	198	29.3

The availability of labour in the study area farms comes from women and men but put into proportions, from women takes the highest proportion of over 70%. Therefore the productivity of labour will increase depending on accessibility of the technology between men and women. As indicated in Table 1, 29.3% of the respondents who adopted the horticultural technologies are women it implies that labour productivity from these farms is low. To acquire the technologies for example, greenhouses the farmer need a substantial amount of money and will need to get assistance from formal banking institutions who demand collateral in form of land, house or title to some immovable assets, to act as security on the loan. It becomes very difficult for the women, who according to the culture, have no rights to ownership of property especially land this means, that the women cannot acquire the horticultural innovations.

In a study by Morris and Doss (1999) [8] on how gender affect the adoption of agricultural innovations of improved maize technology in Ghana, the study found out that the level of education, amount of land owned, number of extension visits, level of infrastructure, and number of adult males in the household were positively associated with the probability of adoption of innovations. Similarly, farmer's age, amount of land owned and soil fertility were positively associated with the probability of farmers adoption of agricultural innovations. This supported my research findings which indicated that when the factors influencing adoption of horticultural innovations studied where ranked they came in this order:-

1. Training attended 16.3%
2. Land size 14.3%
3. Yields associated 14.2%
4. Education level 13.9%
5. Accessibility of agricultural extension services 12.4%
6. Gender 11.9%
7. Accessibility of horticultural markets 8.4%
8. Age 5.3%
9. Marital status 3.2%

4.2 Age of the Respondents

According to Serra *et al*. (2007) [10] there are several economic and non-economic factors that influence the adoption of horticultural innovations among this is farmer's age. They cited that older farmers were more conservative than younger farmers were and therefore more resistant to adopting organic farming. This supported the research findings shown in Table 2 below.

Table 2: Age and adoption of innovations

	Entrepreneurship matters		Biologi cal innovations (new seed varieties		Economic collaboration		Integrated pest management		Zero tillage		Chemical innovations (fertilizers & pesticides		Agronomic innovations (green house)	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Below 30 years	4	4	3	2.9	4	5.1	6	5.2	1	1.5	8	4.5	2	6.5
31-40 years	22	26.2	28	27	19	24.4	29	25	21	31.8	53	21	9	29.0
40-50 years	33	39.3	45	43.3	37	47.4	49	42.2	27	40.9	74	41.3	9	29.0
Over 50 years	25	29.8	28	27	18	23.1	32	27.6	17	225.8	44	24.6	11	35.5
	84	100	104	100	78	100	116	100	66	100	179	100	31	100

Table 2 showed that 40-50 years age bracket, had the highest percentage of respondents who adopted the innovations since 39.3% adopted entrepreneurships matters, 43.3% adopted biological innovations (new seed varieties), 47.4% adopted economic collaborations, 42.2% adopted integrated pest management, 40.9 % adopted zero tillage, 41.3% adopted chemical innovations, and 29.0% adopted agronomic innovations (green house). while the above 50 years category in their age bracket adopted the innovations but at lower percentages as follows 29.9% of the respondent adopted entrepreneurships matters, 27.0% of the respondents adopted biological innovations(new seed varieties), 23.1% of the respondents adopted economic collaborations, 27,6% of the respondents adopted integrated pest management, 25.8 % of the respondents who adopted zero tillage, 24.6% of the respondents adopted chemical innovations, and 35.5% of the

respondents adopted agronomic innovations (green house). The 31-40 years age bracket and 40-50 years age bracket combine takes up over 60% of the respondents who adopted each innovations.

Out of all the respondents 4.5% were below 30 years, 29.6% were 31-40years, 41.3% were 41-50 years and 24.6% were over 50 years. This clearly shows that 30-40 years who fall in category of youth accounted for only 34.1% and the challenges leading to this low percentage are;

a. Most youth do not consider farming as gainful employment and only get into it as a last resort.
b. Youth have limited access to and ownership of land for farming.
c. Some youth lack funds to invest in commercial horticulture.

Though the policy interventions is that the Government will do the following

a. Provide incentives to the youth to involve themselves in different horticulture value chains by expanding innovative youth development initiatives and resources. This has been done through the Youth Enterprise Development Fund (YEDF). In a bid to encourage the country's youth to venture into agribusiness by adopting greenhouse farming, the Youth Enterprise Development Fund (YEDF) and agro inputs supplier Amiran Kenya Ltd have launched the AgriVijana loan scheme. "The AgriVijana loan is provided to youth groups across the country to buy a complete Farmers Kit from Amiran Kenya. The AgriVijana loan scheme is disbursed in batches of Kshs 358,344 per group. The Amiran Farmers Kit (AFK) to be purchased consists of 2 green houses; a drip irrigation system for the 2 green houses; seeds, fertilizers, agro-chemicals; group training and agro support and a CIC insurance package. However, very few youth have been reached by the programme.
b. Continuously address factors that limit profitability of the sector to make it an attractive economic venture for the youth. Such activities will include integrating horticultural value chain activities with other economic sectors like agro-processing, manufacturing and trade.

4.3 Education level of the Respondents

According to Uasin Gishu County Integrated Development Plan 2013-2018, nationally, about 55% primary school leavers proceed to secondary schools. In Uasin Gishu County, the transition rate from primary to secondary is 59.9% which is slightly above the 45 national average. Some of the learners unable to join secondary education either join youth polytechnics or the informal sector. At the end of the secondary education cycle about 12% of the original cohorts join universities while the rest join middle level colleges that offer skills training. The results which were in line with the development plan argument pointed out that most of the farmers interviewed had secondary level of education and above an indication that they could easily understand and adopt agricultural innovations with an aim of improving productivity and profitability.

According to Uaiene (2011) [11] on determinants of agricultural technology adoption in Mozambique, the formal education of the head of the household has a positive relationship to most technology adoption decisions. It is believed that education gives farmers the ability to perceive, interpret and respond to new information much faster than their counterparts without education. In this study, the education level of most respondents is high and therefore they have the ability to respond to new innovations in horticulture.

4.4 Family size

The results showed that 47.50% households had a family size of 4 -5 members, 35.20% households had 6-7 members while 17.3% households had less than 3 members. A larger portion of households practicing horticultural farming in the study area comprised of medium family sizes (between 4-5 members). According to Agwu (2004) one of the most important factors conditioning the level of production and productivity of small-scale farmers is the composition and size of the family. Hence the relatively large family size 46 of the farmers is an obvious advantage, since it may likely enable the farmers to use family labour, thereby reducing labour cost required in Horticultural production.

The labor market affects technology adoption differently depending on whether the area targeted with the technology has a net labor shortage or net labor surplus. Another consideration is whether the proposed technology is labor-saving or labor-intensive. Higher labor supply is associated with higher rates of adoption of labor-intensive technologies. Lee (2005) sums up findings showing that household size and labor availability have been shown to influence adoption of soil conservation investments in the Philippines and Ethiopia. Polson and Spencer, (2008) looking at HYV adoption of cassava among subsistence farmers in Nigeria, found that family size (and therefore labor availability) was not a significant influencer of adoption. They explain this discrepancy by suggesting that subsistence farming does not experience the same types of labor shortages as income-generating agriculture.

5. Conclusion

The demographic characteristics of the farmers that influences adoption of horticultural innovations amongst the farmers in Wareng sub-county included gender, age, education level and family size.

6. Recommendations

Trainings for the farmers should be organized in such a way that most farmers can afford and should be at venues very convenient to most of the farmers. The agricultural private sectors should be supported or facilitated by the government to organize farmers training on horticultural farming so that more farmers receive these horticultural farming trainings. Agricultural shows of Kenya should organize shows specific for horticultural farming so that trainings on all the many horticultural crops can be done on all the stages that is from seed sowing and other propagation methods to harvesting stages.

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