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Women and Youth in Climate Change Oriented Strawberry Farming on Forest Resources: Focus on Mt Kenya West Ecosystem

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Abstract
In many developing countries, the agriculture sector is dominant in raising incomes among the poor by as much as four times than other sectors realizing about 17% of the GDP and 40% of exports are from Agriculture according to World Bank, 2008. The main development problem facing women and youth living adjacent to the forest is low annual income levels which have created pressure on forest resources causing degradation of the ecosystems. According to Nyeri County Integrated Development Plan 2013 -2017. There is a huge population of unemployed workforce especially the youth due to poor market information, inadequate agricultural inputs, lack of credit and limited capacity. Women in Nyeri County constitute 51 percent and the youth 57% of the active labour force who are discriminated by the economy in access and control of productive resources. The objective of the study was to (1) Investigate the production challenges facing women and youth in the production of strawberry as a high value crop. (2) To analyze the market strawberry value chain. (3) To determine if income earned from strawberry correlated in any way with the reduction of pressure on forest resources. The study design was non-experimental and cross-sectional in nature by use of representative sample of 315 respondents. Purposive sampling was applied in the selection of the target villages where then random sampling method was applied in the identification of the final respondents. The methodology used in data collection was both quantitative and qualitative. The data collection tools included a structured questionnaire for the quantitative survey, focus group discussion and key informant interviews done on the key program stakeholders. The target respondents for this study were primarily the women and youth farmers within the study area. Data analysis for the quantitative data was done by use of SPSS software and content analysis for the qualitative data. Key findings of the study was that participation of women and youth was low due to lack of credit to acquire quality planting materials, poor farming skills and exploitation by middle men in the strawberry market value chain. The youth were not allocated adequate and suitable land to participate in farming. The study recommended that capacity development on production and market linkages is imperative to enhance on gains. Participation of youth in the project indicated that there was a positive correlation between income gains and reduction of forest destruction in the adjacent forests.

Key words: Women and youth, forest, strawberry farming, income, capacity development

Background of the Study

Agriculture sector provides about 70% of employment opportunities in Kenya (Strategy for Revitalizing Agriculture - 2004- 2014). In many developing countries, the agriculture sector is dominant in raising incomes among the poor by as much as four times than other sectors realizing about 17% of the GDP and 40% of exports are from Agriculture according to World Bank, 2008. Youth overlook opportunities availed by agriculture in pursuit of white collar job in urban centers and cities. An estimated 64% of Kenya's unemployed persons are youth (Lucy K. Njeru, 2007). The study focused on Nyeri County and like other counties of Kenya she faces a challenge of big population of women and youth whose potential to increase agricultural diversification, productivity and marketing is yet to be utilized. Globally, forests have been very important to more than two billion people because they form an important

source of products and services for their livelihood along with other environmental benefits (Ahenkan & Boon, 2011). Forest adjacent communities depend either on forest products or agriculture for survival. The reason for the inclusion of women and youth in the management of forests is to make them support forest sustainability as well as biodiversity conservation efforts so that in the process they can also achieve socioeconomic benefits (Ngece, Kakuru & Kimani, 2007). Morgera and Tsioumani (2010) underlined the importance of involving communities in alternative sources of income to reduce pressure on forest resources.

A number of factors have been identified as limiting women and youth participation in agriculture which include low returns on time and input investments, seasonality of incomes, lack of knowledge on modern farming and marketing approaches, lack of innovations leading to reliance on traditional labour-based production techniques, concentration on a narrow range of agricultural commodities mainly staple crops, limited access to land, and low investments in the infrastructure necessary for efficient value chains according to Peter Njenga, (2010). According to Sideridis (2010), poverty and hunger in developing countries can be addressed through increasing farm productivity. The Millennium Ecosystem Assessment (MEA) report 2005 states that direct drivers of change in ecosystems and biodiversity are growing in intensity. The drivers collectively influence the level of production and consumption of ecosystem and livelihood sustainability. The sustainable livelihood framework is not just an approach to food security, but is a more general approach to development and theory (Burchi $ Muro 2015).

Despite global improvement in technology; many smallholder producers in Kenya find themselves in a cycle of poverty, merely surviving from cropping season to another (ACDI-VOCA, 2010; Renkow, Hallstrom and Karanja, 2014). Lack of access to input and output markets is a key limitation towards transformation of the agricultural sector from subsistence to commercial production. (Source: Poverty Effects of Straddling: Rural Income Diversification in Nyeri and Kakamega Counties, Kenya, 2014).

Unlike the staple crops grown by most women, strawberry is a high value cash crop that can be grown in a small parcel of land and its less labor intensive. Women play a dominant role in food security as enabling majority of rural household food secure according to Abdullah et al (2017). Once established, strawberry is harvested 2- 3 times a week throughout the year for up to three years when a cycle change is made. From the smallest farm of 50 ft. x100ft (or 1/8 acres a farmer will earn a minimum of USD 14000 over the production cycle. It is an ideal high value crop for both youth and women as it earns regular income and has less labour demands. There are opportunities for women and youth to become the engines for driving rural transformation by playing a leading role in agriculture and agribusiness enterprises hence reducing pressure on forest resources through improvement of market access of farm produce neighbouring the forest (Kirsten, 2010, Munyua *et al* 2008)).

The aim of the intervention is to help diversify agricultural based income generating opportunities and create employment for women & youth of mixed gender, and thereby reduce the vulnerability of targeted youth to drug abuse and indulging non-productive and illegal activities like logging in the neighbouring forest by initiating strawberry farming as an attractive and a rewarding venture. Strawberry is a high value crop that requires relatively small piece of land to produce, requires little amount of water at 25mm/ plant/week, it's less bulky, and has ready market and provide enormous income and employment opportunities for the targeted women and youth. The study established that strawberry production provides a perfect farm enterprise for youth and women considering the shrinking land sizes, the changing climate and the increasingly low returns in the conventional agriculture sector.

Justifications of the study

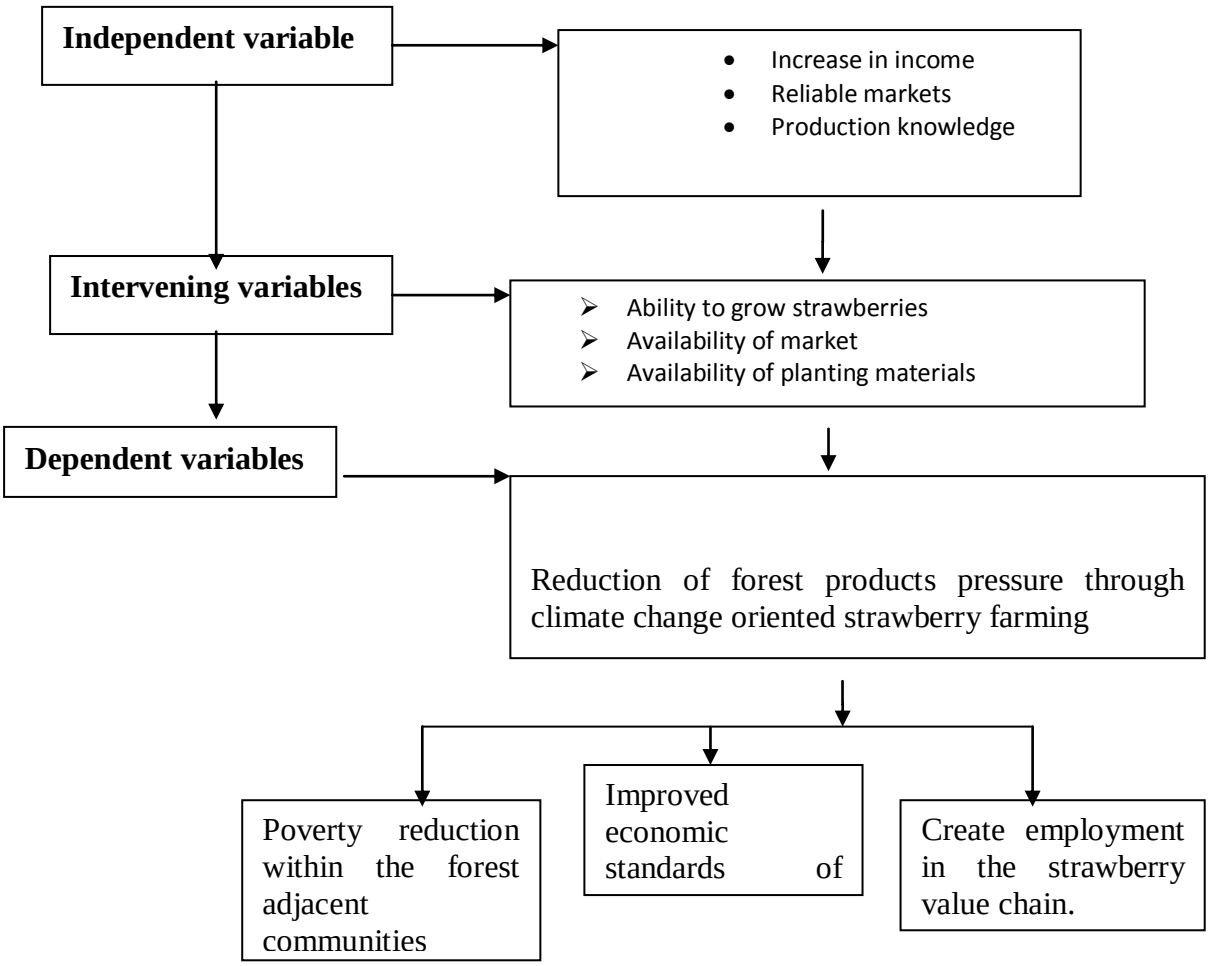
The main development problem facing Nyeri County is low annual income levels among Women and Youth. Nyeri has a huge population of unemployed/underemployed workforce (women and youth) whose energy, knowledge and skills are not being utilized to advance agricultural development. The Nyeri County Integrated Development Plan 2013- 2017 notes that a great proportion of the population in the county has been living on very low incomes mainly due to rampant unemployment and under employment among the youth. Further, poor market information and inadequate use of appropriate technology have also contributed to low incomes. In addition, farmers lack capacity to add value to their agricultural products and hence are not able to receive high prices in the market; they rely on middle men. Women in Nyeri County constitute 51 per cent of the population and contribute 70 per cent of the agricultural labour force but they are discriminated in access and control of productive resources.

Despite women and youth being the main source of labour in the agricultural sector, they do not own land hence cannot access credit facilities due to lack of collateral to secure loans. On the other hand, the youth form about 57% of the total active labour force; however, due to the high level of unemployment and lack of vocational skills demanded by the economy, most of the youth have not been absorbed in the job market. This minimizes opportunities for economic development that would reduce poverty. When women and youth lack livelihoods, they turn to forest products hence accelerating environmental degradation of the ecosystem. The study therefore aimed to establish the role of strawberry farming in reduction of pressure of forest resources.

The study objectives

1. To determine the drivers that influence production of strawberry as a high value crop by women and youth
2. To analyze the relevance of strawberry value chain in climate change interventions
3. To determine if income earned from strawberry correlated in any way with the reduction of pressure on forest resources.

Conceptual Framework



Research Methodology

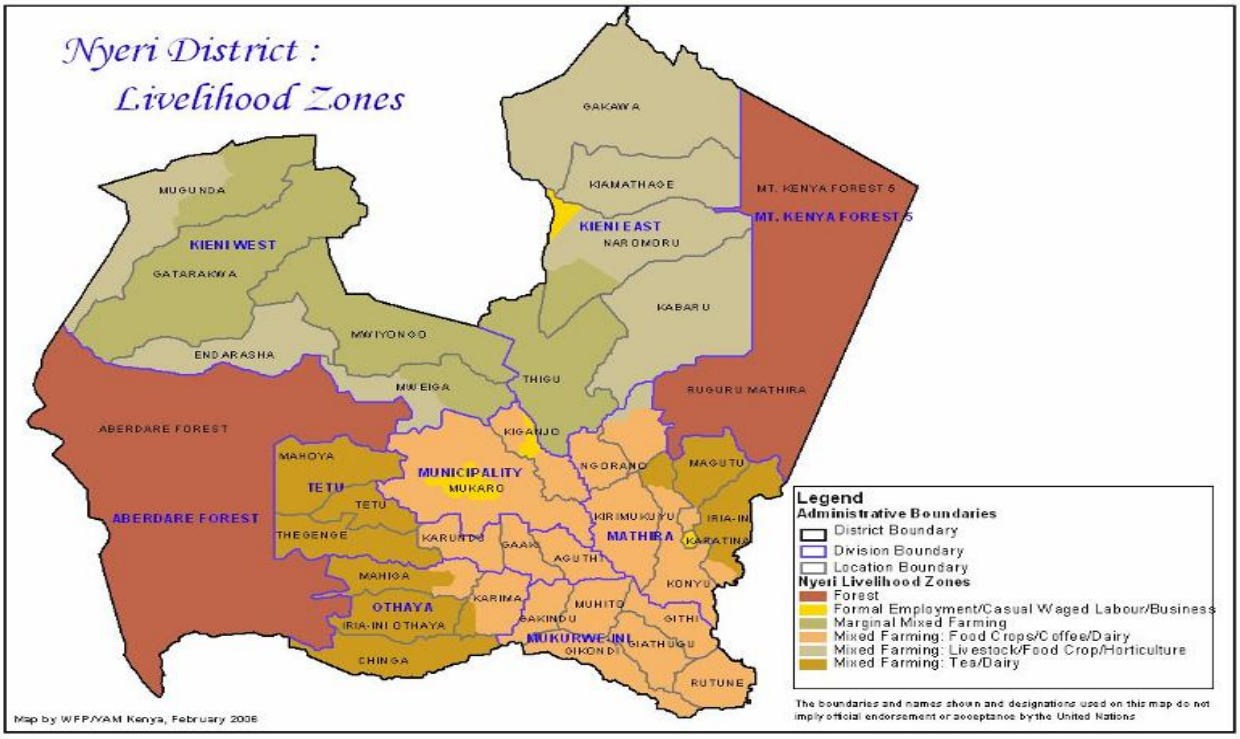
The study design was non-experimental and cross-sectional in nature by use of representative sample of 315 forest adjacent farmers involved in strawberry farmers for inference and generalization of the findings for the entire population. The main data collection method was the quantitative survey by use of structured questionnaire, focus group discussions and key informant interviews. The study targeted smallholder farmers (women and youth) that practice strawberry farming in the region. The farming enterprise endeavors to maximize returns at every level of strawberry value chain.

One of the objectives of the study was to assess the efficiency in strawberry production and what can determine increase in production to increase small holder income. The study focused on the intricacies related to the formation and strengthening of strawberry producer groups in order to ensure cost effective delivery of technical skills particularly in GAPs, post harvesting management, and marketing services for wide adoption among the small holder famers with the aim of increasing productivity to increase income and reduce pressure on forest products.

Strawberry farming for the women and youth in the focus area of the study was designed to create alternative employment and income opportunities, increase resilience against changing climatic conditions and decreasing land sizes by reducing overreliance on conventional crops that are vulnerable to drought, and engage women and youth productive

economic activities throughout the year that are not forest related. The study therefore focused on women and youth who meet the basic criteria of being close to a reliable source of irrigation water. Youth and women residing in the areas targeted by this study were noted to be actively involved in agriculture which is the mainstay in rural Kenya despite the negative impacts of climate change and the ever reducing farm land due to subdivision as supported by Kidane *et al* (2006) study on food security and agricultural development in Africa.

Study area



The scope of the study

This study involved a complete randomized probabilistic sample of a population of Sagana Scheme with a population of 1500 members. The data collected was both qualitative and quantitative in nature.

Data collection instruments

The study followed exploratory research design. Quantitative research method was adopted to collect data from the study respondents. The survey design was non-experimental and cross-sectional in nature by use of representative sample for inference and generalization of the findings for the entire population. Data collection tools including the survey questionnaire and the qualitative data collection instruments which included the focus group discussion and key informant interview guides. The scope also included field data collection from the farmers within the mentioned sub-counties for both those growing and those not growing strawberry as a crop to act as a control group

Data collection methods

The methodology used in data collection was both quantitative and qualitative with more emphasis on the quantitative method. The data collection tools included a structured questionnaire for the quantitative survey, focus group discussion and key informant interviews done on the key program stakeholders. The target respondents for this study were

primarily the farmers (women and youth) within the study area. The enumerators were drawn from the respective wards to make their movement easy and also ensure they interview the right category of farmers.

Data analysis

Data analysis for the quantitative data was done by use of SPSS software and content analysis for the qualitative data.

Sampling technique

Purposive sampling was applied in the selection of the target villages where then random sampling method was applied in the identification of the final respondents. The justification on the use of purposive sampling is due to the fact that within the target area there are forest adjacent farmers not involved in strawberry farming. Therefore the farmers were selected using random sampling method and the selection of the respondents was applied whereby in the context of the survey the farmers were selected by jumping one household from the starting point, in other words the 3rd household from the starting point was selected for the questionnaire administration.

Table 1: Sample Size Calculation

The following formula was used in calculating the random sample for the quantitative survey;

N (population size)	**1500 (larger target)**	**Required sample size = 315**
(confidence level)	95%	
E (+- error)	0.05	
N	Population	
n	Required sample Size N =n/1+ (n) (e) (e)	

Key findings

Age and gender distribution of respondents

Against the conventional analysis based on gender of the respondent the analysis was tailored to match the project target beneficiaries who were mainly categorised as Women and Youth and this called for disaggregation in terms of age groups. Generally, it emerged that majority of the respondents were those within the age cohort of between 36 years 45 years followed closely by those within the cohort of 46 years and above and lastly the cohort of 35 years and below which would categorized as the youth according to the official definition in Kenya.

Further disaggregation revealed that the category under youth was 27.8% (98), women 35.1 %(124) and men 37.1 %(131).The definition of "Women" was customized to denote the respondents of the female gender above 35 years only and thus excluding the females below 35 years who were categorised as "Youth" and this meant the definition of the youth was not limited to male respondents only but a mixer of female and males. The table below presents the disaggregated information and the respective number and percentage of each age category.

Table 2: Distribution of Respondent by Age and Gender

Age Bracket	Number	Percentage	Remarks
Youth(35 years and Below)	90	29.0 %	Both Female and Male
Women(Above 35 years)	113	35.1%	Women only
Men(above 35 years)	112	35.9%	Men only
Total	**315**	**100%**	

Average Household Size

The average house hold size in general terms was 4 members where the survey was conducted with the most frequent number of household member being 5. The average household size matches with the Kenya population data whereby the average household size is 4.4 members per household.

Table 3 Average Household size

Measure of Central Tendency	Result
Mean(Average)	4.3
Mode(most frequent)	5
N Value	349

The percentage of farmers who had accessed certified propagation materials was low at 5.5%(8) since majority of them at 60.3% got their strawberry propagation materials from the previous season and 34.2% were given or bough from other farmers. In terms of youth and women only a small percentage at 0.7 %(1) Youth and 1.4 % (2) women accessed the certified propagation materials. The varieties of strawberry grown in the study areas were dominated by the Chandelier planted by 62.6% of the farmers followed by Douglass. This information was also triangulated through the focus group discussions and the key informant interviews. The average acreage under Chandelier which is regarded as the high yielding strawberry variety was 0.3 acres per farmer.

Figure 1: Sources of strawberry propagation materials

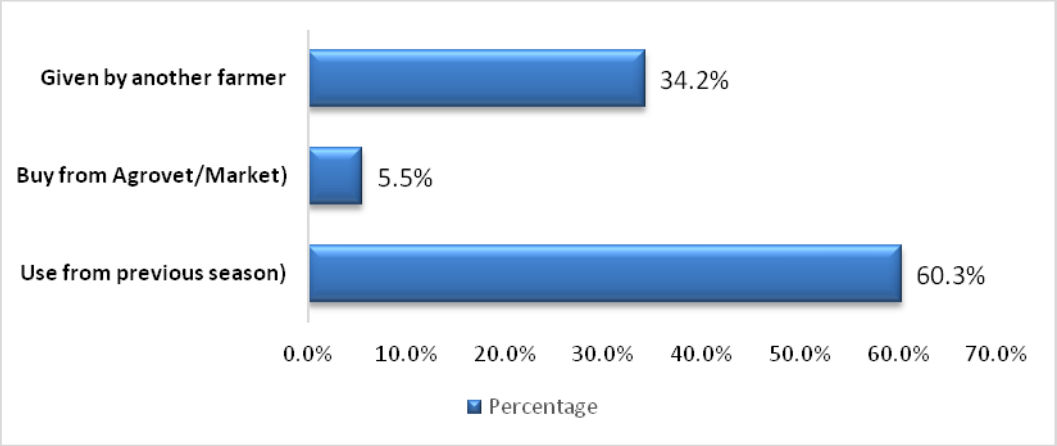
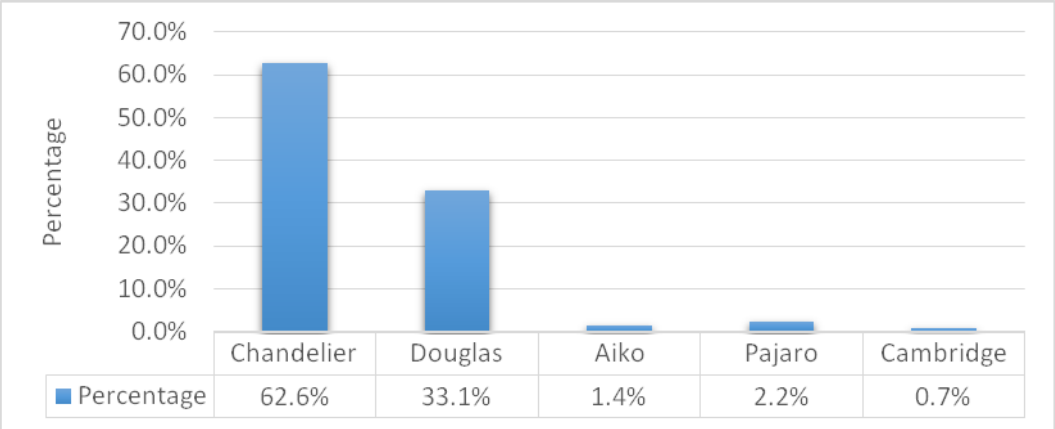


Figure 2: Varieties of strawberry grown



Good Agronomic Practices (GAP) essentially extends beyond agricultural production to enable farmers and consumers enjoy the added guarantee of a dependable product at every stage of its production and distribution process from seed to shelf. While there are numerous competing definitions of what methods constitute good agronomic practices, there are several broadly accepted methods that producers of strawberries can adhere to.

In the context of strawberry production the study established that GAPs includes; proper spacing, weed management, planting material selection, pest control, crop rotation and disease control. In general the percentage of respondents who had undergone training of GAP in the past were 8.5% and further disaggregation in terms of youth and women indicates 1.8%(4) of the youth had undergone GAP training and 6.8%(15) for the women.. The main providers of GAP trainings was found to be farmers who sponsored themselves for the trainings followed by training provided by local NGOs and the Ministry of Agriculture

Figure 3: Types of GAP accessed

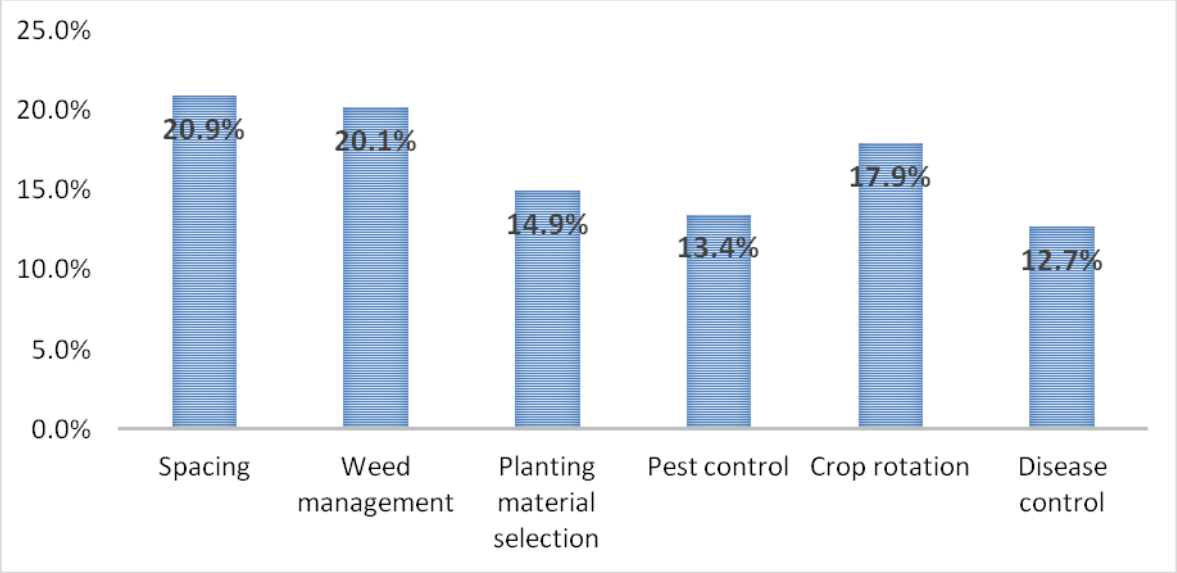
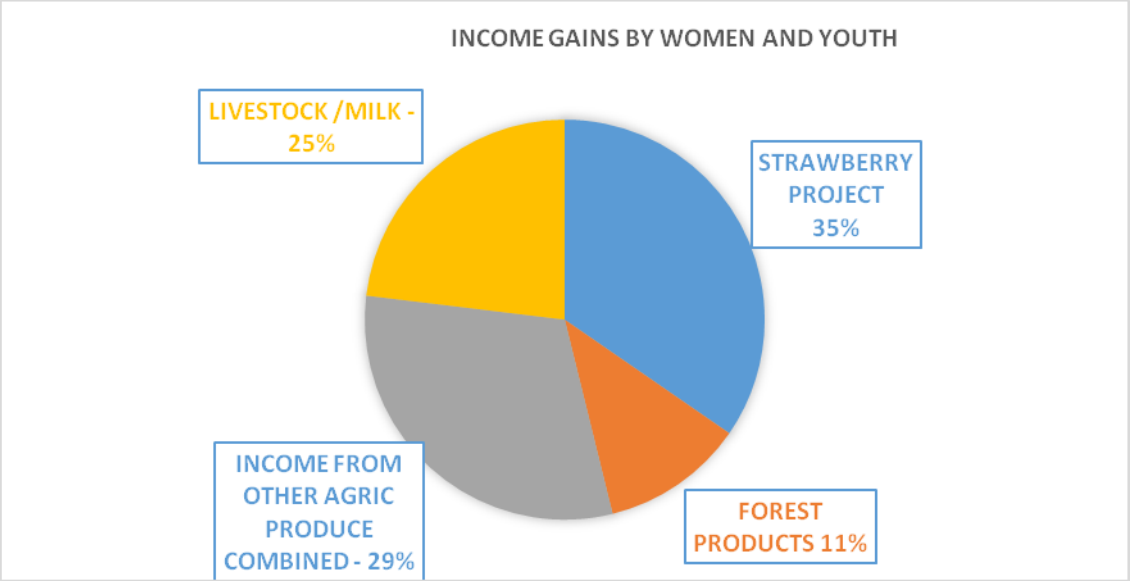


Figure 4: Income gains from enterprises



The study results indicated that the income from strawberry project was the highest at 35%. Income from the forest products was lowest at 11% an indication of reduction of pressure on forest products.

Figure 5: Percentage of farmers growing strawberry and purpose

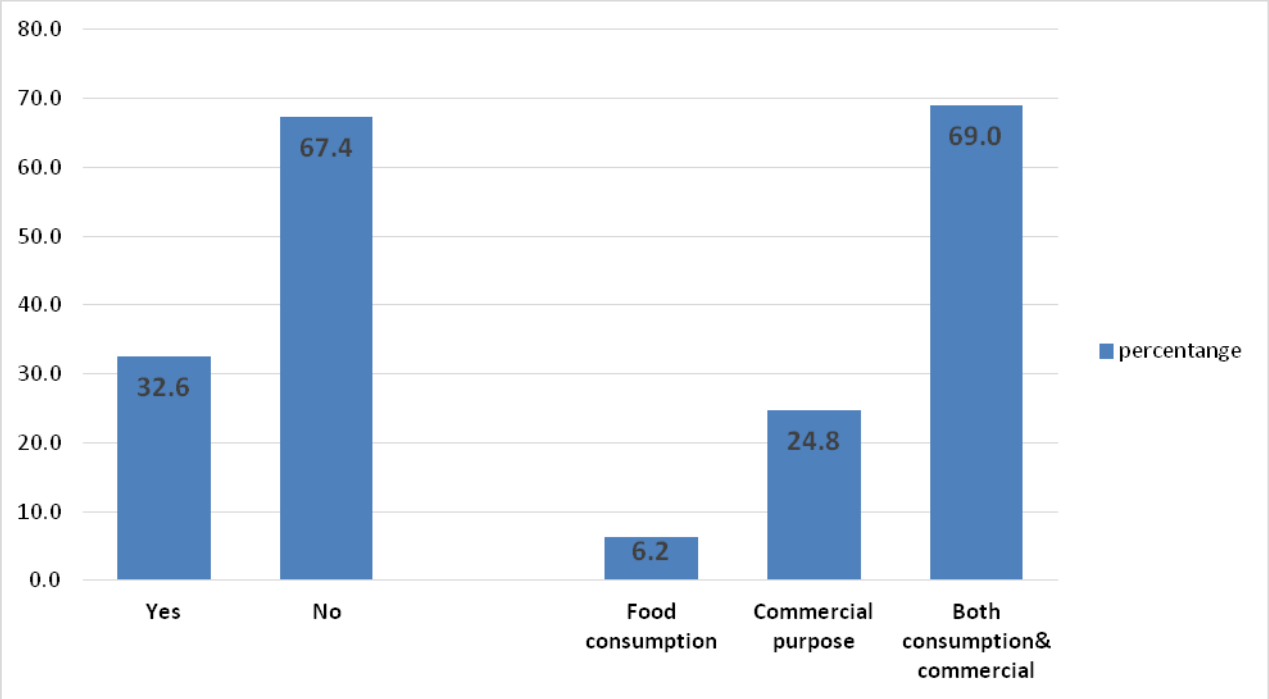


Table 4: Purpose of growing strawberry per gender and age

Age of Respondent		**Gender of Respondent**		**Total**
		Male	Female	
35 Years& Below	Food consumption	0	1	1
	Commercial purpose	5	6	11
	Both consumption & commercial	8	13	21
	Total	**13**	**20**	**33**
36- 45 Years	Food consumption	2	3	5
	Commercial purpose	6	5	11
	Both consumption& commercial	11	19	30
	Total	**19**	**27**	**46**
46 Years & Above	Food consumption	0	1	1
	Commercial purpose	4	2	6
	Both consumption & commercial	9	18	27
	Total	**13**	**21**	**34**
Total	Food consumption	2	5	7
	Commercial purpose	15	13	28
	Both consumption & commercial	28	50	78
	Total	**45**	**68**	**113**

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However, it was noted that there were a number of outliers regarding the average number of acres under strawberry production as presented in table 8 below and thus a further analysis was done excluding the outliers where the trimmed mean came to 0.14 acres per farmer (slightly above an 1/8). During the Focus Group Discussions (FGD), it emerged that brokers play a part in the value chain and they exploit the farmers since they offer low prices and sometimes fail to pay for the produce.

Table 5: Acreage Under Strawberry Production

			Statistic	Std. Error
Acres under strawberry	Mean		0.19899	0.028122
	95% Confidence Interval for Mean	Lower Bound	0.14326	
		Upper Bound	0.25472	
	5% Trimmed Mean		**0.14984**	
	Median		0.12500	
	Variance		0.088	
	Std. Deviation		0.296284	
	Minimum		0.025	
	Maximum		2.500	
	Range		2.475	
	Interquartile Range		0.000	
	Skewness		6.491	0.229
	Kurtosis		45.099	0.455

The study also noted that acreage with high yielding strawberry varieties and the percentage of farmers who had accessed improved planting materials was low at 5.5%(8) since majority of them at 60.3% got their strawberry propagation materials from the previous season and 34.2% were given or bough from other farmers.

Table 6: Role of Strawberry Farming in Reduction of Pressure on Forest Resources

Sub-Factor	Percent
Contributes to income for women and youth	72%
Reduces magnitude of logging in the forest	66%
Discourages youth from destroying the forest	69%
Improves health of women by avoiding forest related tasks e.g. firewood fetching for sale	59%
Income from strawberry has impact on reafforestation	60%

The study indicated that communities appreciate the role played by strawberry farming to reduce pressure on forest resources. Forest degradation activities like logging were noted to reduce significantly since the youth had other better income engagements. Women spent more time on the farm and focused more on the strawberry income than depending on firewood harvesting which in the past had been documented to affect their health. The study confirmed the objective that income earned from strawberry correlated positively with the reduction of pressure on forest resources.

Conclusions and recommendations

From the study, it's clear that strawberry farming is a viable enterprise for forest adjacent farmers and indeed it has positive impact in the reduction of pressure from forest resources. Engaging women and youth in the project has significant impact reduction of forest degradation since the main focus is on income regardless of the source. The participation of

more women and youth should be encouraged and address the drivers that affect the production like acquisition of
quality planting materials, poor farming skills and exploitation by middle men in the strawberry market value chain.
The youth should be allocated adequate and suitable land to participate in strawberry farming. The study hence recommends that capacity development on production and market linkages is imperative to enhance on gains. Participation of youth in the project indicated that there was a positive correlation between income gains and reduction of forest destruction in the adjacent forests. However, to achieve more benefits it's imperative to address the challenges that affect strawberry farmers like market, trainings, access to quality planting materials among others. Policies on agricultural productivity to reduce the dominance of brokers who exploit the famers should be developed and development of strategies to empower farmers to form marketing associations. The decision makers must put at the top of their agenda women and youth empowerment to support agriculture projects to hence food security, a point also emphasized by Tambi *et al* 2016.

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