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Influence of value addition from Kalamba agro-processing fruit industry on socio-economic welfare of farmers in Nzaui Sub-County

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Abstract
Postharvest loss is one of the glaring challenges that affect agricultural development and overall improved livelihoods among farmers in developing countries. In Makueni County, farmers used to experience up to 60 per cent of post-harvest losses. However, in 2017, the County Government of Makueni established an agro-processing plant to curb post-harvest losses and raise incomes for fruit farmers in the County. In this respect, the study sought to ascertain how the growth of the Kalamba agro-processing fruit industry has affected the socio-economic well-being of farmers in Makueni County. The focus of the study was in Nzaui Sub County, as it is one of the top producers of mangoes and hosts the location of the industry. The specific objectives of the study sought to establish the effect of value addition, access to new markets, training and access to financial resources on socio-economic welfare of farmers in Nzaui Sub County. A descriptive research design was adopted for this study. Data was collected by administering a questionnaire to 384 mango and tomato farmers. The sample size was determined using the formula developed by Mugenda and Mugenda formula in 2012 based on the target population. Additionally, 1 Industry representative, 1 county agricultural officer and 1 co-operative society official were interviewed for the study. The data obtained was analysed using SPSS version 28 and excel software and results presented in graphs, tables and charts. The relationship between the variables was tested at a significant level of 0.05. The study results established that there is a very strong significant correlation between value addition and socio-economic welfare of farmers in Nzaui sub-County ($r = .732^{**}$ and a p-value of.000). The study recommends that support programmes should be introduced by the government so as to promote the improvement of the technical efficiency of the agro-processing industry and consequently the total factor productivity of the agro-processing industry. The study also recommends that there is need to support existing farmers' associations and cooperatives. This will enable farmers to have good negotiation power on their produce and in the long run it will generate more income and hence improved welfare. The significance of the study will be to provide new information to scholars and researchers, food security experts, county governments, national governments and other relevant stakeholders.

Keywords: agro-processing, farmers, nzaui, socio-economic welfare, value addition

Introduction

1.1 Background of the study

Agriculture plays a critical role in the economy of every country (Lawrence & Obushe, 2021) [21]. Besides providing food for the entire population of a country, agriculture also helps to connect and interact with all the related industries of that country (Mohammed, 2015) [30]. The multifunctional nature of the agricultural sector usually results to a trickledown effect on the industrial and socio-economic dynamics of a nation. According to a World Bank report of 2016, it showed that a large percentage of the world population is mainly situated in rural areas, which are predominantly agricultural zones. It is therefore essential to put more focus on agricultural activities to enable poverty eradication and raising the welfare standards of the population.

More than 70 percent of the world's poorest people live in rural areas and rely largely on agriculture (Lawrence & Obushe, 2021). This is attributed to poor productivity, the lack of market access, poor infrastructure, post-harvest losses and lack of technology which results in hunger, limited income and eventually rural poverty (Voegele, 2014) [35]. However, value in agriculture could be achieved through investment in value addition, as well as improving post-harvest operations, storage, distribution and logistics. The adoption of an agro-processing industry development strategy creates opportunities for structural transformation and economic growth. This eventually leads to poverty reduction and improved social outcomes (Koira, 2014) [16]. According to the World Bank (2017) [37], there is a strong correlation between agro-processing industry and poverty reduction in Sub-Saharan Africa.

Agriculture has been an essential industry for nearly all major economies in the world. Globally, Agriculture accounted for one-third of Gross Domestic Product (GDP) in 2014. The agriculture sector also accounted for 31 per cent of global employment in 2013 (IDA, 2019). In developed countries, agricultural advancement and investment in industrial development catapulted the economic prosperity of advanced countries such as China and Malaysia. Developing countries have realized the importance of creating economic growth through agricultural production and exports. According to the World Bank report of 2017 growth in agro-processing industry has

tremendous impact in development of agriculture sector, which has been shown to have at least twice as much impact on poverty reduction than investment in any other sector.

In China, during the 1980s and 1990s remarkable annual economic growth rate of 9.5 per cent was reported. This was experienced because of development of rural and agricultural policy reforms in the late 1970 and early 1980. The development of appropriate policies that advocate for agricultural sector development is key especially where the aforementioned policy is coupled with providing avenues for public funding of essential infrastructure facilities and services for promoting agro processing industry development (Moussa, 2015) [31].In Malaysia, the agro-processing industrial sector is vibrant with production of more than 30 products from oil palm and tree, as well as exporting a refined version of palm oil as bio-fuel. It provides major employment for the people, especially from the rural areas. In 2014, this sector employed more than 1.6 million people or 10.9% of the total employment, contributed more than 23% of the total export earnings and adds about 7.2% of Malaysia's GDP (Dardak1, 2015) [7].

In Brazil in 2016, the agribusiness sector (agriculture inputs, transformation, production and distribution) comprised nearly one-fifth of the national economy, contributing about R$1.5 to the country's total GDP of approximately R$6.3 trillion. Although the sector's contribution to total GDP has decreased somewhat over the past 10 years (falling from 26.32% in 1993 to 23% at present), in absolute terms agricultural growth has been positive and significant (Arias, 2017) [2].In many African countries, the agricultural sector is a dominant economic sector and employs a majority of Africa's population. The sector employs about 70% of the total working population and contributes between 30-60% to the total GDP.

However, 49% of the population live on less than $1.25 per day (Asige & Obushe, 2022) [4]. This implies that Africa's agriculture is not creating as much value as it should (KBA, 2018). In Africa, agro-processing is deemed inexistent or just basic especially in the rural areas. This has resulted to huge post-harvest losses in the Sub-Sahara countries. For example, horticulture products such as fruits and vegetables, experienced post-harvest losses ranging between 35-50% of total production amount, while the post-harvest losses for grains ranges between 15-25% (African Development Bank Group, 2019) [1]. As such, growth in agricultural investments and production depends on sufficient complementary investments in agro-processing industry.

Most of the developing countries of the world are exporters of primary products. These products contribute 60 to 70 percent of the total export earnings. However, primary goods attract low prices in the international market and therefore the prospects of increasing export earnings through them are limited. Due to this, developing countries like Kenya, Tanzania and Uganda are making efforts to diversify their production structure and promote the exports of manufactured goods. Eradicating food insecurity and hunger in Africa can be achieved through agriculture industrialization or by introducing agricultural innovations to become more competitive (Mendes et.al, 2014) [28]. According to World Bank (2015) [36], it advocates that in order to promote growth inclusiveness, African economies should shift from low to high-productivity activities and sectors. It is encouraged that Africa requires to transform from a resource-based economy towards an industry or service-based economy. The challenges faced in investment in agro-processing industries in African countries is attributed to low investment in technology, poor infrastructure, lack of capacity building and low access to finances among others.

In Mali, agro-processing industries contribute only 1.5 per cent the national GDP. This is despite being rich in fruit and vegetables processing, animal-based industries such as dairy, meat, leather and fish; cashew nuts and shea processing; processing of tobacco and cereals; sugar refining; processing of cashew nuts and shea; and cotton processing industry. Out of the total labour force, only 0.3% is employed in the agro-processing industry sector. In addition, the agricultural sector commonly experiences seasonal unemployment and it usually lasts several months i.e., 4 to 7 months per year (MEFP *et al.* 2014,) [27]. This has resulted to increased poverty levels experienced especially in rural areas. The situation is witnessed largely by three quarters of the rural inhabitants compared to one third of the urban population.

The economy of Kenya is largely agricultural, with the sector being the leading contributor to both exports and GDP. It contributes 33% of the gross domestic product (GDP) and constitutes 65% of the export earnings. The sector employs more than 40% of the total population and 70% of the rural population. However, majority of the agricultural produce does not undergo any processing. It is exported, marketed or consumed in raw form. There is minimal value addition and this is attributed to among others high operational costs, lack of proper processing machinery and spare parts, and the limited knowledge in operation of the machines (FAO 2021) [8].

Limited value addition is a major contributor to food insecurity, especially through post-harvest losses incurred (Lawrence & Rotich, 2021) [23]. Additionally, there are low returns gained from unprocessed products compared to its processed state leading to minimal returns, hence resulting to low standards of living (Onjala, 2015) [33]. There are numerous opportunities for the country to venture into agro-processing and value addition activities to fill the existing gaps. Currently, the agro processing sector contributes only 3.2% to the total GDP and constitutes 8.5% of the export earnings. The sector only provides 2.4% of employment. Additionally, only 16% of Kenya's raw agricultural produce is processed. Even with the glaring opportunities available, the agro processing sector performance in Kenya is still lower than of its regional and international counterparts (ASTGS, 2019) [5].

1.2 Statement of the Problem

The agricultural sector is an integral component of the economy of Makueni County. Makueni is the leading county in mango production in Kenya, accounting for 60 percent of mangoes produced in the country. It employs approximately 45% of the population and contributes a similar percentage to household incomes. Initially, the under developed agro-processing sector had resulted to farmers incurring up to 60 per cent of post-harvest losses. This situation culminated to enormous potential losses of value added and employment opportunities, as well as posed a challenge to marketing. (KALRO, 2021) [14]. However, in 2017, the County Government of Makueni with the aid from European Union put up an agro-processing plant to stem post-harvest losses and raise incomes for fruit farmers in the

County. The agro-processing plant currently processes both mangoes and tomatoes for maximum efficiency during low mango season.

Globally, the development of the agro-processing industry has been witnessed to increase market opportunities for exports, promote employment creation, enable business development resulting to vibrancy in rural economies, and stimulate agricultural production by creating new stable intermediate markets for raw agricultural products, import substitution, among others. So far, no study has been done to assess the influence of the agro-processing industry in meeting its objective of improving the livelihoods of the farmers in the County. Therefore, the goal of the study is to ascertain how the growth of the agro-processing business has affected the socio-economic well-being of farmers. As one of the County's top growers of mangoes and the location of the agro-processing factory, the Nzaui sub county will be the focus of the study's attention.

1.3 Research Objectives of the Study

1.3.1 General Objective of the Study

To assess the Influence of value addition on socio-economic welfare of farmers in Nzaui sub-county.

1.4 Research question of the Study

What is the Influence of value addition on socio-economic welfare of farmers in Nzaui sub-county?

1.5 Justification of the study

1.5.1 Government and policy makers

The study will inform the County government on development of relevant policies that will spearhead and support development in the agriculture sector. The findings of this study will be helpful in coming up with effective interventions to enhance agro-processing industry development for improved socio-economic status in the country in general.

1.5.2 Scholars and researchers

The study will be useful to scholars and researchers in the thematic area of agro-processing industry development. The findings will provide knowledge on the trickledown effect of the various aspects of agro-processing industry in the community. The findings will also support and enrich the theories and models related to industries in agriculture among others.

Literature review

2.1 Theoretical framework

2.1.1 Sustainable livelihoods approach

The sustainable Livelihoods framework was championed by Robert chambers in the 1980s and further developed by Gordon Conway and other authors. The SL framework is a tool for development work, as it highlights how to understand, analyse and describe the main factors that affect the livelihoods of the poor people. A livelihood is described as the various activities and resources required to make a living. A livelihood is considered to be sustainable when it is resilient (Lawrence, Obushe and Echukule, 2022) [22] in the face of external stresses and shocks, as well able to enhance its capabilities without undermining the livelihood options of others. The Sustainable Livelihoods framework describes how to ensure that the poor have an opportunity to sustainable livelihoods by highlighting the various aspects of development that should be focused on. First, the framework requires that any development projects undertaken should focus on the concerned stakeholders. It denotes that understanding of the different cultural dynamics of the people, the needs of the beneficiaries and how it affects their perspective of quality of livelihoods is important.

Secondly, the framework highlights that the beneficiaries should be involved in pointing out the crucial issues that affect their livelihoods. The project affected beneficiaries understand their needs and priorities better than outsiders, and therefore the role of outsiders should be to listen and be informed (Lawrence *et.al,* 2021) [24] on the requirements of the poor, instead of assuming to know what the poor should be provided with. In the framework, it also emphasizes that the donors should provide the beneficiaries a platform that enables them to identify the challenges and opportunities in their surroundings. Therefore, participation plays a crucial role in execution of development projects (Kungu *et.al,* 2023) [18], and the incorporation of these components enables empowerment of the people to be part of the process of creating change in in their surroundings. The theory provides insight on the importance of transformation to agro-processing industry development. It also characterizes the indicators associated with industrial development such as increase in output per worker resulting from innovation and investments in factors of production in individual sectors.

2.2 Value addition and socio-economic welfare of farmers

According to a study done by Mitullah, (2017) [29], on employment creation in agriculture and agro processing sector in Kenya. The study found out that, while total jobs in the agriculture sector increased by 5,800 between 2005 and 2014, jobs in the flower sector almost doubled (from 59,873 to 92,000) and increment of about 33,000 jobs. The sector contributes at least a quarter of the workforce in the agricultural sector and is probably the only one in agriculture that has witnessed a significant growth in job creation and has a high potential for expansion and specialization. This is because the cut flower sector has invested heavily in new technologies i.e., pre-cooling and cold storage facilities, grading/packaging sheds, and refrigerated trucks, which enhance value addition and to competitively trade in the export markets.

In the study by Mhazo et.al (2003) on the status of the agro-processing industry in Zimbabwe. The study used comparative analysis to examine the status of various agro-processors in the country. It found out that the number of agro-processors had increased, creating employment opportunities. This was attributed to factors such as equipment purchase capital, availability of the manufacturing equipment within the locality of the businesses and the back-up service rendered by dealers, affordable cost of equipment and spares, and in-built technical skills to operate the manufacturing equipment which are important in value addition and consequently the success of agro-processing industry.

Research methodology

This study was conducted using descriptive research design. According to Kothari (2019) [17], descriptive research studies are designed to obtain relevant and precise

information concerning the current status of a problem or phenomenon and whenever possible to draw valid general conclusions from the facts discovered. The design assisted in assessing the perceptions, views and opinions of the respondents regarding the relationship between the variables (Orodho, 2009) [34]. The target population for this study was 6,214 households, with individuals aged 18 years and above (Makueni CIDP 2018-2022). Asiamah (2017) [3] defined a target population as the total sum of individuals from which inferences are made. The unit of analysis was the socio-economic welfare of farmers. The study targeted 3 key informants; 1 Industry representative, 1 sub county agricultural officer and 1 co-operative society official. This is as shown in table 3.1 below.

Table 3.1: Target population

Category	Population
Households	6,214
Key Informants	3
Total	6,217

A sampling frame is a list of the target population from which a sample is drawn. It is the source material or device from which a list of all elements within a population (Keraro, 2014) [15]. The sampling frame was obtained from the list of households engaged in mango and tomato farming in Nzaui Sub County.

3.4 Sample size and technique

The sample size will be calculated using the formula developed by Mugenda & Mugenda, (2012) [32] for calculating sample size for a population of less than 10,000. The sample size was as shown in table 3.2 below.

Table 3.2: Sample size

Category	Population	Sample size	Sample proportion (%)
Households	6,214	384	98%
Key informants	3	3	2%
Total	6,217	387	100%

Purposive sampling was applied in selecting Nzaui sub-county for conducting the survey, as it is where a processing factory is located. The study adopted simple random sampling technique that gives every potential respondent the probability of being selected, hence ensuring a high degree of representativeness. The key informants were selected using purposive sampling technique. The study adopted a semi structured questionnaire and interview guide for data collection. The data has been analysed through descriptive and inferential statistics. After the field survey, data cleaning was conducted to improve the quality of data for coding. The questionnaire was analysed using descriptive statistics of frequencies, means and percentages through application of SPSS 28 and excel software. The study used both simple regressions to test the relation on each variable and the multiple regressions to test the combined effect of the independent variables on the dependent variable. The results have been presented using various formats including graphs, frequency tables and pie charts.

Data analysis and presentation

4.1 Introduction

The study presents its findings based on the available data. The results are presented below.

4.2 Findings of the Study

4.2.1 Response rate

The researcher distributed a total of 384 questionnaires and 320 questionnaires were returned and used for the analysis. As shown in figure 4.1 below.

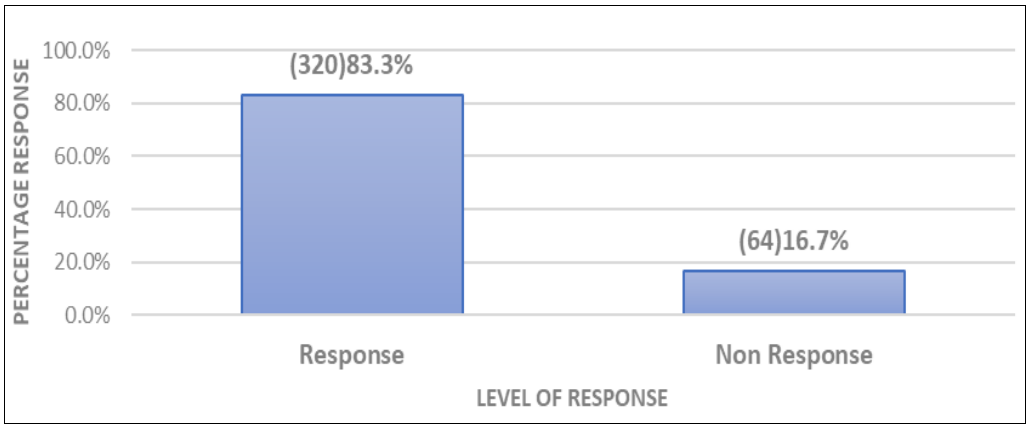

Fig 4.1: Response rate

The figure above shows an 83.3% response rate, which was considered appropriate for data analysis in line with Marton (2006) [26] who noted that a response rate of above 70% is considered appropriate for a descriptive study. The interviews were conducted successfully and all the 3 officers who were targeted were interviewed. The response/results are presented in figure 4.1 above.

4.2.2 Demographic variables of the study

The study sought to analyse the demographic variables as they are important in any descriptive survey because they have an influence on the response and the overall results of the study. For this study, the demographic variables considered were; gender and age of the respondents, crops grown in the study area, land size under mangoes and tomatoes plantations and household farm income in a year. The results are presented in figure 4.2 below.

The first demographic variable is gender of the respondents. The study sought to establish the distribution of male and female respondents who participated in the study. Gender is very important variable when aspects of resource distribution, access and control are being discussed

including their outcomes at the household. The study results indicated that the number of males were 66% and the number of females were 34%. This is in line with Lawrence and Letuyas (2021) and Lawrence and Omuse (2022) [25] studies who noted that men are still in control of the decision-making process in African societies. The study also sought to analyse the age of respondents who take part in farming activities in Nzaui sub-County, Kenya. The study results are presented in table 4.1 below.

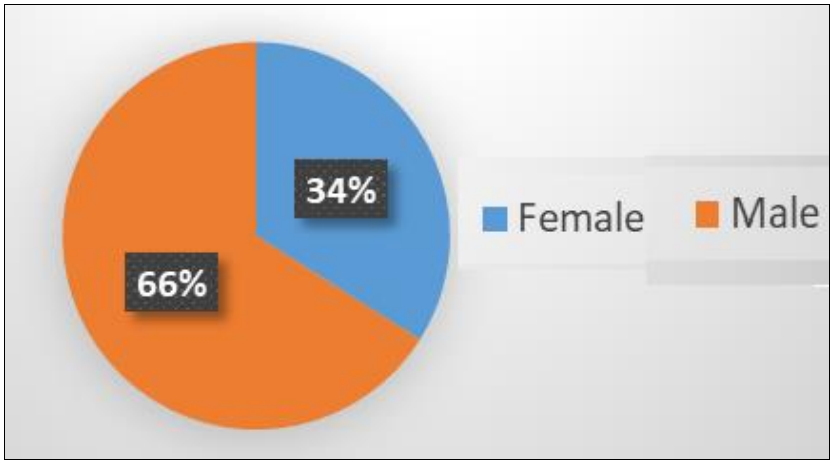

Fig 4.2: Gender of respondents

Table 4.1: Age of respondents

Age levels	Number of respondents	Percentages
18-30 years	40	12.5%
31-40 years	60	18.8%
41-50 years	50	15.6%
Above 50 years	170	53.1%
Total	320	100

The study results indicated that the number of respondents between the ages of 18-30 years were 12.5% and 31-40 years stood at 18.8% while those between ages 41-50 years were represented at 15.6%%. Those above 50 years were 53.1%. This shows that majority of famers in Nzaui sub-County were above the age of 50 years and above. This further shows that those in ages 40 years and below were in the field seeking for white collar jobs as opposed to older people who sought to venture into the agricultural sector. The study concludes that the agricultural sector is still being dominated by aged people despite them being the minority.

The study further sought to analyse the crops that are grown in Nzaui sub-County, Kenya. The study established that majority of the respondents 70.7% grew mangoes. Further analysis revealed that tomato farmers stood at 12.1% while those who grew both mangoes and tomatoes were 17.2%. This is a clear indication that mango farming is a dominant crop that is grown in the study area. Results are presented in figure 4.3 below.

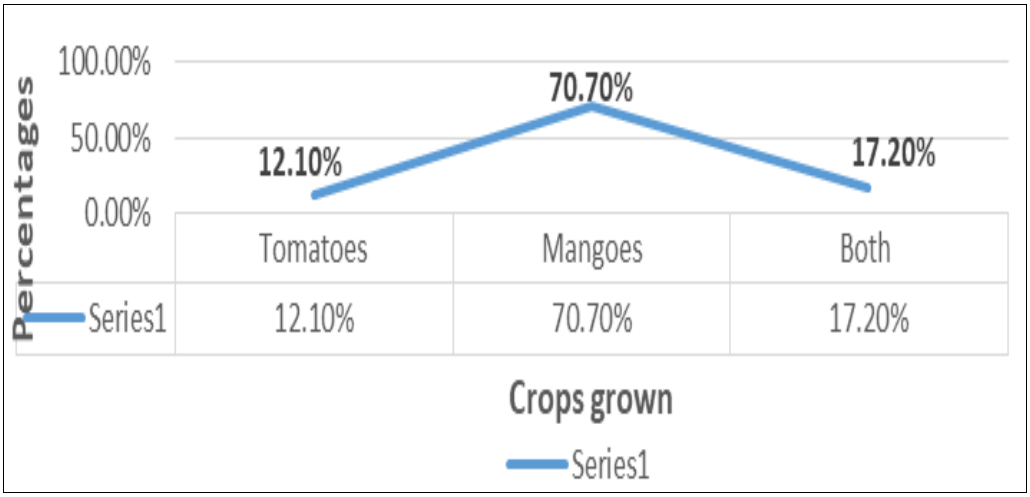

Fig 4.3: Crops grown in Nzaui sub-County

The study also sought to analyse the size of land under mango cultivation. The study established that 37.5% of farmers had dedicated below 2 acres on mango farming. The study further established that 31.3% of respondents had dedicated between 2-5 acres of land under mango farming. Those who had dedicated between 5-10 acres and above 10 acres were 18.8% and 12.6% of respondents respectively. This indicates that majority of the respondents were still small-scale farmers who had dedicated 5 acres and below of land towards mango farming. Results are presented in table 4.4 as shown below.

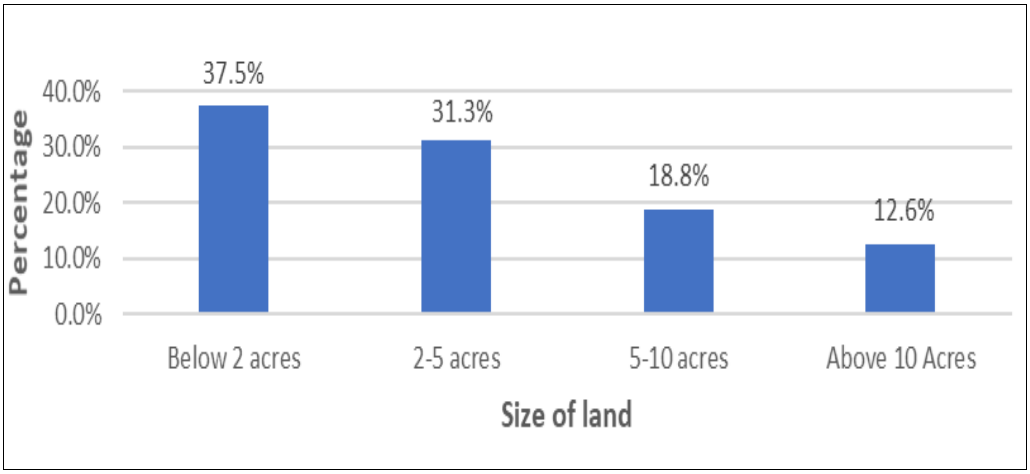

Fig 4.4: Size of land under Mango cultivation

The study also established the number of acres under tomato cultivation. According to the study results, 56.3% of respondents were planting tomatoes land that was below 2 acres. Further analysis showed that 28.1% of respondents had dedicated between 2-5 acres of land, while 9.4% had dedicated 5-10 acres of land on tomato farming. 6.2% of the respondents had dedicated above 10 acres of land towards farming. This indicates that majority of the respondents were still small-scale farmers of tomatoes in the study area. The results are presented in figure 4.5 below.

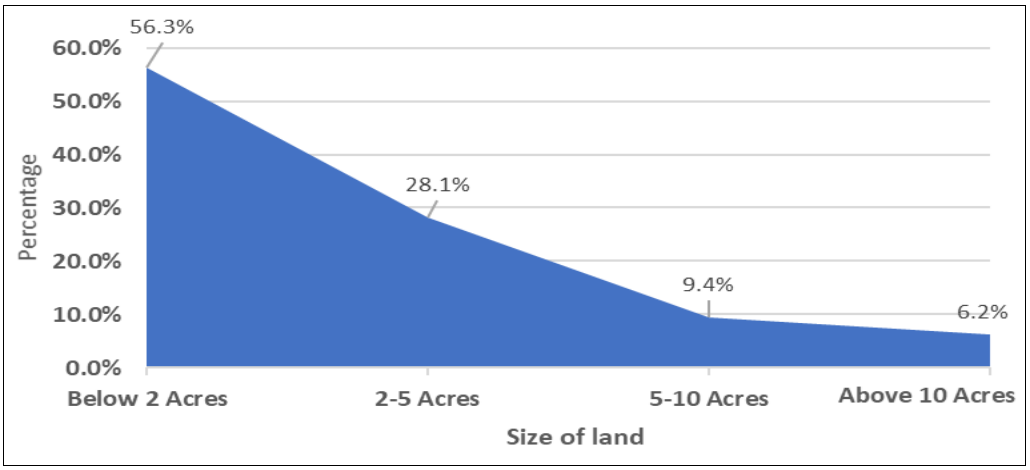

Fig 4.5: Size of land under tomato farming

Lastly, the study sought to analyse the amount of income that the respondents generate per year. The study results indicate that 50% of the respondents were generating between Ksh 50,000 to 100,000 yearly from mango farming. Another 37.5% of the respondents were generating below Ksh 50, 000 yearly. Further analysis revealed that 5.6% of respondents earned between Ksh 150,000 and 200, 000 per year while 4.7% of the respondents earned between Ksh 100,000-150,000. Also, the study revealed that 3.8% of the respondents earned above Ksh 200000. This indicates that majority of farmers in the study area are earning low income because of small land size dedicated to mango farming, as well as lack of maximized value addition on mangoes harvested which translates to low income in the long run. This is as shown in figure 4.6 below.

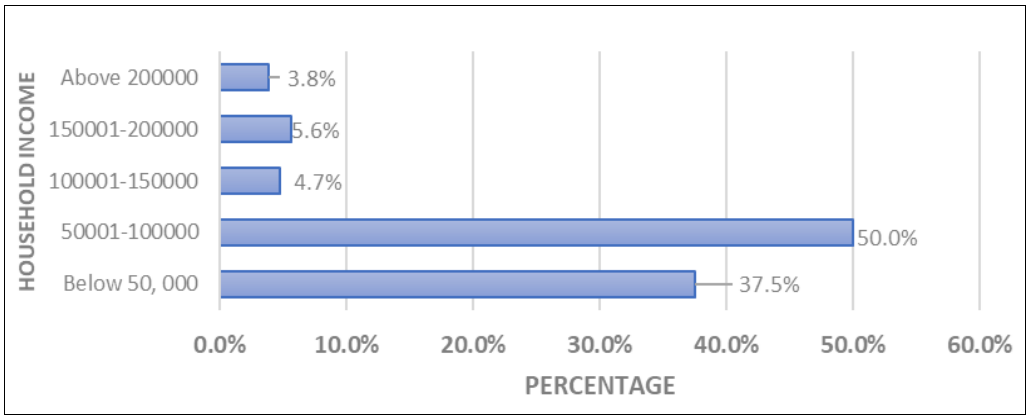

Fig 4.6: Income of farmers per year

On issues related to income and socio-economic welfare, all the key informants noted that;

"The County government has been trying to improve the socio-economic welfare of farmers through direct employment and encouragement of agro-processing industries. This has been key in promoting job creation, increased income, food security, and the general living standards of the people in Nzaui sub-County, Kenya".

4.3 Analysis for the descriptive statistics

This section presents the descriptive analysis of the results using the mean, percentages, and standard deviation for discussions. In this section SD will stand for Strongly Disagree; D -Disagree, NS- Not Sure; A -Agree; SA- Strongly Agree, and S.D.- Standard Deviation.

4.3.1 Effect of value addition on socio-economic welfare of farmers in NZAUI sub-county, Kenya

The objective of the study sought to establish effect of value addition on socio-economic welfare of farmers in Nzaui sub-County, Kenya. The respondents were required to give their opinion by indicating the extent to which they agreed or disagreed with the various statements. The results of the study were analysed descriptively using percentages, mean and standard deviation. The results are presented in Table 4.2 as shown below.

The study sought to analyse whether the modern processing technology used had improved the income levels of farmers and created employment in Nzaui sub-County, Kenya. The study results revealed that 41.2% and 34.3% of the respondents strongly agreed and agreed respectively that the modern processing technology used had improved the income levels of farmers and created employment in Nzaui sub-County, Kenya. Further analysis revealed that 13.5% of the respondents were not sure whether modern processing technology used had improved the income levels of farmers and created employment in Nzaui sub-County, Kenya. However, the study results established that 8.9% and 2.1% of the respondents disagreed and strongly disagreed respectively that modern processing technology used had improved the income levels of farmers and created employment in Nzaui sub-County, Kenya.

This indicates that since the inception of the mango industry in the study area, majority of the respondents feel that it had improved their welfare in terms of living standards and employment as indicated by the results. In regards to the above, the key informants noted that;

"The processing technology is very important in the agricultural sector because it minimizes wastage and improves the value of the harvested products. In Nzaui sub-County, the situation is not different as many farmers have from time to time struggled with postharvest losses. The processing technology that is available has been very important in promoting improved output, increased harvests, and generally value addition and this has helped farmers to greatly benefit from it. The processing technology is able to improve the shelf life of the produce harvested and this has prevented destruction of many farm products"

Table 4.2: Effect of value addition on socio-economic welfare of farmers

Statement Items	1	2	3	4	5	M	SD
The modern processing technology used has improved our income levels and created employment	2.1%	8.9%	13.5%	34.3%	41.2%	4.06	1.079
Access to storage and distribution facilities has improved our income levels/food security	0.3%	7.9%	13.1%	25.8%	52.0%	4.11	.908
Packaging and branding technologies used have improved our income levels and created employment	1.8%	2.3%	18.6%	27.8%	50.5%	4.01	.918
Efficient management of the processing factory has improved our income levels and created employment	6%	17.2%	13.1%	22.9%	40.8%	3.81	.973
The agro-processing industry technology and coordination processes have helped us improve our socio-economic welfare	0	24.0%	4.9%	30.6%	40.5%	4.17	.637

On whether access to storage and distribution facilities had improved the income levels and food security of respondents in the study area, results revealed that 52% and 25.8% of the respondents strongly agreed and agreed respectively with the statement. However, 13.1% of the respondents were not sure as to whether access to storage and distribution facilities had improved the income levels and food security of the inhabitants of Nzaui sub-County. It was further noted that 7.9% and 0.3% of the respondents disagreed and strongly disagreed that access to storage and distribution facilities had improved the income levels and food security of respondents in the study area. This indicates that access to storage and distribution facilities had improved the income levels and food security of respondents in the study area as depicted by majority of respondents in the study area.

On whether packaging and branding technologies used have improved our income levels and created employment of the inhabitants of Nzaui sub-County, the study established that 50.5% and 27.8% of the respondents agreed with the statement above. However, 18.6% of the respondents were not sure whether packaging and branding technologies used have improved our income levels and created employment. Further analysis revealed that 2.3% and 1.8% of the respondents disagreed and strongly disagreed respectively with the statement that packaging and branding technologies used have improved our income levels and created employment. The respondents who were not sure or did not agree had noted that branding and packaging technologies was mainly automatic and didn't require personnel and therefore has not created employment.

The study also sought to examine whether efficient management of the processing factory has improved income levels and created employment. The results of the study indicate that 40.8% and 22.9% of the respondents strongly agreed and agreed with the statement above. Also, the study results revealed that 17.2% of the respondents had disagreed that there was efficient management of the processing factory which had improved income levels and created employment. However, 13.1% of respondents were not sure whether efficient management of the processing factory has improved income levels and created employment. 6% of the

respondents strongly disagreed with the statement that efficient management of the processing factory had improved income levels and created employment. This indicates that most of the respondents felt that the processing industry had improved income and employment in the study area. However, there were mixed results on the above issues as a good number of respondents disagreed with the statement above. According to key informants,

"Efficient management through the Makueni County Fruit Development and Marketing Authority over the past two years has been reflected in term of transparency, accountability and good policy making in the management of the agro-processing industry. Efficient management has contributed towards the improvement of the socio-economic welfare of farmers in Nzaui sub-County". This has made many farmers to earn from the sales of their produce and hence improve their living standards especially at household level.

On whether the agro-processing industry technology and coordination processes have helped farmers improve their socio-economic welfare in Nzaui sub-County, the study established that 40.5% and 30.6% of respondents agreed with the statement above. The study further revealed that 24% of the respondents disagreed that agro-processing industry technology and coordination processes have helped farmers improve their socio-economic welfare in Nzaui sub-County. A further 4.9% of the respondents were not sure as to whether agro-processing industry technology and coordination processes have helped farmers improve their socio-economic welfare in Nzaui sub-County.

4.3.2 Indicators of socio-economic welfare of farmers

The dependent variable of the study sought to establish the opinion of the respondents on socio-economic welfare of farmers in Nzaui sub-County, Kenya. The respondents were required to give their opinion by indicating the extent to which they agreed or disagreed with the various statements. The results of the study were analysed descriptively using percentages, mean and standard deviation. The results are presented in Table 4.3 as shown below.

Table 4.3: Socio-economic welfare of farmers in Nzaui sub-County,

Statement	1	2	3	4	5	M	SD
Agro-processing industry development has resulted to increased household income	1.6%	1.6%	16.3%	27.3%	53.3%	4.49	0.813
Agro-processing industry development has resulted to increased food security	0.8%	3.9%	12.5%	49.2%	33.6%	4.11	0.825
Agro-processing industry development has resulted to increased employment opportunities	0.8%	0	10.2%	30.5%	58.6%	4.46	0.741
Agro-processing industry development has resulted to skills development	6.8%	0	12.2%	35.5%	45.6%	4.39	0.734
Agro-processing industry development has a great influence on improving socio economic welfare in Nzaui sub-county	5.9%	3%	12%	20%	59.1%	4.48	0.823

The study sought to analyse the extent to which agro-processing industry development has resulted to increased household income for farmers in Nzaui sub-County, Kenya. The study established that 53.3% and 27.3% strongly agreed and agreed respectively with the statement that agro-processing industry development has resulted to increased household income. The study further elaborated that 16.3% of the respondents were not sure whether agro-processing industry development has resulted to increased household income in the study area.

The study further sought to determine whether Agro-processing industry development has resulted to increased food security in the study area. The study results reveal that 49.2% and 33.6% of the respondents were of the opinion that agro-processing industry development has resulted to increased food security in Nzaui sub-County. The study results further show that 12.5% of the respondents were not sure whether agro-processing industry development has resulted to increased food security in the study area. The study also revealed that 3.9% and 0.8% of the respondents agreed and strongly agreed respectively with the statement that agro-processing industry development has resulted to increased food security in Nzaui sub-County, Kenya.

On whether agro-processing industry development has resulted to increased employment opportunities in the study area, results from the study revealed that 51.6% and 37.5% of the respondents strongly agreed and agreed respectively with the statement that Agro-processing industry development has resulted to increased employment opportunities in Nzaui sub-County, Kenya. The study results further revealed that 10.2% of the respondents were not sure whether agro-processing industry development has resulted to increased employment opportunities.

On whether the agro-processing industry development has resulted to skills development, the study established that 45.6% and 35.5% of respondents strongly agreed and agreed with the statement that Agro-processing industry development has resulted to skills development and this has been the outcome of improved living standards. The study further noted that 12.2% of respondents were not sure whether agro-processing industry development has resulted to skills development or not.

Lastly, the study sought to determine whether agro-processing industry development has a great influence on improving socio economic welfare in Nzaui sub-county. The study results revealed that 59.1% and 20% of respondents strongly agreed and agreed that agro-processing industry development has a great influence on improving socio economic welfare in Nzaui sub-county. The study further noted that 12% of respondents were not sure as to whether agro-processing industry development has a great influence on improving socio economic welfare in Nzaui sub-county or not.

4.4 Analysis of Inferential statistics

The study sought to assess whether there was a statistically significant relationship between the variables. The analysis was done by establishing the correlation and regression analysis of the study variables.

4.4.1 Correlation analysis

The study sought to establish the nature of the relationship between independent variables and dependent variables of the study. The independent variables are value addition, access to new markets, training and capacity building and access to financial resources. The dependent variable is

socio-economic welfare of farmers in Nzaui sub-County, Kenya. These variables were tested using correlation coefficients as suggested by Cohen, West and Aiken, (2003) [6]. Correlation analysis helps to test the linearity of the study variables in order to make inferences. The results are presented in Table 4.4 below.

Table 4.4: Pearson correlation analysis

		Value Addition
Socio-economic welfare	Pearson Correlation	.732**
	Sig. (2-tailed)	.000

The result show that there is a very high and strong significant correlation between value addition and socio-economic welfare of farmers in Nzaui sub-County as indicated by the study results (r =.732** and a p-value of.000). This implies that value addition has a very significant influence on socio-economic welfare of farmers in the study area. This is because it is through value addition that products attract good returns through improved sales and hence generation of profits for farmers.

4.4.2 Simple linear regression analysis

Simple linear regression is used to test the effectiveness of a variable in predicting the dependent variable in study. The analysis helps to establish the relationship between two variables (dependent variable and independent variable. The results for this study are summarized in the regression model summary shown in table 4.5.

Table 4.5: Simple linear regression analysis

Independent variables	R	R Square	Adjusted R Square	Std. Error	P value
Value addition	.732[a]	.535	.479	.505	.000[b]

Dependent variable: Socio-economic welfare

From the results, the values of R denote the correlation between the independent and the dependent variables. In this case, the correlation between value addition and socio-economic welfare of farmers in Nzaui sub-County is analysed to be very strong, positive and significant (R =0.732; p-value = 0.000).

Summary, conclusion and recommendations

5.1 Summary of the findings

5.1.1 Summary of demographic variables

The main objective of the study was to determine the effect of the agro-processing fruit industry development on socio-economic welfare of farmers in Nzaui sub-county. The study notes that the response rate was 83.3% which was adequate for a descriptive survey as per Merton's view of 2006 who noted that a response rate of more than 70% and above was adequate for a descriptive survey. In regard to gender of the respondents, the study established that 66% of the households were headed by the males which implied that men were the main decision makers in the household unit in Nzaui sub-County, Kenya. The study further noted that more than 60% of respondents were above the age of 40 years, a clear indication that many of the farmers in the study area are not majorly youths. The study revealed that mangoes are the dominant crops grown in Nzaui sub-County as noted by 59.4% of respondents. The study further noted that majority of respondents grew mangoes on less than 5 acres, a clear indication that majority of farmers in Nzaui sub-County are small scale farmers. Further analysis shows that majority of respondents who grow tomatoes are small scale farmers. Lastly, the study established that majority of the respondents noted that they were earning below Ksh. 100, 000 yearly. This is a clear indication that they were small scale farmers and they were not in a position to earn much due to low productivity in the study area.

5.2 Effect of value addition on socio-economic welfare of farmers in Nzaui sub-county

The study sought to analyse the extent to which value addition promoted the socio-economic welfare of farmers in Nzaui sub-County, Kenya. Majority of the respondents established that the modern processing technology used has improved income levels and created employment for the residents of Nzaui sub-County. The processing technology has ensured that upon harvesting of the mangoes, the farmers deliver the produce and the processing procedures begins. The conversion of the mangoes to puree and juice has seen the value of their products increase and securing better market prices from the industry than before.

On whether access to storage and distribution facilities had improved the income levels and food security of the farmers in the study area, the study results revealed that majority of the respondents agreed with the statement. This means that majority of the respondents are of the opinion that access to storage and distribution facilities has improved income levels and food security of farmers in the study area. The industry usually receives the mangoes from farmers when its harvesting season and therefore they do not experience post-harvest losses and exploitation from brokers. For example, last season, the industry bought the mangoes at Ksh 18, while the brokers were buying from other farmers at Ksh 8.

On whether packaging and branding technologies used have improved income levels and created employment for many of the farmers and residents in the study area, the study revealed that majority of respondents noted that indeed it had improved their socio-economic welfare of farmers. This is because it elevates the perceived quality of mango produced from the county and hence valued globally. Additionally, the packaging used preserves the formulation used and maintains freshness according to the consumer expectations. This shows that packaging and branding technologies were key in improving the socio-economic welfare of farmers in Nzaui sub-County.

On whether the efficient management of the processing factory had improved the income levels and created employment for the residents in the study area, the study revealed that majority of the respondents were of the same opinion. The study results established that the efficient management of the agro-processing plant has been a major determinant of improving farmers' welfare in Nzaui sub-County. Since the formation of the Makueni County Fruit Development and Marketing Authority in 2020, which comprises of farmer, industry and county representatives, there has been changes whereby the needs of the farmers are heard, accountability in growth of the industry hence improvement of farmers' welfare experienced. The respondents that were not sure noted that the industry had experienced a lot of management and accountability issues

during the initial years which led to various farmers to shun away from the industry.

5.3 Conclusions

The main objective of the study was to determine the effect of value addition on the socio-economic welfare of farmers in Nzaui sub-County. The result indicated that there is a strong significant correlation between value addition and socio-economic welfare of farmers in Nzaui sub-County as indicated by the study results ($r = .732^{**}$; p-value of.000). The study concludes that value addition has a very significant influence on socio-economic welfare of farmers in the study area.

5.4 Recommendations for the study

From the study conclusions, the study provided the recommendations as follows;

The study recommends that support programmes should be introduced by the government so as to promote the improvement of the technical efficiency of the agro-processing industry and consequently the total factor productivity of the agro-processing industry.

The study recommends that there is need to support existing farmers' associations and cooperatives. It also recommends formation of additional co-operatives across the county and sensitize farmers on the importance of becoming members. This will enable farmers to have good negotiation power on their produce and in the long run it will generate more income and hence improved welfare.

Furthermore, the study recommends creating avenues for information dissemination, quality standards, good manufacturing practices, market development, funding options, legal and policy frameworks governing the agro-food processing sector, food processing and logistics.

5.5 Areas for further study

First, the study variables should be conducted in other areas of the country in order to validate the research findings by examining the points of convergence and divergence.

Secondly, studies should be conducted on the role of government in promoting agro-processing industries in rural areas of Kenya with key focus to other products.

Thirdly, studies should be conducted on the role of international development partners in the development of agro-processing industries in Kenya.

Lastly, studies should further be conducted in order to determine how agro-processing industries have been developed in the era of devolution.

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