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## **EFFECTS OF ALTERNATIVE LIVELIHOOD STRATEGIES ON WELLBEING OF PYRETHRUM SMALL SCALE FARMERS: A CASE STUDY OF NAKURU COUNTY**

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### **Abstract**

*From a position of controlling over 90% of world pyrethrum production in the late 1990s, Kenya currently produces less than 2% of world pyrethrum. The general objective of this study is to establish the effects of alternative livelihood strategies on wellbeing of pyrethrum small scale farmers in Nakuru County. Primary data was collected using questionnaires. Both descriptive and inferential statistics were used to analyze the data. Further, chi square and multiple regression were used to predict the value of a variable based on the value of two or more other variables. The study reveals that maize farming was a major activity that almost every farmer carried out. The activity was a major source of income as it presented the farmers with a high level of income and affordability of basics of life. It is noted that majority of the farmers who had adopted non-farm employment diversification strategies had opted for professional jobs that generated high income. The study also revealed that the farmers agreed that telecommunication retail presented the farmers with a high level of income, high affordability of basics of life, meeting social obligations to a great extent. The government should provide an enabling environment for small-scale farmers to be more entrepreneurial for better livelihoods. Farmers should be encouraged to add value by processing, packaging and branding since value addition is largely limited to storage of farm produce in granaries. Very few farmers are processing and packaging their agricultural produce, therefore, there is limited value addition which minimizes their profit margins.*

Keywords: Alternative livelihood strategies, small scale farmer, wellbeing

### **1. Background of the study**

Pyrethrum was first introduced in Kenya in 1928 from Europe and by December, 1933 the first commercial crop from the country was sold abroad. The crop is cultivated at high altitude by small scale farmers who are paid a fixed price, based on pyrethrin content, by the Pyrethrum Board, which holds a monopoly on production and marketing. Current production, at around 5,000 tonnes of dried

flowers p.a. has declined from a peak of around 18,000 tonnes p.a. (Busolo, 2014).

For an extended period of time, Kenya was the biggest producer of pyrethrum in the world, producing up to 90% of the world's pyrethrum up until 1998, a position that has since been taken over by Tasmania Australia. The counties with potential to grow pyrethrum in Kenya include: Nakuru,

Uasin Gishu, Keiyo, Marakwet, Nandi, Baringo, Koibatek, Kericho, Bomet, Narok, Laikipia, Trans Nzoia, West Pokot, Kisii, Nyamira, Kiambu, Nyeri, Nyandarua, Meru, Nyambene and Embu. Nakuru is among the top potential counties to grow pyrethrum in Kenya with a majority of pyrethrum growers being small scale farmers with less than 5 acres of land (WHO, 2008).

Although Kenya produces the best quality pyrethrum in the world, the sector has been bedeviled by many problems that have contributed to the downfall of Kenya's share in the world market from a high of 70% to the current 2%. It is with great hope that the entry of HighChem Agriculture into the pyrethrum industry will significantly contribute to current efforts in the country to turn around the fortunes of this sub sector to reclaim its place as the industrial crop of choice for Kenyas small holder farmers (Kiiru, 2002).

## **2. Global Perspective of alternative livelihood strategies on wellbeing of small scale farmers**

Kenyan pyrethrum was of very high quality. It therefore quickly replaced the Japanese pyrethrum on the world market by around 1941. Other countries that produce pyrethrum include; Austria-20%, Tanzania7%, Rwanda 5% and Uganda 1%. Small farmers produce much of the developing world's food. Yet they are generally much poorer than the rest of the population in these countries, and are less food secure than even the urban poor. Furthermore, although the majority of the world's population will live in urban areas by 2030, farming populations will not be much smaller than they are today. For the foreseeable future, therefore, dealing with poverty and hunger in much of the world means confronting the problems that small farmers and their families face in their daily struggle for survival (Gulliver, 2001).

In South Asia, for example, growth in employment opportunities in the off-farm rural economy are

measures that assist farm households to leave agriculture and are an important secondary priority, and would need to include improved rural education and vocational skills training. There is also some potential for poverty reduction by means of intensification of existing production patterns, largely through improved water management and adoption of improved technologies (Andersen et al., 2007).

In Africa, for instance, initiatives have been put in place, (the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD), that recognize, to different degrees, that more and better aid and political support is needed to revitalize agricultural livelihoods in Africa. To achieve this aim, there is a growing consensus that small-scale farming systems must be prioritized, along with smallholder farmers' ability to access local and international markets (Hopkins, 2008).

## **3. Livelihood strategies adopted by small scale pyrethrum farmers in Kenya**

The concept of a livelihood strategy has become central to development practice in recent years. Nonetheless, given the uncountable possible proportional mixes of activities undertaken by a household, it is not always clear what constitutes a distinct livelihood rather than just a slightly different mix of activities within the same general livelihood. The ability to operationalize the concept of a livelihood strategy becomes especially important when one speaks of "improving" livelihoods, to paraphrase much current development discourse (Cabrera et al., 2006). In Kenya small scale farmers have adopted alternative livelihood with the aim of improving their wellbeing.

#### **4. Nakuru County farmers' perspective on effects of alternative livelihood strategies on pyrethrum small scale farmers**

A common feature of alternative livelihoods is that their viability requires capital investment and trade-related infrastructure, which in turn depend on enabling policies and effective leadership. These attributes are also instrumental for an effective implementation of innovations for attaining sustainability of livelihoods based on land productivity (Chambers and Conway, 1992). In Kenya and more so in Nakuru County pyrethrum small scale farmers have adopted alternative livelihood strategies due to the drastic failure of pyrethrum over the years.

Improved dairy-goat breeds are another introduced technology in Nakuru County for small-scale farmers is the use of improved dairy-goat breeds. The NGO FARM-Africa has been working in Nakuru area, targeting the poorest farmers in medium- and low-agricultural potential zones, by working with over 80 self-help dairy-goat groups. The Nakuru County Dairy Goat and Animal Healthcare Project has been in the Nakuru area since 1996. The purpose of the project is to improve the productivity of local goats through better management and access to sustainable healthcare and genetic improvement, and of local dairy cattle through better access to sustainable healthcare (Mulwa, 2011).

The Project works through both existing extension and the private sector to support small-scale farmers in the County. Through these linkages, FARM-Africa helps the dairy-goat groups obtain loans, training, and improved bucks for breeding. The project is estimated to benefit the welfare and income of 20,000 families in the area.

In terms of horticulture, agriculture is the mainstay of Nakuru's economy. The county's weather is conducive for large scale farming, horticulture and dairy farming. Food crops grown in Nakuru include

maize, wheat, beans, peas, cabbages, tomatoes, kales and carrots. The produce is consumed locally and sold to consumers in neighboring towns and cities. Some of the largest flower farms in the county include Homegrown, Oserian, Karuturi and Preesman. The bulk of flowers grown in these farms are mainly exported to Holland, UK and Germany. Nakuru County is Kenya's floriculture center, contributing highly to the employment and economic development of its people. According to the Lake Naivasha Growers Group (LNGG, 2015), there are 73 flower farms in the county with Naivasha town accounting for 48 of these.

In terms of manufacturing activities, there are currently, there are well over 100 manufacturing businesses in the town. These include grain milling and storage, the processing of cooking oil from agricultural raw materials, agro-chemical production, soap manufacture, blanket weaving and dairy processing. There is increasing growth in small scale agricultural activities and in what are sometimes referred to as microenterprises (very small businesses). The town is also a center for various retail businesses that provide goods and services to the manufacturing and agricultural sectors. There are a number of manufacturing companies in Nakuru including the Kenya Pyrethrum Growers Company. Nakuru's industrial development started when the first agro-industries were started in the 1920's. Currently there are well over 100 industrial establishments including grain milling and storage, processing of cooking oil from agricultural raw materials, agro-chemical production, soaps, blankets and dairying in the town (Kimuyu, 2010).

Limited job opportunities have resulted in a rapid increase in informal trading throughout Nakuru. Selling on the streets is common in several areas including the Matatu Park area and in the streets in the low-income areas. The informal sector in Nakuru plays a very important role in generating employment for a large proportion of the population. There is however a lot of conflict

between the informal workers and the town's authorities since their activities are not licensed and they do not pay taxes. There is currently a decline in manufacturing but a level of growth in industrial retailing of finished products. The town has a vibrant economy based on broad sectors such as commerce and trade, manufacturing industry, service and tourism, agriculture and forestry, and informal trade and industry (Kiiru, 2002).

### **5. Wellbeing of small scale pyrethrum farmers**

Well-being is a general term for the condition of an individual or group, for example their social, economic, psychological, spiritual or medical state; a high level of well-being means in some sense the individual or group's condition is positive, while low well-being is associated with negative happenings. In economics, the term is used for one or more quantitative measures intended to assess the quality of life of a group, for example, in the capabilities approach and the economics of happiness (Yacyno, 2012).

Well-being is a positive outcome that is meaningful for people and for many sectors of society, because it tells us that people perceive that their lives are going well. Good living conditions, for example housing, employment are fundamental to well-being. Tracking these conditions is important for public policy. However, many indicators that measure living conditions fail to measure what people think and feel about their lives, such as the quality of their relationships, their positive emotions and resilience, the realization of their potential, or their overall satisfaction with life, that is their wellbeing. Wellbeing generally includes global judgments of life satisfaction and feelings ranging from depression to joy (Diener, 2004).

### **6. Relationship between alternative livelihood strategies and wellbeing of small scale pyrethrum farmers**

Livestock farming for example, bee keeping is a potential livelihood diversification option with ready local and international markets for honey and other bee products and has been widely promoted in the country by government and development agencies. Beekeeping offers many potential benefits including income, health and environmental. Beekeeping has traditionally been considered an activity of the Arid and Semi-Arid Lands in Kenya. However, with increasing population there has been increasing environmental degradation and reducing forest cover and an increasing need to adapt beekeeping to small scale farms. As a result there has been a move away from more extensive beekeeping systems to intensive beekeeping. This study examined beekeeping as part of smallholder mixed farming systems in mid-high altitude areas of Kenya (Carroll, 2012).

With the rapid growing acceptance of horticulture farming such as onion, cabbage, cauliflower, carrot, tomato, garden eggs, ginger, pepper mushroom as an alternative basic part of a meal in most households both in Nakuru and other major towns, this can be one important way to increase employment rate for small, marginal pyrethrum farm households for generating employment and earning extra money. They can easily cultivate these vegetables in their home yard because it requires small piece of land. Mushroom cultivation might serve as means of generating employment, particularly for rural women and youths in order to raise their social status. By practicing mushroom cultivation farmers can contribute successfully and significantly to the economic development (LNGG, 2015).

The positive relationship between off-farm and farm income, in particular, has attracted considerable attention from researchers in this area. It is used in a number of studies to argue in favor of the widely held view that rural off-farm income is important for agricultural development as it helps households overcome cash constraints on farm investment. If accurate, this view would be

important for agricultural development in low-income countries where there is widespread evidence of institutional failures in rural capital markets. It is not surprising, therefore, that it attracts considerable attention from non-governmental organizations (NGOs) and development agencies when formulating policies to improve the agricultural potential of households in poor countries (Braun & Pandya, 2011).

### **7. Statement of the Problem**

In the 1980s, the pyrethrum sector was earning the country billions of shillings but this has changed, with farmers opting for different crops the number of farmers growing pyrethrum has sharply dropped from about 300,000 in the 1980s to around 30,000 currently. Farmers paint a picture of disillusionment that set in due to lack of payments for deliveries. This paralyzed the sub-sector, thus growers uprooted the pyrethrum and planted other crops to sustain their livelihoods (Monda, 2014).

The involvement of cartels in purchasing, processing and marketing of pyrethrum is considered by some stakeholders, particularly local manufacturer and farmers to be a disincentive to investment in the sub-sector. This is coupled with cartels diverting farmers' money and hence without financial support it is difficult for them to hire needed labor and inputs. In the absence of institutional credit, they resort to local money lenders who charge interest rates of 100 or higher. Farmers who obtain loans from the money lenders often lose their farms to them as they are unable to pay the cumulative interests (Mutitu, 2008).

The collapse of the Pyrethrum board of Kenya (PBK) slowly led to the decline in pyrethrum production pushing farmers to uprooting the cash crop and replacing it with other crops such as maize, potatoes and beans. With farmers opting for different crops the number of farmers growing pyrethrum has sharply dropped from about 300,000 in the 1980s to around 30,000 currently. From a position of controlling over 90% of world

pyrethrum production in the late 1990's, Kenya currently produces less than 2% of world pyrethrum (Francis et al., 2005).

Diseases such as pyrethrum wilt and fungal diseases have also been a major cause of the decline of production in the sector (Kimani et al., 2001). Example, Root-rot complex of pyrethrum caused by nematodes accounts for 20-30% of pyrethrum yield losses since it causes decrease in flower size and decrease in pyrethrum content (Mutitu, 2008). The fact that pyrethrum production has been declining over time and later leading to a collapse in 2000 has been noted and studies have been done in different areas in Kenya to ascertain the causes of this decline but none has been done in Nakuru County. This necessitates a study in this area because most of the pyrethrum farmers are shifting to alternative livelihood means. The proposed study therefore seeks to find out the effects of alternative livelihood strategies on wellbeing of pyrethrum small scale farmers in Nakuru County.

### **8. Study Objectives**

- i. To evaluate the impact of farm diversification of agricultural activities on wellbeing of pyrethrum small scale farmers in Nakuru County.
- ii. To investigate the influence of non-farm employment diversification strategies on wellbeing of pyrethrum small scale farmers in Nakuru County.
- iii. To establish the impact of manufacturing diversification strategies on wellbeing of pyrethrum small scale farmers in Nakuru County
- iv. To evaluate the influence of retail service diversification strategies on wellbeing of small scale pyrethrum farmers in Nakuru County

- v. To establish the challenges experienced by small scale pyrethrum farmers in Nakuru County

### **Literature Review of Study Objectives**

#### **9. Farm diversification of agricultural activities**

Agriculture remains the most important economic activity in Kenya, although less than 8% of the land is used for crop and feed production. Less than 20% of the land is suitable for cultivation, of which only 12% is classified as high potential (adequate rainfall) agricultural land and about 8% is medium potential land. The rest of the land is arid or semiarid. About 80% of the work force engages in agriculture or food processing. Farming in Kenya is typically carried out by small producers who usually cultivate no more than two hectares (about five acres) using limited technology. However, with most of Kenya's land mass being arid or semi-arid, only about 20 percent is suitable for farming. About 80 percent of Kenya's work force engages in farming or food processing. Kenya's agriculture is mainly rain-fed and is entirely depended on bimodal rainfall in most parts of the country. Droughts are frequent and crops fail over the seasons (Kibet, 2008).

Many farmers, faced with such challenging situations consider diversification. Diversification is the name given to the process where farmers seek alternative income, other than from growing food crops or conventional livestock keeping. Recently most farmers in Kenya have opted for alternative food crops, alternative non-food crop and improved livestock farming as a way of diversification and improving their livelihoods. Small-scale beef farming is carried out in almost all parts of Kenya. Dairy farming is mainly practiced in several parts of the Rift Valley and the Central, Eastern, Coast and Western Provinces. It is mostly practiced by small-scale holders, who account for 80% of the milk produced in Kenya, while large-scale farming accounts for the remaining 20%. Animals that

farmers often rear are; improved breeds of pigs, poultry farming, sheep farming, rabbit farming, goat farming among others (KARI, 2008).

Fresh produce accounts for about 30% of horticultural exports, and include; green beans, onions, cabbages, snow peas, avocados, mangoes, and passion fruit. Flowers exported include roses, carnations, statice, astromeria, and lilies (Ministry of Agriculture, 2010). Farmers in Kenya have also largely diversified into non-food crops and especially for medicinal use and commercial purposes, this include such plants as; spelt, evening primrose, miscanthus (a type of elephant grass) and short rotation coppice (Rosas, 2001).

#### **10. Non-farm employment strategies**

Non-farm income refers to the portion of farm household income obtained off the farm, including non-farm wages and salaries, pensions, and interest income earned by farm families. There is growing interest in non-farm income as research on rural economies is increasingly showing that rural people's livelihoods are derived from diverse sources and are not as overwhelmingly dependent on agriculture as previously assumed.

Non-farm income is crucial to rural farm households, because it helps to smooth the flow of farm income over the cropping cycle and it stabilizes income by spreading risk through diversification (Lanjouw, 2005). For smallholders in areas where agricultural output varies greatly over a year or years because of unpredictable weather conditions, the seasonal smoothing and risk diversification obtained through non-farm/off-farm income sources can be very important.

Although the farm sector is considered to be the backbone of the economy and a major source of food and income for most Kenyans, recent evidence shows that rural household income in Kenya is increasingly diversified, with a substantial share coming from sources outside the farm. It is estimated that in Kenya as much as 60 percent of

rural household income is gained from non-farm sources, (World Bank, 2004); the major sources include non-farm wage employment in rural areas, such as working in agro-processing enterprises, self-employment in household based enterprises and wage employment in rural labor markets is both widespread and profits from small-scale enterprises in the non-farm informal sector (Liedholm, 1990).

### **11. Manufacturing strategies**

Manufacturing is the production of merchandise for use or sale using labour and machines, tools, chemical and biological processing, or formulation. The term may refer to a range of human activity, from handicraft to high tech, but is most commonly applied to industrial production, in which raw materials are transformed into finished goods on a large scale. Kenya is generally perceived as Eastern and central Africa's hub for Financial, Communication and Transportation services. Major industries include; agriculture, forestry and fishing, mining and minerals, industrial manufacturing, energy, tourism and financial services. Although Manufacturing Companies in Kenya are small, they are the most sophisticated in East Africa. The Industries in Kenya have been growing since the late 1990s and into the new century. The manufacturing companies in Kenya are relatively diverse (Odero, 2014).

The transformation of agricultural raw materials, particularly of coffee and tea, remains the principal industrial activity. Meat and fruit canning, wheat flour and cornmeal milling, and sugar refining are also important. Electronics production, vehicle assembly, publishing, and soda ash processing are all significant parts of the sector. Challenges facing the agricultural sector in Kenya have resulted to the drastic move of employment away from agriculture toward services and manufacturing services (Nguyen, 2009).

Retail involves the process of selling consumer goods and services to customers through multiple channels of distribution to earn a profit.

Demand is identified and then satisfied through a supply chain. In total, 144,300 Kenyans were involved in retail in 1996, not counting those that were engaged in the informal sector. The informal sector itself, known in Kenya as "jua kali," employs approximately 64 percent of all Kenyan urban workers. It is also the most dynamic sector in the economy in terms of job creation, accounting for about 90 percent of new jobs outside the smallholder farm sector. Informal sector activities, such as carpentry, motor vehicle repair, tailoring, hawking, and selling various fruits, vegetables, and other commodities, are largely service-based (Foroutan, 2005).

Though the government recognizes the value of the informal sector, the U. S. Department of State Country Commercial Guide 2000 argues that it could do more to develop needed infrastructure. In comparison to other African markets, Kenya's formal retail penetration rate which ranges from 30% to 40%, according to analysts is the second highest in sub-Saharan Africa. This places the country at roughly half the level of South Africa, where formal retail is estimated to stand at 60 % of overall activity, but twice that of Nigeria, Africa's largest economy (Karugia, 2015).

### **12. Research Methodology**

The study will use descriptive research design. The target population of this study will be pyrethrum farmers, both small scale and if any large scale farmer, a case study of Nakuru County. The study used a sample size of 339 respondents from the County of Nakuru. The study collected both primary and secondary data. Secondary data was collected from written sources such as books, journals and the internet. Primary data was collected using questionnaires. Both descriptive and inferential statistics were used to analyze the data. Further, chi square and multiple regression were used to predict the value of a variable based on the value of two or more other variables. The variables to be predicted are both the dependent

variables and independent variables. Data was presented in the form of frequency distribution tables, graphs that facilitate description and explanation of the study findings.

### 13. Data Analysis, Results and Discussions

#### Period of Pyrethrum Farming

The study sought to find out the period the farmers had practiced pyrethrum farming. Table 1 below presents the findings.

**Table 1: Period of pyrethrum farming distribution**

Period of farming	Frequency	Percentage
1 year	15	7%
1-5 years	68	33%
5-10 years	71	34%
Above 10 years	54	26%
<b>Total</b>	<b>208</b>	<b>100%</b>

Findings from the study reveal that majority of the respondents (34%) had 5-10 years farming experience, 33% had 1-5 years' experience, 26% had above 10 years' pyrethrum farming experience and 7% had done pyrethrum farming for one year. The study findings are a clear indicator that the farmers had enough time in pyrethrum farming an aspect that gives the researcher courage that diversification strategies have taken place over the years.

#### Acres of land being cultivated

The study sought to find out how many acres of land the farmers were farming on. Table 2 below presents the findings.

**Table 2: Acres of land being cultivated**

Acres cultivated	Frequency	Percentage
Less than 1 acre	31	15%
1 acre	42	20%
2 acres	73	35%
More than 3 acres	62	30%
<b>Total</b>	<b>208</b>	<b>100%</b>

Study findings indicate that majority of the farmers farmed on 2 acres of land (35%), 30% farmed on more than 3 acres of land, 20% farmed on 1 acre of land and 15% farmed on less than 1 acre of land.

#### Diversification of agricultural Strategies

The study sought to establish the effect of alternative livelihood strategies on wellbeing of pyrethrum small scale farmers in Nakuru County. The study focused on four alternative strategies that the farmers adopted namely; agricultural diversification strategies, non-farm employment diversification strategies, manufacturing strategies and retail services strategies.

#### Wellbeing of Small Scale Pyrethrum Farmers

The study sought to establish the wellbeing of the small-scale pyrethrum farmers in Nakuru County. The researcher collected the data and the results are tabled below after the analysis.

**Table 3: Wellbeing of Small Scale Pyrethrum Farmers**

	Freq. %		Freq. %	
	Yes	No	Yes	No
Do you think diversification strategies facilitate access to quality healthcare?	141	68 %	67	32%
Do you think diversification strategies improves income status?	131	63%	77	37%
Do we have improved ability to afford education through diversification strategies?	162	78%	46	22%



Research findings as shown in Table 3 reveal that majority of the farmers had agreed that diversification strategies facilitated access to quality healthcare (68%) while 32% of the respondents did not agree with the same aspect. Further, the respondents indicated that diversification strategies helped them to earn extra income an aspect that enabled them to have access to quality healthcare.

The researcher also investigated whether the diversification strategies had an effect on the income status of the farmers. Study results indicate that majority of the farmers (63%) agreed that diversification strategies improved their income status. 37% of the farmers disagreed with that aspect. Further findings reveal that diversification studies improved the farmer’s income status since in carrying out several agricultural activities helped them to have multiple products that they could sell and make more income as well as to mitigate the risks involved in pyrethrum farming.

The researcher further investigated diversification strategies helped the farmers afford education. Majority of the farmers (78%) responded positively to this aspect while 22% disagreed with the aspect. Further findings reveal that diversification strategies were ways of making extra income as well as an extra mile in farming business thus they were able to generate income that could be used to help in accessing education.

**Farm diversification of Agricultural Strategies**

The study sought to establish the agricultural diversification strategies that the farmers had taken into account. The study identified seven farming strategies that the farmers had invested in. Table 4.8 below presents the activities and further investigated whether the activities were commercial or not, the level of income associated by the activities, the extent they met the social obligations, affordability of basics of life and the extent they met challenges when carrying out the activities.

Table 4: Farm diversification strategies

Activities	Poultry farming	Dairy farming	Fish farming	Goat farming	Pig farming	Wheat farming	Maize farming
	Mean score	Mean score	Mean score	Mean score	Mean score	Mean score	Mean score
To what extent do you think farm diversification contributes to Commercialization	3	4	2	1	2	3	4
To what extent do you think that farm diversification contributes to income	3.2	4.2	3.1	2.1	3.2	2.8	3.6
To what extent do you think that farm diversification contributes to affordability of basics of life	3.1	3.2	3.8	2.6	3.1	3.2	3.8
To what extent do you agree or disagree that farm diversification contributes to meeting social obligations	3.5	4.2	2.6	3.6	2.7	2.7	3.1
Chi square	24.021 sig.	23.098 sig.	21.054 sig.	27.898 Sig.	20.954 sig.	28.851 sig.	20.741 sig.
<b>Key for mean</b>							
Commercialization	1-Non-commercial	2- Commercial	3-Both commercial/non-commercial	4- Highly commercial			
Income	<1.0-1.8 Very low	>1.8-2.6 Low	>2.6-3.4 Moderate	>3.4-4.2 High	>4.2-5 Very high		
Affordability of basics of life	<1.0-1.8 Not affordable	>1.8-2.6 Low affordability	>2.6-3.4 Moderate	>3.4- 4.2 Affordable	>4.2-5 Highly affordable		
Meeting of social obligations	<1.0-1.8 Strongly disagree	>1.8-2.6 Disagree	>2.6-3.4 neither agree or disagree	>3.4-4.2 Agree	>4.2-5 Strongly agree		

Study findings as shown in the above Table 4 reveal that the farmers carried out seven main farm diversification activities that included; poultry farming, dairy farming, fish farming, goat farming, wheat farming, maize farming and pig farming. The study reveals that maize farming was a major activity that almost every farmer carried out. The activity was a major source of income as it presented the farmers with a high level of income (3.6) affordability of basics of life (3.8). However, the maize farming was moderate in meeting social obligations as well as its challenges were moderate. Dairy farming presented the farmers with a great source of income with a high mean of (4.2), social obligations were met to a great extent, while affordability of basics of life was to a moderate affordability. Further, it is noted that the contribution of poultry and wheat farming to

income, affordability of basics of life and meeting of social obligations was to a moderate extent. There are a huge range of alternative food crops grown in Kenya today; horticulture which include, green beans, red onions, cabbages, snow peas, avocados, mangos, passion fruits among others, improved maize grades and other improved grades of food crops (Prag, 2002).

Pig farming was practiced a strategy that presented the farmers with a moderate level of income, the affordability of basics of life was also moderate, while meeting social obligations was to a moderate extent as well (2.7). The challenges associated with the activity was agreed to moderate as well. Goat farming presented the farmers with low level of income (2.1), moderate affordability of life basics and meeting social obligations to a moderate extent (3.6). The perceived challenges in the activity were moderate. From the study results, poultry farming, dairy farming, fish farming and maize farming were both commercial and non-commercial. This finding implies that the activities were done for household food supply as they are a good source of proteins as well as the supplements could be sold to generate extra income.

Goat farming was a non-commercial activity carried out by farmers. The findings imply that the area doesn't have a good environment for goat breeding thus few farmers endeavor in the activity. Pig farming was purely a commercial activity while wheat farming was highly commercial. The findings imply that wheat is a commercial crop in the region and farmers would carry out the activity for commercial use only. According to the Ministry of Agriculture (2010) many extension agencies have promoted increased household involvement in the rearing of alternative livestock such as pigs, improved goats, sheep, rabbits and poultry (usually chickens) in Kenya with the aim of improving people's livelihoods. Livestock farming is the rearing of animals for food and for other human uses. The major types of commercial livestock farming include dairy and beef farming. Beef

farming is very important in Kenya today; ninety percent of beef cattle in Kenya are in the hands of subsistence farmers and pastoralists.

The chi square results for each of the activities were as follows; Poultry farming (24.021), dairy farming (23.098), fish farming (21.054), goat farming (27.898), pig farming (20.954), wheat farming (28.851), maize (20.741). Given that all the chi square values exceeds the critical value the study concluded that there exists a significant relationship between farm diversification strategies and wellbeing of pyrethrum small scale farmers in Nakuru County at 4 degrees of freedom and 95% level of significance.

### **Non-farm Employment Diversification Strategies**

The study sought to investigate on the non-farm employment diversification strategies the farmers adopted. Six areas were inspected under this aspect and they included; professional jobs, civil service, employment, juakali sector employment, agro-processing sector, construction employment and transport sector employment. The aspects were tested under the level of income they generated, affordability of basics of life, meeting social obligations and the challenges associated. Table 5 below presents the study findings.

**Table 5: Non-farm employment strategies**

Activities	Professional Jobs	Civil service Jobs	Juakali sector employment	Agro-processing	Construction sector	Transport sector
	Mean score	Mean score	Mean score	Mean score	Mean score	Mean score
To what extent do you think non- farm diversification contributes to Commercialization	3	3	3	2	2	2
To what extent do you think that non- farm diversification contributes to income	3.6	3.7	2.6	3.2	2.7	2.8
To what extent do you think that non- farm diversification contributes to affordability of basics of life	3.8	3.6	3.2	2.7	2.8	3.1
To what extent do you agree or disagree that non- farm diversification contributes to meeting social obligations	3.5	3.5	3.2	2.5	2.4	2.9
Chi square	32.893 sig.	23.990 sig.	22.793 sig.	36.871 sig.	30.868 sig.	28.849 sig.
<b>Key for mean</b>						
Commercialization	1-Non-commercial	2- Commercial	3- Both commercial/non-commercial	4- Highly commercial		
Income	<1.0-1.8 Very low	>1.8-2.6 Low	>2.6-3.4 Moderate	>3.4-4.2 High	>4.2-5 Very high	
Affordability of basics of life	<1.0-1.8 Not affordable	>1.8-2.6 Low affordability	>2.6-3.4 Moderate	>3.4-4.2 Affordable	>4.2-5 Highly affordable	
Meeting social obligations	<1.0-1.8 Strongly disagree	>1.8-2.6 Disagree	>2.6-3.4 Neither agree or disagree	>3.4-4.2 Agree	>4.2-5 Strongly agree	

Study findings reveal that majority of the farmers who had adopted non-farm employment diversification strategies had opted for professional jobs that generated high income. The farmers think that they were in a position to afford basics of life (3.8) while they also met their social obligations to a great extent. They however faced challenges that they indicated affected them to moderate extent (2.6). The farmers working in the civil service revealed that their level of income was high and they think that the basics of life were affordable. They further noted that they met their social obligations to a great extent (3.5) and the challenges they faced were moderate as well. The farmers who were working in the Juakali sector revealed that they had a moderate level of income with a moderate affordability of basic needs of life (3.2) as well as moderate meeting of social obligations with

great challenges being experienced in the sector (3.7).

Further, it is noted that the farmers that worked in the construction sector had a moderate level of income, and affordability of basics of life. However, they noted to a low extent that the strategy met their social obligations. They agreed to a moderate extent to the challenges that they experience in the sector. Farmers who worked in the transport sector revealed that they had a moderate level of income, affordability of basics of life (3.1), meeting of social obligations (2.9) and the perceived challenges experienced were moderate.

Evidence from field surveys during the 1970s and 1980s across many of these countries shows that self-employment in household based enterprises and wage employment in formal sector is widespread (Chuta and Liedholm, 1990). The expansion of non-agricultural employment opportunities is likely to tighten casual labor markets in general and thus raise wages in the agricultural labor market (Lanjouw, 1999).

The chi square results for each of the nonfarm diversification strategies were as follows; professional jobs (32.893), civil service jobs (23.990), Jua kali sector employment (22.793), agro-processing (36.871), construction sector (30.868) and transport sector (28.849). Given that all the chi square values exceeds the critical value the study concluded that there exists a significant relationship between non-farm employment and wellbeing of pyrethrum small scale farmers in Nakuru County at 4 degrees of freedom and 95% level of significance.

**Manufacturing Strategies**

The researcher sought to investigate on the manufacturing strategies that the farmers could have possibly ventured in. The study focused on agro-based manufacturing, industrial based manufacturing, mineral based manufacturing,

lumbering, construction, and electronics manufacturing. Table 6 below presents the results.

Table 6: Manufacturing Strategies Presentation

Activities	Agro-based manufacturing	Industrial manufacturing	Mineral-based manufacturing	Lumbering	Construction sector	Electronic manufacturing
	Mean score	Mean score	Mean score	Mean score	Mean score	Mean score
To what extent do you think manufacturing contributes to Commercialization	4	4	4	2	2	2
To what extent do you think that manufacturing diversification contributes to income	4.26	4.3	4.3	3.2	2.2	1.6
To what extent do you think that manufacturing contributes to affordability of basics of life	4.2	4.0	4.1	2.7	2.1	1.9
To what extent do you agree or disagree that manufacturing contributes to meeting social obligations	4.0	3.9	4.1	2.5	2.6	1.2
Chi square sig.	26.541 sig.	20.830 sig.	35.611 sig.	37.858 sig.	29.901 sig.	26. sig.
<b>Key for mean</b>						
Commercialization	1-Non-commercial	2- Commercial	3- Both commercial/ non-commercial	4- Highly commercial		
Income	<1.0-1.8 Very low	>1.8-2.6 Low	>2.6-3.4 Moderate	>3.4-4.2 High	>4.2-5 Very high	
Affordability of basics of life	<1.0-1.8 Not affordable	>1.8-2.6 Low affordability	>2.6-3.4 Moderate	>3.4-4.2 Affordable	>4.2-5 Highly affordable	
Meeting social obligations	<1.0-1.8 Strongly disagree	>1.8-2.6 Disagree	>2.6-3.4 Neither agree or disagree	>3.4-4.2 Agree	>4.2-5 Strongly agree	

Findings from the study reveal that agro-based manufacturing, industrial manufacturing, and mineral based manufacturing were all highly commercialized while lumbering, construction based, and electronics manufacturing were commercialized. The study results imply that these manufacturing activities can only be carried out for commercial services. Further findings reveal that agro-based manufacturing strategies generated a high level of income to the farmers with highly affordability of basics of life as well as a great extent in meeting social obligations (4.0). However, the challenges experienced were moderate (3.1). Also, the industrial manufacturing presented the farmers with a high level of income (4.3), and

highly affordability of basics of life as well as meeting social obligations to a great extent. The challenges experienced were also to a great extent. Mineral based manufacturing presented farmers with a high level of income and highly affordability of basics of life, and meeting social obligations to a great extent. However, the challenges experienced were moderate (3.4).

Lumbering was another strategy that was being adopted by the farmers and presented the farmers with moderate income, affordability of basics of life to a moderate extent, meeting social obligations to a moderate extent while the challenges experienced were to a great extent. Construction based manufacturing strategy presented the farmers with a low income, affordability of basics of life to a low extent, meeting social obligations to a moderate extent and challenges experienced were to a low extent. Electronics manufacturing was the least adopted strategy as it was undertaken by only 3% of the farmers presenting them with very low income, low affordability of basics of life, meeting social obligations (1.2) and challenges experienced to low extent as well (1.6). Some key Kenyan manufacturing subsectors that have increased demand in the recent past include galvanized iron sheets, cement, cigarettes, beer and Wheat flour. All of these have increased production between 2003 and 2005; particularly cement which is a good indicator of economic activity. On the consumer goods side, goods manufactured locally include stationery and grooming products. The transformation of agricultural raw materials, particularly of coffee and tea, remains the principal industrial activity. Meat and fruit canning, wheat flour and cornmeal milling, and sugar refining are also important. Electronics production, vehicle assembly, publishing, and soda ash processing are all significant parts of the sector (Kimuyu, 2010).

The chi square results for each of the manufacturing strategies were as follows; Agro-based manufacturing (26.541), Industrial manufacturing (20.830), Mineral-based manufacturing (35.611),

Lumbering (37.858), construction sector (29.901) and electronic manufacturing (26.942). Given that all the chi square values exceeds the critical value the study concluded that there exists a significant relationship between manufacturing strategies and wellbeing of pyrethrum small scale farmers in Nakuru County at 4 degrees of freedom and 95% level of significance.

**Retail Service Diversification**

The study sought to establish the retail service diversification strategies that farmers ought to have adopted. The researcher focused on three main strategies namely; agro-based retail, telecommunications retail, and general merchandise retail. Study findings are presented in Table 7 below.

Table 7: Retail service strategy

Activities	Telecommunication retail	Agro-based retail	General merchandise retail
	Mean score	Mean score	Mean score
To what extent do you think retail service diversification contributes to Commercialization	4	4	4
To what extent do you think that retail service diversification contributes to income	4.0	4.1	4.0
To what extent do you think that retail service contributes to affordability of basics of life	4.0	4.1	4.2
To what extent do you agree or disagree that retail service contributes to meeting social obligations	4.3	3.3	4.1
<b>Chi Square</b>	27.690 sig.	29.076 sig.	35.980 sig.
<b>Key for mean</b>			
<b>Commercialization</b> 1-Non-commercial	2- Commercial	3- Both commercial/non commercial	4- Highly commercial
<b>Income</b>	<1.0-1.8 Very low	>1.8- 2.6 Low	>2.6- 3.4 Moderate
<b>Affordability of basics of life</b>	<1.0-1.8 Not affordable	>1.8-2.6 Low affordability	>2.6-3.4 Moderate
<b>Meeting of social obligations</b>	<1.0-1.8 Strongly Disagree	>1.8-2.6 Disagree	>2.6-3.4 Neither agree/disagree
	>3.4- 4.2 Agree	>4.2-5 Strongly agree	

The study revealed that the farmers agreed that telecommunication retail presented the farmers with a high level of income (4.0), high affordability of basics of life, meeting social obligations to a great extent (4.3). However, the challenges faced were to a moderate extent. Agro-based retail also presented the farmers with a high level of income, high affordability of basics of basics, meeting

social obligations, with a moderate extent in the challenges experienced (3.2). The general merchandise retail presented a high level of income to the farmers, highly affordability of basics of life, meeting social obligations to a great extent while the challenges were to a moderate extent. In total, 144,300 Kenyans were involved in retail in 1996, not counting those that were engaged in the informal sector. The informal sector itself, known in Kenya as "jua kali," employs approximately 64 percent of all Kenyan urban workers. It is also the most dynamic sector in the economy in terms of job creation, accounting for about 90 percent of new jobs outside the smallholder farm sector. Informal sector activities, such as carpentry, motor vehicle repair, tailoring, hawking, and selling various fruits, vegetables, and other commodities, are largely service-based (Foroutan, 2005).

The chi square results for each of the retail service strategies were as follows; telecommunication retail (27.690), agro-based retail (29.076), general merchandise retail (35.980). Given that all the chi square values exceeds the critical value the study concluded that there exists a significant relationship between retail service diversification strategies and wellbeing of pyrethrum small scale farmers in Nakuru County at 4 degrees of freedom and 95% level of significance.

**Challenges Experienced**

**Challenges Experienced when engaging in Farm Diversification Strategies**

The study sought to establish the challenges the farmers experienced while engaging in farm diversification strategies. Table 8 below presents the study results.

**Table 8: Challenges faced by farmers while engaging in farm diversification strategies**

Activity	Poultry farming	Dairy farming	Fish farming	Goat farming	Pig farming	Wheat farming	Maize farming
	Mean score	Mean score	Mean score	Mean score	Mean score	Mean score	Mean score
To what extent do you think that farm diversification face challenges	3.2	3.3	4.3	3.2	2.7	3.2	3.4
Challenges faced by farmers while engaging in agricultural diversification strategies	Mean			Std.Dev			
Lack of enough rainfall	3.5			1.43			
High costs associated with farm diversification activities	4.2			0.79			
Diseases that affect the crop/livestock production	2.6			2.31			
Varying market prices	3.2			1.73			

The study used the following key for the means; <1.0-1.8 Very small extent, >1.8-2.6 small extent, >2.6-3.4 moderate extent, >3.4-4.2 great extent, and >4.2-5 very great extent.

The study findings reveal that the farmers agreed that they lacked enough rainfall for their activities and the farm diversification activities they undertook were associated with high costs. However, they were neutral on the fact that diseases affected their crop/livestock production and the markets for their products were variable.

### Challenges Experienced when engaging in Non-Farm Diversification Strategies

The study sought to establish the challenges the farmers experienced while engaging in non-farm diversification strategies. Table 9 below presents the study results.

**Table 9: Challenges Experienced when engaging in Non-Farm Diversification Strategies**

Activity	Professional jobs	Civil service	Juakali sector employment	Agro-processing	Construction sector	Transport sector
	Mean score	Mean score	Mean score	Mean score	Mean score	Mean score
To what extent do you think non-farm diversification face challenges	2.6	2.4	3.7	3.3	2.5	2.6
Challenges faced by farmers while engaging in nonfarm employment strategies	Mean			Std.Dev		
Lack of enough time for non-farm activities	3.1			1.85		
More working time, less income	2.8			2.12		
Insecure jobs	1.7			3.25		

The diversification strategies were investigated with means ranging from 1-5. The study used the following key for the means; <1.0-1.8 Very small extent, >1.8-2.6 small extent, >2.6-3.4 moderate extent, >3.4-4.2 great extent, and >4.2-5 very great extent.

Study findings reveal that the farmers were neutral on the aspects that they lacked enough time for farm activities, they worked for more hours for a little pay and the jobs they were having were insecure.

### Challenges Experienced when engaging in Manufacturing Diversification Strategies

The study sought to establish the challenges the farmers experienced while engaging in manufacturing diversification strategies. Table 10 below presents the study results.

**Table 10: Challenges Experienced when engaging in Manufacturing Diversification Strategies**

Activities	Agro-based manufacturing	Industrial manufacturing	Mineral based manufacturing	Lumbering	Construction
	Mean score	Mean score	Mean score	Mean score	Mean score
To what extent do you think that manufacturing face challenges	3.1	3.6	3.4	3.3	2.1
Challenges faced by farmers while engaging in manufacturing strategies	Mean			Std.Dev	
High initial capital required for start up	3.6			1.32	
Requires more management time	3.1			1.81	
High maintenance cost	2.9			2.03	
Limited market	2.5			2.42	

The diversification strategies were investigated with means ranging from 1-5. The study used the following key for the means; <1.0-1.8 Very small extent, >1.8-2.6 small extent, >2.6-3.4 moderate extent, >3.4-4.2 great extent, and >4.2-5 very great extent.

Findings from the study reveal that the farmers agreed that there was a high startup capital involved in manufacturing strategies. However, they were neutral that manufacturing strategies required more management time, high maintenance cost and had limited market.

### Challenges experienced when engaging in Retail Service Diversification Strategies

The study sought to establish the challenges the farmers experienced while engaging in retail service diversification strategies. Table 11 below presents the study results.

**Table 11: Challenges Experienced when engaging in Retail Service Diversification Strategies**

Activities	Telecommunication retail	Agro-based retail	General merchandise retail
	Mean score	Mean score	Mean score
To what extent do you think that retail services face challenges	3.1	3.2	3.0
Challenges faced by farmers while engaging in retail service strategies	Mean	Std. Dev	
High operation cost	3.3	1.68	
Strict regulatory framework	2.9	2.04	
Disruptions by council officers	1.4	3.53	
Irregular low income	2.0	2.97	

*The diversification strategies were investigated with means ranging from; <1.0-1.8 Very small extent, >1.8-2.6 small extent, >2.6-3.4 moderate extent, >3.4-4.2 great extent, and >4.2-5 very great extent.*

Study findings show that the farmers were neutral that the retail service diversification was associated with high operation cost, strict regulatory frameworks, and irregular low income. However, they disagreed that there were disruptions from county council officers.

**Inferential Analysis**

The study sought to determine the effect of alternative livelihood strategies on well-being of pyrethrum small scale farmers in Nakuru County. Four research questions were generated that the study sought to answer. A probit analysis was carried out to generate the values for the pre-determined study model. The findings were shown under the following section.

**Probit Analysis**

The researcher conducted a probit analysis so as to determine the relationship between alternative livelihood well-being of pyrethrum farmers in Nakuru County. The regression equation was:  
 $Y_i = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4$

Y = Wellbeing of small scale pyrethrum farmers.  
 $\beta_0$  = Constant or intercept.  $\epsilon$  = disturbance term or error term.  $X_1$  = Farm diversification of agricultural strategies  $X_2$  = Non-farm employment  $X_3$ = Manufacturing strategies  $X_4$  = Retail service strategies.

**Table 12: Probit Analysis**

Classification Table <sup>a</sup>					
	Observed	Predicted			
		Wellbeing of pyrethrum farmers		Percentage Correct	
		.00	1.00		
Step 1	Wellbeing of pyrethrum farmers	.00	23	19	54.8
		1.00	8	58	87.9
	Overall Percentage				75.0
a. The cut value is .500					

The classification table indicates that the overall percentage of the model was 75% an indicator that the model has a good fit. The four independent variables that were studied, explain only 75% of the changes in the well-being of pyrethrum small scale farmers in Nakuru County as represented by the overall percentage while 25% was not explained by the model.

**Hypothesis Test**

Chi square test of the hypotheses was done on the data. Chi square test was used since the result is expected to be non-parametric and would give a much more holistic association. The findings on hypotheses testing were established by carrying out a two tailed Chi- square test. The study tested the following hypothesis on all the alternative livelihood strategies using Chi-Square at (.05) significant levels.

**H01** There is no significance relationship between farm diversification of agricultural activities and wellbeing of pyrethrum small scale farmers in Nakuru County.

**H02** There is no significance relationship between non-farm employment diversification strategies and wellbeing of pyrethrum small scale farmers in Nakuru County.

**H03** There is no significance relationship between manufacturing diversification strategies and

wellbeing of pyrethrum small scale farmers in Nakuru County

**H04** There is no significance relationship between retail service diversification strategies on and wellbeing of small scale pyrethrum farmers in Nakuru County.

The study rejected the null hypothesis (**H0**) because the computed chi square equals or exceeds the critical value.

**Table 13: Variable in Equation**

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup>	Agricultural diversification	-1.669	.543	9.457	1	.002	.188
	non-farm employment diversification	1.378	.582	5.611	1	.018	3.968
	Manufacturing diversification	.585	.497	1.388	1	.239	1.796
	Retail Service diversification	.382	.596	.411	1	.522	1.465
	Constant	.478	.405	1.395	1	.237	1.613
a. Variable(s) entered on step 1: piv, piv2, piv3, piv4.							

Replacing the coefficients in the model we get:

$$Y_i = .478 - 1.669X_1 + 1.378X_2 + .585X_3 + .382X_4$$

According to the regression equation established, taking all factors (farm diversification of agricultural strategies, non-farm employment strategies, manufacturing strategies, and retail service strategies) constant at zero, the well-being of small scale pyrethrum farmers in Nakuru County will be .478. The data findings analyzed also shows that taking all other independent variables at zero, a unit increase in farm diversification agricultural strategies will lead to a -1.669 decrease in well-being of small scale pyrethrum farmers. A unit increase in the non-farm employment strategies will lead to a 1.378 increase in the well-being of

small scale pyrethrum farmers in Nakuru County. Also, a unit increase in manufacturing strategies will lead to a .585 increase in the well-being of small scale pyrethrum farmers in Nakuru County. Moreover, a unit increase in retail service strategies will lead to a .382 increase in the well-being of small scale pyrethrum farmers in Nakuru County.

This withstanding, the study shows that there is a negative correlation between alternative livelihood strategies and the well-being of small scale pyrethrum farmers in Nakuru County. Again, we find that farm diversification of agricultural strategies and non-farm employment strategies have a significant effect on the well-being of small scale pyrethrum farmers in Nakuru County since their p-values are less than 0.05 (0.002 & 0.018) while manufacturing strategies, and retail service strategies have an insignificant effect since their p-values are greater than 0.05 (.239 & .522). Therefore, it can be deduced that alternative livelihood strategies have a significant impact on the well-being of small scale pyrethrum farmers in Nakuru County.

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