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Factors Influencing Profitability of Diversified Cash Crop Farming among Smallholder Tea Farmers in Gatanga District, Kenya

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Abstract
Small-scale farming account for about 75% and 55% of total agricultural production and marketed output respectively in Kenya. Cash crop farming is the main occupation of a majority of the farmers in central Kenya. However, with continued decline in the prices of traditional cash crops, horticultural crops have become an integral part of smallholder farms as a strategy to enhance farm incomes. It's, however, not well documented as to whether this cash crop multiplicity has helped improve the economic welfare of these peasant farmers. The study aimed at determining whether diversified cash crop farming is more profitable than specialization in tea farming and also identify the factors influencing this profitability. The study revealed that diversified cash crop farming is at least 63% more profitable than specialization in tea farming. Gender, farming experience, farm tools, farm size, credit, hired labour and the fertilizer and manure applied are the significant determinants.
Keywords: profitability, smallholder, tea, horticulture, diversification, cash crops

1. Introduction

Agriculture is the mainstay of the Kenyan economy. The sector employs more than 67% of the total population, directly contributes to 24% of the Kenyan Gross Domestic Product (GDP) and accounts for 65% of Kenya's export earnings (HCDA, 2010). Kenya's agricultural sector is made up of four major sub-sectors; namely, industrial crops, food crops, horticulture, and livestock and fisheries (KNBS, 2009). The major cash crops grown in Kenya are tea, coffee, pyrethrum, cut flowers, macadamia nuts, avocadoes and passion fruits. Tea is the leading agricultural export commodity contributing about 28% of the total value of agricultural exports, followed by horticulture at 20% (Amde *et al*., 2009). In addition, tea accounts for about four percent of the country's GDP and employs about a tenth of the country's population when indirect jobs in the sector are included (Agri Trade, 2010). The horticultural sub-sector has recorded significant export-driven growth in the past five years and employs approximately 4.5 million people countrywide directly in production, processing and marketing while 3.5 million people benefit indirectly through trade and other activities. The Kenya Vision 2030 has for these reasons identified agriculture as one of the key sector to deliver the 10% annual economic growth rate envisaged under the economic pillar. To achieve this, transformation of smallholder agriculture from subsistence to an innovative, commercially-oriented, and modern agricultural sector is critical. This transformation will effectively necessitate a movement of resources from low value to high value agriculture and horticultural production offers this avenue for the smallholder farmers in Kenya in general and central Kenya in specific.

The horticultural sub-sector contributes positively to wealth creation, poverty alleviation and gender equity especially in the rural areas (HCDA, 2010). It contributes to the Kenyan economy through income generation, creation of employment opportunities for rural people and foreign exchange earnings, in addition to providing raw materials to the agro-processing industry (HCDA, 2010). In summary therefore, growth of horticultural sector would contribute enormously to realization of the national development agenda through wealth and employment creation, foreign exchange earnings, provision of raw materials for the agro-processing industry, enhancing nutrition and food security and poverty alleviation. The uptake of horticulture farming among the traditional cash crop farmers will thus, in addition to increasing farm incomes, provide income security and safety nets should one enterprise fail.

Farmers in Gatanga District are primarily small scale cash crop farmers and the chief cash crops grown in the district are tea and coffee. Over the years, however, horticultural crops such as avocado, vegetables, macadamia, passion fruits and cut flowers have become important on the farms of these farmers. There is however no adequate documentation of the effect the shift of resources to horticulture has on the profitability of smallholder tea farming in Gatanga. Given the small sizes of farms in the district, sustainability of these farms in the long run is pegged on improved productivity and profitability at the farm level. Secondly, given the role of agriculture in the economic pillar of Kenya's development plan, vision 2030, improving productivity and profitability of the smallholder farms is crucial since they occupy 60% of area under production in the country. Farm sustainability is the ability of agriculture to endure over time and to achieve it smallholder farming needs to be profitable and economically viable (van Veenhuizen, 2007). The study thus seeks to establish whether diversification to horticulture significantly improves the profitability of smallholder tea farming and if so,

identify the factors influencing the profitability of diversified cash crop farming system so that promotion of diversification can be empirically advised.

2.Material Aand Methods

2.1 The study area

The study was conducted in Gatanga District of Muran'ga County during the months of April and May 2011. Gatanga District lies in the Agro ecological zones UH0, UH1, LM1, UM1 and UM2 (MoA Gatanga District, 2010). The soils found in the district are mainly Andosols and Nitosols. The District has an altitude of 1,340-2,190 m above sea level and receives an average annual rainfall of 2,000 mm (MoA Gatanga District, 2010). Total arable land in the district is 312.4 Km^2 supporting a population of 113,094 people as per 2009 census which gives a population density of 362 persons per Km^2 and an average smallholder farm size of 0.23 hectares per person (MoA Gatanga District, 2010).

The study utilized primary data collected from the field during the months of April and May of the year 2011. The primary data collected from a random sample of 161 smallholder tea farmers included cash crops grown, yields obtained, selling prices and household economic and social characteristics, production cost, crop sales, and the institutional support available to farmers. Secondary data used was collected from published sources. The primary data was collected by administering pre-tested structured interview schedules to the sampled farmers. The data so collected was supplemented with focus groups discussions for selected lead farmers.

2.2 Data analysis

To estimate the profitability of cash crop farming both specialized and diversified, gross margin analysis was used. The model used for the estimation of the gross margin for each farm is the model according to Olukosi and Ernabor (1988) as quoted in Ebukiba (2010) and as applied in Izekor & Olumese (2010) and Masuku (2011) among others. However, for purposes of further comparison, the Net farm margins are also computed by deducting cost of capital and household expenses per annum from the gross margins.

Gross Margin = Total Revenue-Total variable Cost……...1

Net farm Margin = Total Revenue-Total variable Cost-Fixed costs……2

To identify the factors influencing profitability of cash crop farming in Gatanga the gross margins were regressed on the various socioeconomic and institutional characteristics. To achieve this, the ordinary least squares approach as specified in equation three was used.

$$PROFIT = \beta 0 + \beta_1 Fertqty + \beta_2 Labourhire + \beta_3 Nocashcrops + \beta_4 Conserv + \beta_5 Tools + \beta_6 Age + \beta_7 + \beta_8 Exper + \beta_9 Edn + \beta_{10} Credaccess + \beta_{11} Distoutptmkt + \beta_{12} Fieldsize + \beta_{13} FOrgn + \beta_{14} Contract + \beta_{15} Headgender + \varepsilon_i \quad \ldots\ldots 3$$

3.0 Results and Discussions

3.1 Land ownership and utilization in Gatanga District

Land is the most important resource a farmer could possibly have since for any agricultural activities access to own or hired land is needed. Figure 1 shows how farmers in Gatanga District have allocated their land to various crops. The average land holding in Gatanga District is 1.15 and 0.9 hectares for diversified and specialized farmers respectively indicating that on average specialized tea farmers own 27.8% less land than the tea farmers engaged in horticulture. The diversified and specialized tea farmers have allocated 70.06% and 72.82% of their total cropped land area to tea respectively implying that farmers in Gatanga District have less than 30% of the farm to carry out any other farming activities. Diversified farmers have however allocated 90% of total cultivated land to cash crop farming while specialized farmers have dedicated 70% of total cultivated land to cash crop farming. This implies that among the diversified farmers, 10% of cropped land is available for food crops and fodder production while in the case of specialized farmers 30% of the land is available for food fodder production. Further it can be deduced that whereas specialized tea farmers attempt to access food from own production, the diversified farmers attempt to increase their cash income from cash crops and possibly use the cash income to purchase food. If this was to be the case, then the specialized farmers may sell any surplus food crop harvest to the diversified farmers since the demand for food exists. This would eventually lead to improved economic welfare among food crop producers in the study area.

A diversified cash crop farmer is any tea farmer who produced and sold one or several HVAC during the study year. The results show that 64% of the farmers in the random sample have diversified their cash crop portfolio to include tea and either one or several of the HVAC's under consideration in the study. The findings of the current study are similar to those of Mwaura and Muku (2007) who found that more than 60% of tea farmers in the Central Kenya highlands have diversified into other high value farm enterprises for income generation and livelihoods.

The diversified cash crop farmers in Gatanga District grow a number of HVAC's as illustrated in

Figure 2. At least 58% of diversified farmers are engaged in commercial cabbages production. Avocado is the second most important HVAC in Gatanga District. It is grown by 47% of the diversified farmers. This crop is preferred by the diversified farmers because the main avocado harvest coincide with the month of July when tea output is at its least, thus providing the much needed alternative source of income to these farmers. Tree tomatoes, passion fruits, and courgettes are also equally important HVACs among the diversified farmers. Among the diversified farmers 18% are growing tree tomatoes and passion fruits for each while 14% are growing courgettes. Macadamia nuts, flowers and tomatoes have the least number of diversified farmers growing them at six, seven and four percents respectively. This can be explained by the relatively technical nature of tomato and flower production and the long duration macadamia trees take to be productive as well as the labour and capital intensive nature of tomato and flower production.

A majority of diversified farmers grow several HVAC's in addition to tea as opposed to tea and one HVAC. Among the diversified farmers 30% are growing six cash crops tea included while 25% of the diversified farmers grow five cash crops. About 20%, 15% and 10% of the diversified farmers grow four, three and two cash crops respectively. Although these percentages may indicate a lack of specialization, the aim of these farmers is to meet consumption needs by increasing cash income, to reduce risk associated with weather or disease outbreak or for economy of scale (Ibrahim *et al.,* 2009). These findings also agree with the findings of Minot *et al.,* (2006) that rural households grow up to five or six crops in a bid to reduce agricultural risks.

3.2 Profitability of HVACs-tea farming system in Gatanga District

The enterprise gross margin is used to assess the financial performance of cash crop farming in Gatanga District. To construct a proxy measure of farm profit, from the value in KES of all cash crops income in the year, all associated variable input costs are deducted as shown in Table two. The cost of labour included is separated into tea harvesting costs, which varies with the quantity of tea harvested, and the HVAC labour which varied with the size of the HVAC field and number of days worked on the field thus considered as variable. The findings show that cash crop revenues are significantly higher for the diversified farmers as compared to specialized farmers at 1% significance level. This is attributable to cash crop diversification and use of more productive inputs by the diversified farmers. The diversified farmers also apply significantly more manure and pesticides as well as hire more non-tea harvesting labour per hectare than the specialized tea farmers.

During the study year, diversified farmers in Gatanga District earned a gross margin of KES 569227 while specialized farmers earned KES 348990 per cash crop hectare. The gross margin earned by diversified farmers is 63% higher than that of specialized tea farmers. Similarly diversified farmers earned a net farm gross margin of KES 384475 while the specialized farmers earned a net farm gross margin of KES 153554 per hectare. This difference is significant at 1% level and suggests that diversification to horticulture can greatly improve farm profitability among traditional cash crop farmers. Households with higher share of industrial and horticultural crops in their cropped land exhibit higher agricultural productivity and therefore earn higher income than households with higher share of their land under cereals. Since the diversified farmers apply significantly more manure, labour and pesticides per hectare to their cash crops than do specialized farmers, they earn significantly higher profit from cash crop farming than the specialized farmers.

The study also finds that cash crop farming in Gatanga District is profitable after deduction of cost of capital and household living expenses. At 1% significance level diversified farmers earn more net farm gross margins than the specialize farmers. This implies that cash crop farmers in Gatanga District have excess investible funds and financial advice on spending such money will go a long way in improving living standards and economic development in the area.

3.3 Factors influencing profitability of diversified cash crop farming in Gatanga District

There is a statistical difference in profits received from cash crop farming per hectare by diversified farmers compared to the receipts of specialized tea farmers as shown in Table two. Table three presents the empirical findings on the factors identified as key determinants of profitability for the diversified cash crop farms in Gatanga District. The observed profitability of diversified smallholder tea farmers is regressed against the socioeconomic and institutional factors expected to have an influence on farming profit. The variables used explain the model 62% while other factors not included explains 38% of the variability in the model.

Cash crop diversification has a significant positive impact on farm profitability in Gatanga District at 1% level as shown in Table two. This is in line with the findings of Falco *et al.,* (2010) that farm biodiversity is positively correlated with farm profitability. The author argues that this is an indication that farms that grow a range of different products perform better, when compared to those that do not. This further illustrates the fact that there are economic benefits associated with cash crop diversification. Similarly, different crop species reduce the implication of price and production risk and allows farmers the option of marketing their produce several times throughout the year (Baumgärtner & Quaas, 2008. The profitability of diversified cash crop farmers was found to be determined by various factors both internal and external to the farmer's circumstances.

Gender of the household head is one of the factors that have a positive and significant effect on profitability of cash crop farming in Gatanga District. Male-headed diversified farms make more profits from cash crops than their female headed counterparts in Gatanga District. Being a diversified male farmer leads to a KES 128027 higher profits from cash crop farming activities compared to being a diversified female farmer. Evidence gathered from the field shows that men spend most of their time working on cash crops and none on food crop fields. Women on the other side spend time in the cash crops especially harvesting tea and also tended to food crops so as to feed their families. With the work burden being high on women than men and farming objectives varying between these two types of households, male headed households were able to produce more and also make more profits. This finding corroborates the findings by Ibrahim *et al.,* (2009) and Demurger (2010), who found that family composition is influential in terms of household diversification strategies and productivity because male-headed households have more available labour.

Years of farming experience influences the production efficiency as well as the marketing links and skills a farmer can possibly have. Experience reduces the mistakes a farmer makes in production thus improving the performance of such a farm. Experienced farmers know better which crops to grow, when to grow them, how to grow them, which markets to sell to, when to sell, which inputs to use or not use and which mistakes not to make. The knowledge of these aspects gives the experienced farmer a comparative advantage relative to their less experienced counterparts. The farmers experience in cash crop farming is a significant determinant of cash crop profitability at 1% significance level in Gatanga District. This finding is consistent and similar with the finding by Rahman (2003) who found that experience in modern rice farming plays an important role in raising profitability and reducing inefficiency among rice farmers in Bangladesh. Farmers with more experience in growing modern varieties earn significantly higher profit, incur less profit–loss and operate at significantly higher level of profit efficiency (Rahman, 2003). Similarly in Gatanga District, farmers with more years of experience in cash crop farming fetch higher profits from cash crops.

The use of credit facilities also has a significant influence on profitability of diversified cash crop farming. Credit improves farm revenues and profits by easing the financial constraint in the acquisition of inputs for application to high value crops (Smith *et al*., 2001; Hyuha, 2010).

Use of hired labour is another variable with a significant effect on both diversification and profitability of diversified cash crop farming in Gatanga District. Diversified farmers identified labour as one of the major constraint they face in their farming business especially when tea production is at its peak. Increasing the labour supply for non-tea harvesting purposes among the diversified cash crop farmers leads to a significant increase in annual cash crop profits earned at the 10% level. The value of agricultural assets owned by a farmer also has a positive and significant effect on cash crop profitability at 10% significance level. Increasing value of agricultural assets guarantees the diversified farmer an increase in annual cash crop farming profits. The farm tools variable represents the value of all tools and implements used for the agricultural production process. The farmers with higher value of farm assets are in a better position to grow crops which may require different specialized tools and make more profits compared to farmers with very few assets (Masuku, 2011; Rahman, 2003). The principal argument for household asset holding as a determining factor in smallholder economic excellence can be viewed from the production side perspective which asserts that farm tools are essential for the production of a marketable surplus at a smallholder level. The ownership of these assets for surplus production is especially critical when markets for their hiring are completely missing or less functional as is the case in most of rural Africa where smallholder agriculture dominates (Jaleta *et al*., 2009). Weeding is an absolutely critical operation in the cropping cycle. The penalty, in crop yield, for late or no weed control is heavy: more than 30% of yield is commonly lost because of weed infestation and farm tools come in handy in weed control (Sims & Kienzle, 2006). In line with these findings, diversified cash crop farmers in Gatanga District can further improve the profitability by ensuring that they continually invest in farm tools and equipments.

The use of fertilizer and manure has the most significant effect on profitability of diversified cash crop farming in Gatanga District. Increasing fertilizer usage on the cash crop fields by one kilo leads to a significant KES 676 increase in the profits earned from cash crops in Gatanga District, holding all the other factors constant. Increasing organic manure application also leads to a significant increase in profit from the cash crops in Gatanga District. Use of fertilizer and organic manure have positive and significant impacts on farm profits received by diversified cash crop farmers in Gatanga District at 1% and 10% significance levels respectively. Given the small land sizes in Gatanga District and the prevalent cash crop farming system, intensive agriculture which requires an intensive input use is called for. This finding is consistent and similar to the findings of Reaerdon *et al.,* (1997); Olubanjo & Oyebanjo, (2005); Ahmad & Bakhsh (2006) who found that fertilizer contributes significantly to profitability of agricultural production. Fertilizer and manure application is especially important in Gatanga District since most crops are perennial and the farms are too small such that fallowing is not a feasible solution to soil infertility.

Finally, but not least, the amount of off-farm income received by diversified cash crop farmers has a significant and negative impact on cash crop profitability in Gatanga District. Increasing farmer's off-farm

income sources by KES 10000 decreases the cash crop profits by KES 5192. There is no consensus among researchers on the role of off-farm activities on agricultural development (Chikwama, 2010). The finding of this study is inconsistent with the finding by Reardon *et al*., (1997) who found that off-farm income has a positive impact on farm productivity in Africa. The inconsistency is however cleared in the same work when the authors acknowledge that this happens only in cases where formal rural credit is lacking and informal credit markets are also very underdeveloped (Reardon *et al*., 1997). Access to non-cropping income tends to be crucial for provision of capital to purchase farm input where credit facilities are unavailable. In Gatanga District, most farmers have access to formal credit services and therefore working off-farm creates competition for scarce family labour and management time between the farm and non-farm activities and therefore reduces farm revenues. This finding is similar to the finding by Chikwama (2010) who found that when there is no surplus labor in a household, increased availability of wage employment leads to 'de-agrarianization'. Further, a demand-side expansion in the rural labor market would cause the wage to rise and thus a household would allocate more labor to wage employment, away from farm production. However, when there is surplus labor in the household, a demand-side expansion of the rural labor market draws on idle labor and farm investment increases whenever the savings rate on wage income is positive (Chikwama, 2010). Most of the labour in the study area is actively involved in cash crop production. Any movement of this labour away from the farm to wage employment will therefore lead to decline in productivity and profitability of the farm.

4.0 Conclusions and Recommendations

The results show that 64% of farmers in the random sample have diversified to HVACs while 36% have specialized in tea farming. The results of gross margin analysis have shown that the gross margins from cash crop farming in Gatanga District are positive for both the diversified and specialized tea farmers. Cash crop gross margins per cash crop hectare are KES 569227 for diversified and KES 348990 for specialized farmers respectively. The gross margin per hectare for diversified farms is 63% higher than the gross margin of specialized tea farms with the difference being attributable to cash crop diversification. Diversified cash crop farming, achieved through supplementation of the HVAC's with tea other than through substitution, is 63% more profitable and therefore less risky than specialized tea farming in Gatanga District. The factors identified as having significant positive influence on profitability of diversified cash crop farming are gender of the household head, experience in cash crop farming, the value of farm tools owned, farm size under cash crops, access to credit, quantity of labour hired for non-tea harvesting activities and the quantities of fertilizer and manure applied to the cash crop fields. The amount of off-farm income earned has a negative and significant effect on the income of diversified cash crop farming in Gatanga District.

In conclusion, it is important to encourage the smallholder tea farmers in Gatanga District and other high potential regions of the country to embrace cash crop diversity since apart from improving farm profits; it reduces the income risks involved in agriculture and provides cash inflow throughout the year. So as to reap maximum benefits from diversified cash crop farming farmers also need to embrace modernized production and farming technologies. There is a need for the farmers to invest in modern farm tools and equipments, take advantage of the available credit facilities to modernize the way farming is done and above all adopt intensive farming which requires application of fertilizer and organic manure.

As shown in the study, high value agriculture has potential to improve financial performance and profitability of smallholder farms even when land is limiting. HVAC also lead to increased labour demand and employment in the rural areas reducing rural urban migration. There is therefore a great need to establish regulations that will support and promote HVACs at the national level by establishing the necessary regulatory and institutional frameworks needed for these crops. Good rural infrastructure and institutional infrastructure such as markets when well managed will transform the fortunes of the many smallholder farmers involved in HVAC production. Leaving these farmers at the mercy of traders will most likely hamper the growth of this so important sub-sector.

The promotion of agricultural productivity will require the full development of the input market in the country. Fertilizer and organic manure application have a very significant impact on farm profitability. If the input market can avail these inputs at the right time and at fair prices, then productivity of smallholder agriculture would improve significantly. This calls for investment in rural infrastructure for easy movement of the inputs, investment in fertilizer manufacturing and giving incentives to input traders to venture in the rural areas. Contract farming also has a potential in availing inputs to farmers and policies encouraging firms to contract smallholder farmers should be formulated.

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Table1. The variables in the regression model

Variable	Description	measurement	Expected sign
Labourhire	Quantity of non-tea harvesting labour	Number of hours hired	+ve
Fertqty	Quantity of fertilizer	Kilogram's of fertilizer applied /ha	+ve
manure	Quantity of manure	Quantity of manure in tonnes per hectare of cash crop field	+ve
Conserv	soil conservation	Dummy; 1 for yes; 0 for otherwise	-ve
Age	Age of the farmer	Number of years since birth	-ve/+ve
Headgender	Gender of the head	Dummy, 1= female and 0= male.	-ve/+ve
Exper	Cash crop Farming experience	Number of years the farmer has been growing cash crops	+ve
Educhead	Level of education	Number of schooling years.	+ve/-ve
Hhsize	Size of the household	The number of people in the household	-ve/+ve
IncomeLevel	off-farm income	Average annual off-farm income ('000' KES)	-ve/+ve
Nocashcrops	Number of cash crops	Number of cash crops a farmer grows	+ve
Tools	Value of farm tools	Value of farm tools owned('000' KES)	+ve
Credaccess		Dummy 1=access 0 = otherwise	+ve
Fieldsize	Cash crop field size	The number of acres a farmer has put under cash crop farming.	+ve
Extenstimes	Extension times	The number of extension visits received by the farmer	+ve
Distoutptmkt	Distance to output market	Distance in kilometers to the market place	+ve/-ve
Contract	Participation in contract farming	Dummy 1for yes 0 for otherwise.	+ve

The table above provides a list, description and measurement approach of the explanatory variables included in the regression model.

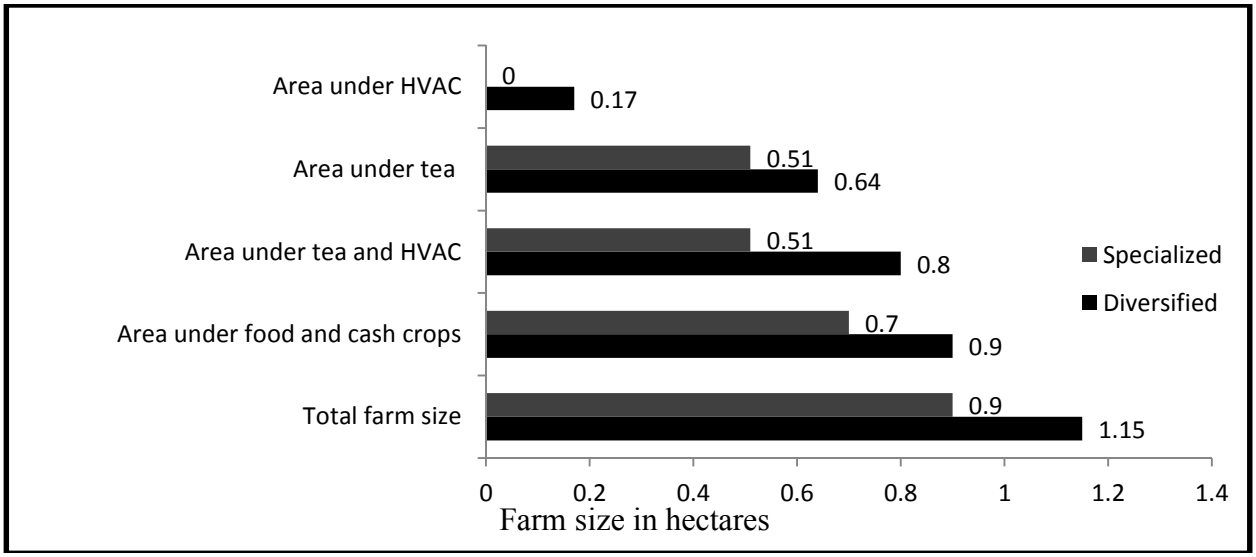

Figure 1: Summary of land allocation to various crops in Gatanga District

Figure above provides a summary of how farmers in Gatanga have allocated land to various cash and food crops.

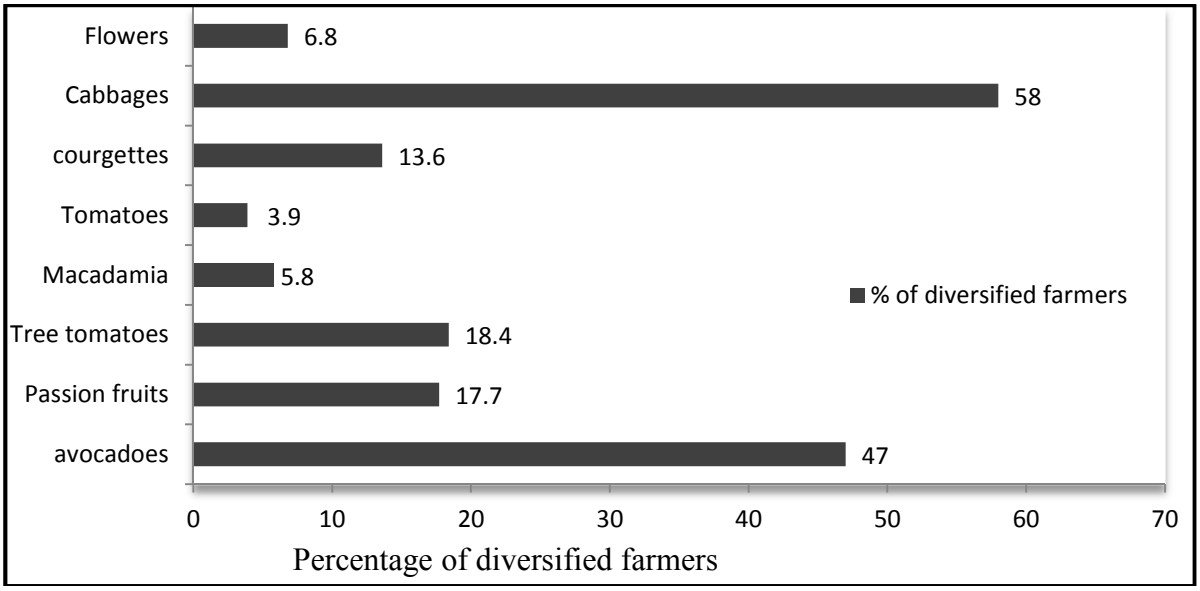

Figure 2: Main HVAC's diversified into by farmers in Gatanga District

The figure above provides information on the cash crops grown by the diversified cash crop farmers in Gatanga District.

Table 2: Cash crop Gross Margins (profitability) in Gatanga District

	Diversified cash crops (Mean)	Specialized Tea farming (mean)	Mean Difference	t-value	Sig. (2-tailed)
Cash crop Revenues					
Total income from cash crops ('000'KES/Ha)	649.084	417.395	231.689	3.738	0.000***
Variable Costs ('000'KES/Ha)					
Manure cost	3.184	.369	2.815	3.143	0.002***
Pesticide cost	2.352	.000	2.352	3.091	0.003***
Labour cost (tea harvesting)	77.915	65.311	12.604	1.217	0.225
Labour cost (HVAC)	20.508	.000	20.508	3.354	0.001***
Fertilizer cost	20.943	20.176	.768	.429	0.668
Total farm GM/Ha ('000'KES)	569.227	348.990	.220	3.952	0.000***
Cost of capital ('000'KES)	6.972	7.233	-.261	-.167	0.868
Total Hhd. Expenses ('000'KES)	177.830	188.203	-.103	-.569	0.570
Net farm GM/Ha ('000' KES)	384.475	153.554	230.920	3.952	0.000***

Where; * Significant at 10%; ** significant at 5%; *** significant at 1%;

Table 2 is a comparison of the farm profitability for diversified and specialized cash crop farmers in Gatanga district. The comparison of both gross and net farm revenues for diversified and specialized farmers is aimed at finding out whether cash crop diversification has advantages over specialization.

Table 3: Regression results for factors influencing profitability of diversified cash crop farming in Gatanga District

			Number of obs = 103 F(21, 81) = 6.34 Prob > F = 0.000 R-squared = 0.622 Adj. R-squared = 0.524	
Profit	Coef.	Std. Err.	t-value	P>|t|
Headgender	-96365.11	48190.22	-2.00	0.049*
Hhsize	3813.631	8630.526	0.44	0.660
Numpostpry	-39020.77	19756.28	-1.98	0.052**
Agehead	1113.101	2277.407	0.49	0.626
Educhead	29859.85	21508.6	1.39	0.169
Experiencehead	4799.87	1834.768	2.62	0.011**
areacashcrops	80300.74	14357.82	5.59	0.000***
Nocashcrops	-11362.41	17733.1	-0.64	0.523
Contracthvac	-60561.24	77237.06	-0.78	0.435
Soilconserv	-26437.55	36901.36	-0.72	0.476
Loan	-431983.6	168951.1	-2.56	0.012**
Extenstimes	1639.531	10677.94	0.15	0.878
Distoutptmkt	-2460.585	5869.87	-0.42	0.676
Hirelabour	1588.51	793.4602	2.00	0.049**
Fert	628.4563	140.0681	4.49	0.000***
Manure	3353.965	1905.971	1.76	0.082*
Tools	19823.65	10420.85	1.90	0.061*
Offfarmincome	-4150.339	3213.022	-1.29	0.200
_Cons	376895	248822.1	1.51	0.134

Significant at 10%; ** significant at 5%; *** significant at 1% significance level

Table 3 presents the output of the ordinary least squares regression of the computed farm profits per hectare against the various explanatory variables.

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