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Research Article

Factors Influencing Diversification and Intensification of Horticultural Production by Smallholder Tea Farmers in Gatanga District, Kenya

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Abstract: The contribution of traditional cash crops in the Kenyan economy is slowly being surpassed by horticulture saves for tea which continues to lead in terms of contribution to GDP and foreign exchange earnings. Smallholder tea farmers, who produce 62% of tea in Kenya, have however, also shown an increasing interest in production of horticultural crops for income and livelihoods. This shift is only possible if the tea income is insufficient to meet their needs or if there is a strong incentive to engage in horticultural production. It's however not well documented on what actually influence the smallholder tea farmers' resolution to diversify into horticulture. This study aimed at identifying these drivers as well as the determinants of intensity of diversification into horticulture. Using a Heckman two-step model to analyze a sample of 161 smallholder farmers collected using a multistage sampling technique, group membership, value of agricultural assets, amount of hired labour, occupation of the household head, contractual arrangements, farm size and distance to the output market were the major determinants of the farmers decision to diversify into horticulture. The intensity of diversification was influenced by gender of the household head, number of children pursuing post primary education, area under tea, occupation of household head, size of the farm, soil conservation activities and experience of the farmer in cash crop farming. The study specifically identified a need for a comprehensive land policy to address the plight of smallholder tea farmers in the study area.

Keywords: Cash crops, exports, horticulture, income, intensification, participation

INTRODUCTION

Traditionally, economies in the Sub-Saharan Africa (SSA) region have depended on conventional agricultural export crops (coffee, cocoa, tea, cotton, cashew nuts and sisal) for their balance of trade and foreign exchange earnings (Temu and Temu, 2005). However, with returns to the traditional export commodities having declined due to a fall in world prices amid rising production costs and limited value addition, High Value Agricultural Products (HAVP's) have become an important source of income for rural dwellers, traders and national incomes in the region (Temu and Temu, 2005; Meijerink and Roza, 2007).

In Kenya, agriculture is the mainstay of the economy with farming being typically carried out by about 3.5 million farming families with landholding size of less than two ha (GOK, 2010). These households occupy roughly 60% of the 38 million ha under cultivation in the country and account for 75% of total production and 55% of total marketed agricultural produce (GOK, 2010). Smallholder farming is for these reasons one of the most important sub-sectors of the economy and remains a major likely driver for the attainment of Kenya's long term development plan; Vision 2030.

Tea is the leading agricultural export commodity from Kenya. On average, tea contributes about 28% of the total value of agricultural exports followed by horticulture at 20% (Amde *et al*., 2009). Kenya is the world's largest black-tea exporter and third largest tea producer controlling 23% and 9% of total global tea exports and production respectively (Agri, 2010). This tea export is however in bulk semi-processed form thus dipping the market value and benefits to domestic producers. Despite this weakness, tea still accounts for about 4% of the country's Gross Domestic Product (GDP) and employs about a tenth of the country's population either directly or indirectly (Agri, 2010). Though tea production in Kenya is done by smallholder and large-scale farmers, the smallholder farmers are the major producers. Currently there are about 500,000 small scale tea farmers who account for 62% of all the tea produced in the country (Made *et al*., 2009).

Other than tea, there are many high value agricultural commodities in which Kenya tops the

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global trade with the smallholder farmers producing the largest proportion of the traded output. For instance, Kenya is the world's third largest macadamia (*Macadamia integrifolia*) producer and second largest exporter (Ondabu *et al.*, 2007). The country accounts for about 10% of the world's total macadamia production (Gitonga *et al*., 2009). More importantly, about 70% of total macadamia production in Kenya is accounted for by small scale farmers (Muhara, 2004. Avocado (*Persea Americana*) is another major export crop grown almost exclusively by smallholder farmer in Kenya. According to Wasilwa *et al*. (2005) avocado constitutes about 17% of the total horticultural exports from Kenya indicating that the fruit plays an important role in the horticultural sub-sector. Globally, Kenya is the 9th largest producer of avocado according to FAOSTAT (2012) and more than 85% of the avocado is produced by smallholder growers (Griesbach, 2005). Passion fruit (*Passiflorae edulis* Sims) is the third most important fruit crop in Kenya after mango and avocado in terms of foreign exchange earnings. The fruit is mainly grown by small scale farmers for subsistence and commercial purposes (Kahinga *et al*., 2006). In 2010, about 728 tonnes of passion fruits valued at 165 Million were exported from Kenya (HCDA, 2010). Passion fruits, like the other horticultural produce, are therefore a key source of revenue to smallholder producers in Kenya.

Gatanga District has a very high agricultural potential for livestock, food crops and cash crops production. However, farmers in the district are predominantly cash crop farmers and the primary cash crops grown in the district are tea and coffee. Tea is grown in the high potential upper Gatanga District under the KTDA smallholder out-grower scheme while coffee is grown in the warmer lower parts of the district. The smallholder tea farmers dedicate most of their productive time and resources to tea farming due to its labour intensive nature, but their living standards have remained low. This is in spite of the fact that tea is the single most important foreign exchange earner in Kenya. In an attempt to make ends meet about 60% of smallholder tea farmers in the central Kenya highlands have diversified into other high value farm enterprises for income and livelihood (Mwaura and Muku, 2007; MoA, Gatanga District, 2010). The tea farmers in Gatanga have specifically diversified into crops such as avocado, macadamia, passion fruits, cut flowers, Banana, vegetables and the tree tomato as a strategy to supplement their tea income (MoA, Gatanga District, 2010).

Agricultural diversification being the adjustment of farm enterprise patterns aims to increase farm incomes, or to reduce income vulnerability and risk. It entails a larger mix of diverse and complementary activities within agriculture and a movement of resources from low value to higher value agriculture (Delgado and Siamwalla, 1999; Joshi *et al.*, 2003; Meerta *et al*., 2005; McCulloch and Ota, 2002). The shift of resources towards high-value commodities is one of the most likely avenues to improve agriculture in Sub- Saharan Africa given that the demand for these commodities is growing with rising incomes, urbanization and globalization (IFPRI, 2007). Compared to cereals, the HVACs yield higher income and generate more employment, particularly for women and therefore will help in solving the problem of unemployment in rural areas if farmers are encouraged to grow them (IFPRI, 2007; Mertz *et al*., 2005). Given this rationale for diversification, most authors on the subject have studied diversification from cereal crops to HVACs. However, farmers in the study area grow tea as opposed to cereals but have as well diversified into the HVACs. The study thus focuses on a shift of resources from a conventional cash crop to other higher value cash crops. Specifically, the study aims to provide a documentation of the shift from tea to HVACs as a livelihood and income supplementation strategy for the rural households in Kenya. The study aims at identifying the factors influencing smallholder tea farmers' decision to engage in horticultural production. Similarly it's expected that tea farmers will diversify into horticultural production to different degrees. Thus the study also seeks to find out what factors influence the degree to which these farmers diversify. Understanding on-farm diversification decision in an already commercialized agricultural system is important in order to improve farm incomes, make smallholder agriculture more profitable and sustainable in the long run. To facilitate agricultural growth and development, diversification to high value products should not be treated as a preserve of cereal farmers only. The cash crop farmers also need to be encouraged to diversify to the HVACs as this will lead to increased demand for labour in rural areas, increase in farm incomes, an increase in quality of rural life and eventually, as farmers accumulate more capital, an increase in farm and off farm investments.

MATERIALS AND METHODS

The study area: Gatanga District is one of the districts in Muran'ga County and is divided into five administrative divisions, namely, Gatanga, Kariara, Kigoro, Kihumbu-ini and Samuru divisions. Kariara and Kigoro divisions fall in the tea zone (upper Gatanga District) where this study was conducted since tea farmers were the focus point of the study. Gatanga and Samuru divisions fall in the lower Gatanga District where coffee is the main cash crop, while Kihumbu-ini division lies in the transition zone where growing of both tea and coffee takes place.

Gatanga District lies in the Agro ecological zones UH0, UH1, LM1, UM1 and UM2 (MoA, Gatanga District, 2010). The soil types 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 and has a population density of 362 persons per Km^2 and an average smallholder farm size of 0.23 ha per person (MoA, Gatanga District, 2010). Gatanga District has a potential for many other cash crops apart from tea and coffee. These include pineapples, cut flowers, macadamia, avocadoes, pears, mangoes, passion fruits and vegetables. Since it is a requirement that payments from KTDA be channeled through a bank, all tea farmers operate bank accounts. These banks play a critical role in farmer support especially through credit provision and most tea farmers have access to formal credit facilities.

The study was conducted in the tea zone which is divided into two catchment areas, one under each tea factory. The study utilized a multistage random sampling technique. In the first stage the tea zone was purposively selected since it contains the farmers of interest to the study. Secondly, between the two catchment areas, Ngere catchment was randomly picked. In the third stage, four electoral areas in Ngere catchment area were selected randomly using a table of random numbers. A simple random sample proportionate to size of each of the four electoral areas was then generated using a list of farmers delivering tea to this factory to make up a total random sample of 161 tea farmers. Data was then collected using a structured interview schedule during the months of April and May 2010.

Heckman selection model: Generally, diversification studies involve determining not only the factors influencing households' decision to diversify but also the intensity of diversification. Such consecutive decisions are presumed to follow the selectivity models (Key *et al*., 2000; Omiti *et al*., 2009). In selectivity models, the decision to diversify in agriculture occurs in two steps. First, a farmer makes a discrete decision about whether or not to diversify. Secondly, the household chooses the level of their participation in the diversified farming conditional on the decision to diversify. To analyze such sequential decisions the Tobit model, double hurdle model and Heckman model are widely used. However, the Tobit procedure is not appropriate for the current study since it conceals some information by combining both direct and partial effects of the explanatory variables on the dependent variables. The Double-hurdle model is subject to selectivity bias and therefore unsuitable for this study (Greene, 2002). To cater for the problem of selectivity bias and to relax the assumptions in the Tobit model, the study adopts Heckman's two step procedure after taking in to consideration the significance of lambda.

The Heckman two step model used to analyze the objectives in this study has been widely applied in empirical studies on institutional (Warning and Soo, 2000). Some of the factors that influence a household decision to take up diversification would also likely determine the level to which the farm is diversified. This would result in an overstatement of the estimator of the dummy of diversification in a linear dummy variable regression (Greene, 2000). Therefore it is necessary to control for self selectivity bias in the estimation of the household diversification and intensification decisions. The first step of the Heckman two stages model addresses the determinants of the diversification decision. Since a farmer may be growing a horticultural crop-especially vegetables- for home consumption only, marketing of surplus HVAC produce is used as a threshold to separate diversified and non diversified farmers. In this first step, a probit model is estimated. The dependent variable in this step is a probabilistic binary choice of being a diversified farmer (1) or otherwise (0). These binary choices are then regressed on farmers' socio-economic characteristics and institutional factors to identify which factors are significant determinants of the diversification decision. Similarly this step yields the mills ratio which is incorporated into the second step as an explanatory variable.

The second stage of the Heckman model addresses the factors influencing intensity of diversification by the farmers who chose to diversify. To achieve this objective, ordinary least squares estimation technique is used to regress the Crop Diversification Index (CDI) for each diversified farm on the various socioeconomic and institutional factors as well as the inverse mill's ratio from step one above. The outcome of this regression is the estimation of betas of the various variables. This outcome equation therefore includes both the original X's and the constructed value of the inverse of mill's ratio, λ.

The empirical model: The Heckman two- step model describing cash crop diversification choice by a random sample of smallholder tea farmers is divided into a selection and outcome equations. Equation one shows the selection equation for evaluating drivers of diversification among the smallholder tea farmers in Gatanga District:

$$DIVFM = \beta_0+\beta_1 Age + \beta_2 Gender + \beta_3 Exper + \beta_4 Edn + \beta_5 Educ\ Spouse + \beta_6 HHsize + \beta_7 Farmsize + \beta_8 IncomeL + \beta_9 Credit + \beta_{10} Extn + \beta_{11} MktDist + \beta_{12} FOrgn + \beta_{13} Contract + \varepsilon \quad (1)$$

A crop diversification index is then computed for all the diversified farmers using the formula shown in equation two as suggested by Malik and Singh (2002) (Table 1 and 2):

$$Crop\ Diversification\ Index\ (C.D.I) = 1\text{-}H.I \quad (2)$$

where, H.I is the Herfindal index computed as:

Table 1: Description of variables used in step one of the Heckman two stages model

Variable	Description	Measurement	Expected sign
Divfm	Participation in diversified cash crop farming	Dummy, 1 for participation and 0 for otherwise	
Occuphead	Occupation of household head	Dummy, 1for off-farm and 0 for farmer	+ve
Age	Number of years of the farmer	Number of years since birth	+ve/-ve
Gender	Sex of the farmer	Dummy, 1for male and 0 for female.	+ve
Exper	Experience of the farmer in cash crop farming	Number of years the farmer has been growing cash crops	+ve
Edn	Education level of the farmer	Years of formal education	-ve
EducSpouse	Education level of the farmer	Years of formal education	-ve
Hhsize	Household size of the farm household	The number of people in the household	+ve
Income L	Off-farm Income amount	O-farm income ('000' KES/yr)	+ve/-ve
Tools	value of farm tools	Value of farm tools owned ('000' KES)	+ve
Credit	Credit access	Dummy; 1for access 0 for otherwise	+ve
Exten	Extension	The number of extension visits received by the farmer	+ve
MktDist	Distance to the market (input and output)	Distance in kilometers to the market place	+ve
Contract	Contract farming	Dummy; 1for yes 0 for otherwise.	+ve
FOrgn	Whether farmer belongs to a farmer group	Dummy;1for member and 0for non-member	+ve
Farmsize	Size of the farm	Total size of the farm owned by a farmer.	+ve/-ve
Labour	Labour Hired for Non-tea harvesting activities	Number of hired labour in man days	+ve

Table 2: Description of variables used in step 2 of the Heckman two stages model

Variable	Description	Measurement	Expected sign
CDI	Crop Diversification Index		
Occuphead	Occupation of household head	Dummy, 1for off-farm and 0 for farmer	+ve
Age	Age of the farmer	Number of years since birth	-ve
Gender	Sex of the farmer	Dummy, 1for male and 0 for female.	+ve
Exper	Experience of the farmer in cash crop farming	Number of years the farmer has been growing cash crops	+ve
Edn	Education level of the farmer	Years of formal education	+ve
EducSpouse	Education level of the farmer	Years of formal education	+ve/-ve
Hhsize	Household size of the farm household	The number of people in the household	-ve
IncomeL	Off-farm Income amount	O-farm income ('000' KES/yr)	+ve/-ve
Tools	value of farm tools	Value of farm tools owned('000' KES)	+ve
Credit	Credit access	Dummy; 1for access 0 for otherwise	+ve
Exten	Extension	The number of extension visits received by the farmer	+ve
MktDist	Distance to the market (input and output)	Distance in kilometers to the market place	-ve
Contract	Contract farming	Dummy; 1for yes; 0 for otherwise.	+ve
FOrgn	Whether farmer belongs to a farmer group	Dummy; 1for member ; 0for non-member	+ve
Farmsize	Size of the farm	Land in acres owned by farmer.	+ve
Labour	Labour Hired for Non-harvesting activities	Number of hired labour in man days	+ve
Teaacre	Size of land under tea	Acres of land owned under tea crop	-ve
Infohvac	Access to HVAC specific information	Dummy, 1 for access, 0 for no access	+ve
Soilconserv	Practicing of soil conservation measures	Dummy, 1 for participant, 0 for non-participant	+ve/-veve
Numpostpry	Number of children in post primary institutions of learning	Number attending secondary schools, college and university	-

$$H.I = \sum_{i=1}^{n} pi^2 \quad (3)$$

where,

p_i = Proportion of i^{th} crop
A_1 = Area under i^{th} crop (ha)
$\sum A_1$ = The total cropped land

Equation four shows the outcome equation for analyzing determinants of extent of diversification among the diversified farmers in Gatanga District:

$$CDI = \beta_0 + \beta_1 Labourhire + \beta_2 Conserv + \beta_3 Tools + \beta_4 Age + \beta_5 No\text{-}postpry + \beta_6 Exper + \beta_7 Edn + \beta_8 Partn^* + \beta_9 Credaccess + \beta_{10} Distoutptmkt + \beta_{11} Fieldsize + \beta_{12} FOrgn + \beta_{13} Contract + \beta 14 Gender \varepsilon_i \quad (4)$$

RESULTS AND DISCUSSION

Socio economic characteristics of smallholder tea farmers in gatanga district: This section presents the two tailed t-test for the continuous socio-economic characteristics of the diversified and specialized smallholder tea farmers in Gatanga District. In addition the section presents the χ^2 analysis of the discrete socioeconomic characteristics of the respondents (Table 3).

The mean values of farm tools, total cropped area, size of tea field, size of cash crops field, size of HVAC field, amount of cash crop income per hectare and the number of cash crops grown are statistically different and in favour of the diversified farmers. The primary resource in agriculture is arable land. With more land, the diversified farmers are able to engage in at least more farm enterprises than the specialized farmers. The agricultural asset base for the diversified farmers is also significantly higher than that of the specialized tea farmers. This may either be due to the need to cultivate significantly more land or the fact that that some HVACs may require more specialized equipment. Thus the diversified farmers have made more investments on their farms. With a higher agricultural asset base, the diversified farmers earn significantly more cash crop income per unit of land than the specialized farmers

Table 3: Results of two-tailed t-test for continuous socioeconomic characteristics of diversified and specialized tea farmers in Gatanga District

Characteristic	Overall	Diversified	Specialized	Mean diff.	t	Sig. (2-tailed)
Household size	4.780 (2.673)	4.95 (2.647)	4.48 (2.716)	.469	1.061	0.291
Age of head in years	46.810 (13.749)	47.24 (13.242)	46.03 (14.692)	1.208	0.519	0.605
Education h'hhead (yrs)	10.550 (3.180)	10.40 (3.336)	10.81 (2.895)	-0.39	-0.387	0.443
Farming experience (Yrs)	20.160 (15.385)	20.16(14.819)	20.16 (16.475)	0.000	0.000	1.000
School going children	1.890 (2.021)	2.07 (2.054)	1.59 (1.938)	0.482	1.482	0.141
Cash crops grown (No.)	2.205(1.200)	2.708 (1.143)	1.310 (.654)	1.398	9.871	0.000***
Cash crop income ('000'KES/ha)	562.400 (455.700)	648.99 (532.39)	408.622 (195.179)	240.371	4.117	0.000***
Total cropped area (Ha)	0.828(.607)	0.901 (.614)	0.699 (.578)	0.201	2.077	0.040**
Tea field size (Ha)	0.590(.478)	0.6362(.525)	0.509 (.371)	0.126	1.784	0.077*
HVAC field size (Ha)	0.111(.139)	0.172 (.140)	0.000 (.000)	0.172	12.40	0.000***
Cash crops field size (Ha)	0.746(.518)	0.810 (.576)	0.632 (.372)	0.177	2.362	0.019**
Farm tools ('000'KES)	68.011 (67.975)	75.694 (71.822)	54.37 (58.679)	21.324	2.218	0.028**

*, **, ***; Significant at 10%, 5% and 1% levels respectively; ( ) denote standard deviations.

Table 4: Results of χ^2 analysis for categorical socioeconomic characteristics of diversified and specialized tea farmers in Gatanga District

Variable	Overall (%)	Diversified (%)	Specialized (%)	χ^2	Sig.
Head gender:					
Male	77	79.6	72.4	1.086	0.345
Female	23	20.4	27.6		
Occupation head:					
Farmer	85.1	88.24	81	2.129	0.297
Off-farm worker	14.9	11.76	19		
Credit access:					
Yes	76.4	76.7	75.9	0.014	0.904
No	23.6	23.3	24.1		
HVACs' contract:					
Yes	5.0	5.8	0	0.444	0.505
No	95.0	94.2	100		
Group membership:					
Yes	23.0	26.2	17.2	1.688	0.194
No	77.0	73.8	82.8		
Access to extension:					
Yes	85.1	85.4	84.5	0.027	0.870
No	14.9	14.6	15.5		
Farmer training attendance:					
Yes	60.2	60.2	60.3	0.000	0.985
No	39.8	39.8	39.7		
Access to market information:					
Yes	66.3	68.9	62.1	0.784	0.376
No	33.7	31.1	37.9		

Table 5: Factors influencing the decision of smallholder tea farmers in Gatanga District to diversify into horticulture

	Coefficient	Std. Err.	z	P>|z|
Farmsize	0.976	0.370	2.64	0.008***
Crediaccess	0.0641565	0.5775545	0.11	0.912
Info HVAC	0.0967028	0.0738871	1.31	0.191
Distoutptmkt	0.3688098	0.1596348	2.31	0.021**
Tools	0.268205	0.1483265	1.81	0.071*
Off farm income	0.0454748	0.0361608	1.26	0.209
Hired labour	0.0165204	0.0067353	2.45	0.014**
Head gender	0.6094309	0.6176724	0.99	0.324
Hhsize	-0.1216663	0.0961869	-1.26	0.206
Age head	0.0017286	0.0216312	0.08	0.936
Educhead	-0.1460735	0.2013958	-0.73	0.468
Occupat	0.2654309	0.1569449	1.69	0.091*
Occupspouse	-0.0501442	0.0598505	-0.84	0.402
Contract HVAC	1.280025	0.2015879	6.35	0.000***
Experience head	-0.0050275	0.0171452	-0.29	0.769
Extn	0.302842	0.4612602	0.66	0.511
FOrgn	0.8748769	0.4107227	2.13	0.033**
Mills				
Lambda	0.0775623	0.0399613	1.94	0.052*
Number of obs = 161	Censored obs = 58		Uncensored obs = 103	
Waldchi2 (35) = 223.91	Prob > chi2 = 0.000***		Pseudo R^2 = 0.6054	

*, **, *** Denotes significant at 10%, 5% and 1% levels respectively

implying that the former may be more efficient in the use of their resources.

Table 4 presents results of χ^2 analysis for categorical socioeconomic and institutional characteristics of farmers in Gatanga District.

Results in Table 4 show that access to market information and training opportunities, access to extension services, access credit facilities, engagement in off farm jobs are not different for diversified and specialized tea farmers. This is largely due to the fact

that tea farmers depend on these services from the same sources and institutions such as KTDA.

Factors influencing smallholder tea farmers' decision to diversify into horticulture: Table 5 presents the empirical findings of the first stage of the Heckman's two step model on the factors which influence farmers' decision to diversify into HVACs in Gatanga District.

Overall, the model is statistically significant as shown by the value of Pseudo R squared (60.5%) and significance of Wald χ^2 at 1% level. The variables included in the model correctly predicted the variability of the dependent variable by 60.5%. The dependent variable is a binary outcome of diversification or non-diversification while the covariates report the marginal change in likelihood of diversification when the independent variables are marginally altered. The coefficient on lambda is statistically significant at 10% indicating the presence of sample selection bias and therefore the use of a sample selection model was justified.

The distance to the output market and value of assets owned by the tea farmer have a significant positive effect on their decision to diversify into horticulture. While it is true that most cash crops earn better prices in markets far away from the production area (probably the export and urban markets) where demand is high compared to the market within the vicinity of the farms, Barrett (2008) argues that well-integrated markets that transmit excess supply to distant locations encourage household market participation. Jaleta *et al*. (2009) reinforce this point arguing that the returns to increased output due to technology adoption diminish less quickly in well-integrated markets that transmit excess output to distant markets than in segmented or poorly integrated markets. Secondly, smallholder tea farmers who own more farm tools and implements are more likely to diversify than those with fewer and basic farm tools in Gatanga District. This finding is consistent and in line with the finding of Babatunde and Qaim (2009), Schneider and Gugerty (2010) and Rahman (2003), that the value of productive farm assets significantly determine the diversification decision among farmers and enable them to grow various crops which may require different specialized tools.

Tea is a labour intensive crop and most of the household labour is directed to this crop in Gatanga District. At 5% significance level, farmers who hired labour for non tea harvesting farm activities were more likely to diversify into horticulture than otherwise. Similar to the current study, labour shortage was found to hinder diversification from paddy rice to other high value upland crops among rice farmers in Asia (Pingali, 2004). Farmers who hire labour are therefore able to overcome the labour constraint thus making the incorporation of horticulture in to the tea system smoother. The occupation of the household head also has a positive and significant influence on the decision to diversify into horticulture. When the head works on the farm permanently, that farm is 27% more likely to be diversified compared to where the head is working off-farm. This is attributable to the farmer offering labour and more management time on the farm.

Contract farming has the most significant influence on the decision to diversify into horticulture among tea farmers in Gatanga District. All farmers who are contracted to grow horticultural produce in the district are effectively diversified. The contract farming arrangements serve to link farmers to distant markets where the demand for and price of high value crops are often higher than in the domestic market, reduce the production risk for farmers by facilitating risk sharing, the contractors also provides credit and financial intermediation to the farmers, provide a timely access to inputs and assure farmers of a market for their produce and provide productive inputs to the farmers (Setboonsarng, 2008). The pieces of agricultural land owned by the farmer and membership to an agricultural group also have significant and positive influence on diversification in Gatanga District at 10 and 5% levels, respectively.

Factors influencing intensity of diversification into horticulture by diversified smallholder tea farmers in gatanga district: Among the diversified farmers, there are varying degrees of diversification as measured by the crop Diversification Index (CDI). The CDI is adopted since it has a direct relationship with diversification with a value of zero referring to specialization and the degree of diversification increase as the value tends to one. The mean CDI among the diversified farmers is 0.341 while 46% of the diversified farmers have a CDI of 0.26 to 0 0.5 and 25% of the farmers have a CDI of more than 0.5. Table 6 shows the major factors influencing the intensity of diversification into Horticulture. The results show that the gender of the household has a positive and significant influence on the degree of diversification at 10% level in favour of the male gender. As such, male headed households are more diversified than the female headed household. The number of children in post primary education level is another factor influencing the degree to which farmers in Gatanga District diversify. A unit increase in the number of children in this education level leads to a 3% increase in the intensity of diversification. This is because with more children in post primary education levels, more money will be needed to finance the children education. To meet this need the farmers have diversified further into horticulture.

The occupation and the experience of the household head in cash crop farming have a significant effect on the degree of diversification at the 10% level. Farmers who work on the farm fulltime have higher diversification indices probably because they are able to offer more management time and labour to the

Table 6: Factors influencing the degree of diversification into horticulture among smallholder tea farmers in Gatanga District

	Coefficient	Std. Err.	z	P>|z|
Schoolgoing	0.005	0.011	0.41	0.681
Headgender	-0.093	0.052	-1.8	0.071*
Hhsize	-0.005	0.008	-0.57	0.565
Num_postpry	0.030	0.015	1.95	0.052*
Agehead	0.005	0.002	2.52	0.012
Educhead	0.012	0.017	0.73	0.462
Occupat	0.001	0.011	0.05	0.958
Experiencehead	0.002	0.001	1.65	0.099*
Occupationhead	-0.012	0.006	-1.79	0.074*
Farmsize	0.314	0.029	10.66	0.000***
Soilconserv	0.109	0.028	3.95	0.000***
Loan	-0.006	0.031	-0.19	0.85
Infohvac	0.003	0.007	0.47	0.636
Distinptmkt	-0.005	0.005	-0.98	0.327
Groupmemb	0.048	0.034	1.41	0.159
Hiredlabou	0.000	0.000	1.39	0.164
Teaacre	-0.406	0.035	-11.73	0.000***
Contracthvac	0.057	0.066	0.86	0.388
offfarmincome	-0.001	0.003	-0.46	0.647
_Cons	-0.315	0.176	-1.79	0.074

*, **, *** Denotes significant at 10%, 5% and 1% levels, respectively

agribusiness. Similarly, farmers with more experience in cash crop farming are more diversified possibly due to the learning curve effects.

The amount of land owned by the farmer has a very significant effect on the degree of diversification with an increase in farm size leading to an increase in the crop diversification index. However, as farm size allocated to tea increases, the crop diversification index decreases. This implies that there is an inverse relationship between the intensity of diversification and the size of the tea field. This inverse relationship implies that higher level of diversification can only be attained through substitution of horticulture for tea. This may be a big dilemma to the tea farmers because tea is a perennial crop and most farmers may not willing substitute tea with other crops.

Participation in soil conservation activities is another factor identified to negatively and significantly influence the degree to which farmers diversify. This is possibly because the soil conservation activities and intensive cropping are conflicting objectives. Attaining a high CDI in the study area will in most cases call for intensive agriculture since land is a limiting resource. Intensive agriculture on the other hand requires making the most out of the piece of land, an objective that may not auger well with the conservation minded farmers.

The study reveals that the most important factors to diversification by tea farmers in Gatanga are size of the farm and labour availability. These two factors have a significant influence on both the decision to diversify and the intensity of diversification. Whereas farmers who hire more non tea harvesting labour are more likely to diversify, farmers who work on the farm fulltime have higher diversification indices. This implies labour has a double effect on the decision to diversify as well as the degree to which the farmer will diversify. Similarly, farmers with more land are 98% more likely to diversify and an increase in farm size by one hectare leads to a 0.31 increase in the diversification index. These two variables are expected to have important policy implications.

CONCLUSION AND RECCOMENDATIONS

The motivation for this study was to examine the drivers of cash crop diversification decision among the smallholder cash crop farmers. The need for the study was occasioned by a lack of information on what influences diversification into HVAC's among smallholder tea farmers yet Kenya dominates the global tea market and the crop performs excellently at the national level. The twin objectives were thus to examine the role of socioeconomic and institutional factors in cash crop farmers decision to diversify and consequently examine their influence on intensity of diversification. Descriptive statistics, t-test and Chi-square tests were used to describe the sampled farmers. Then, a Heckmans' two-step model is used to analyze the two objectives so as to correct for self selection bias.

The results show that 64% of the tea farmers have diversified into horticultural crops farming. The t-test and Chi-square tests reveal that the demographic characteristics of diversified farmers such as age, education, family size and farming experience are not statistically different from those of specialized farmers. There are however very significant differences between these farmers with respect to the farm sizes, cash crop acreage and net revenues earned from cash crops and inputs used in cash crop production. As a result the factors influencing diversification into HVACs in Gatanga District are of either economic or institutional nature but not demographic. The diversified farmers own significantly more agricultural land in Gatanga District, have more farm tools, have allocated more land to cash crops and apply significantly more manure, inorganic and organic matter on their farms. The empirical analysis identifies membership to an agricultural group, value of agricultural assets, hired labour, occupation of the household head, contractual arrangements, farm size and distance to the major output market to positively influence the tea farmers' decision to diversify into HVACs. Therefore, diversification in Gatanga seems to be driven by pull factors as opposed to push factors. On the other hand, gender of the household head, number of children in post primary education institutions, acreage under tea occupation of household head, size of the farm, soil conservation activities and experience of the household head in cash crop farming are the major determinants of the intensity of diversification.

Since high value agriculture is the most probable avenue to livelihood security in rural Kenya, there is a need for a national policy that provides incentives for the farmers to increase farm investments. This can be achieved through farm support programs such as provision of irrigation and other equipment. Through

such initiatives, the labour demand will rise as farmers' uptake diversification and thus create more employment opportunities in the rural areas. Secondly, there is a need to promote contract farming in the country so as to bridge the gap between the market and the small producers. By offering tax incentives to contractors, more small scale farmers will be reached and the economic welfare of such farmers will increase with increased production of horticultural production. Moreover there is a need to encourage farmers to form cooperative societies for marketing their produce and procure inputs in bulk. A comprehensive national land policy is also called for to deter further uneconomical subdivision of land in the high potential areas and consolidation of the defragmented land if agricultural production is to make full contribution to economic development.

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