



Deutscher Tropentag 2005
Stuttgart-Hohenheim, October 11-13, 2005

Conference on International Agricultural Research for Development

The Interlinks Between Agricultural Export Diversification, Food Security and Livelihood of Farm Households in Southern Ghana

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***ABSTRACT:** Policy makers in developing countries have been concerned with the economic and political risks associated with heavy dependence on specialized raw materials as main sources of government revenue and foreign exchange. Development partners and donor agencies have equally extolled the need for these countries to diversify their export base as a poverty alleviation strategy. To this end, several African countries have tended to focus on non-traditional agricultural exports (NTEs) which reflect their comparative advantage and for many countries the export of horticultural crops has been favoured. This study focuses on a household survey undertaken in the forest-coastal savannah transition zones of Ghana, where the farming system has undergone a remarkable transition from an established system of food crop farming for sale to urban consumers to an intensive production of fruits and vegetable crops for export to European consumers. Econometric analysis shows that though export horticulture has a positive impact on the wellbeing of the majority of households, others may be facing constraints to participation in the sector.*

1. INTRODUCTION: Various studies have shown that countries can improve their welfare by opening up their borders to freer trade. Moreover, there is a worldwide move toward economic integration, the EU being the most prominent example. Not only is it foreseen that this movement will improve welfare of a country but it's competitiveness could also improve by generating foreign exchange earnings and fiscal revenues to increase the income of smallholders and to provide employment for the rural poor. In response to a liberalised trade regime, horticultural exports have grown dramatically in many Sub-Saharan African countries while many other traditional agricultural commodities have faced stagnation and declining world prices. Undoubtedly, the horticultural industry provides an important source of foreign exchange, generates substantial employment and has contributed to the upgrading of agricultural production skills. But has the growth in export horticulture contributed significantly to smallholder food security and general livelihood? A number of studies have raised concerns about the microeconomic performance of non-traditional exports in developing economies. Most of such concerns are related to the trade-offs between food and export cash cropping systems due to the possibility of competition for resources between export crops and food crops resulting from a potential re-allocation of resources from one to the other and their effect on household caloric availability. Indeed potential synergy effects have been identified between cash-crop investment and food productivity, whereby positive spillover benefits of increased input are made possible for food crops through cash crop delivery channels (DIONE 1989; GOETZ 1993; GOVERAH and JAYNE 2003; VON BRAUN 1995). Consequently, there are critics of such policies that

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advocate cash crop production (VON BRAUN and KENNEDY 1986; WEBER ET AL. 1988). They argue that the benefits have never materialized with the premise that, in areas where cash crop production has increased, food consumption and the nutritional status of the poorest households have deteriorated. The aim of this paper is to examine the trend of this debate for pineapple and mango export booms within the forest/coastal-savannah transition zones of Ghana.

2. METHODOLOGY: The analysis presented in this paper is based on a primary data set collected by a survey of 200 farm households in southern Ghana. The survey was carried out from May to October 2004, covering the 2003/2004 cropping season. In accordance with the importance of the various horticultural crops to total export earnings, 7 villages with 20 households each within the pineapple cultivated based communities of the *Akwapim south* district and 3 villages with 20 households each from the mango cultivated based communities of the *Dangme west* district were selected for the survey using the stratified random sampling approach. Descriptive statistic tools were employed to specify the basic socio-economic characteristics of sampled households. Probit and Logistic regression models were used to determine participation and food availability while a linear function was used to compare the incomes of household households producing only horticultural export crops with those producing mainly food crops vis-à-vis those indulged in the combined scenario. The descriptive statistics from the field study gave an initial indication that participation in export horticulture, primarily appears to increase the average per capita income of the household. However, as explained by McCULLOCH and OTA (2002), such descriptive statistics do not take account of other possible differences in the characteristics of adopters and non-adopters and it may be these differences that are giving rise to the disparities in income rather than their participation in export horticulture. To account for this, we apply the traditional Log-linear mincerian wage equation to construct a model of income determination, while making use of the same explanatory variables employed in the participation determination model. Based on the assumption that households typically distribute their labour and capital resources over a set of productive activities, we specify a reduced form expression for income Y , as a function of these explanatory variables and accordingly estimate:

$$\ln(Y) = \beta_0 + \beta_1 HHCrop + \beta_2 Demog + \beta_3 Educ + \beta_4 Employ + \beta_5 Asset + \beta_6 Misc + \beta_7 IntNTE + \varepsilon$$

Where, *HHCrop* is a vector of dummy variables indicating categories of non-horticultural export crops grown by the household; *Demog* is a vector of demographic characteristics; *Educ* is a variable indicating the educational level attained by the household head; *Employ* is a vector of dummy variables indicating whether at least one household member participates in a specific off-farm occupation; *Asset* is a vector of asset and access variables; *Misc* is dummy variable indicating miscellaneous income receipt; *IntNTE* is a vector of variables indicating the intensity of cultivation of non-traditional export crops and ε is an error term.

3. RESULTS

3.1 Descriptive Statistics: The field study results indicate which households decide whether or not to participate in the cultivation of horticultural export crops based on perceived benefits, opportunities and constraints considering the risks and probabilities of occurrence. Generally, Horticultural households have the highest land resource in terms of endowment, total cultivated farm size, farm size per capita and fallow land area. This is followed by Horticultural and Staple households and finally Non-horticultural households in chronological order. The Kruskal-Wallis test in Table 1 shows statistically significant differences for the landholding characteristics of the household categories except for the fallow land area. This might be expected because land ownership status of some households in the various categories are based on traditional inheritance patterns or asset symbolization status of land as a result of which some households possess parcels of land that are not necessarily under current cultivation.

Table 1: Landholding Characteristics per Sampled Household Category, Southern Ghana

Household type		Total land endowment (ha)	Total farm size (ha)	Farm size per capita (ha)	Fallow land area (ha)
Horticultural households (N=38)	Mean	5.61	3.56	0.94	2.05
	SD ^a	5.83	4.24	1.12	2.29
Horticultural and Staple households (N=118)	Mean	4.87	2.98	0.54	1.89
	SD	5.52	4.07	0.55	2.61
Non-horticultural households (N=44)	Mean	2.61	1.52	0.35	1.09
	SD	2.40	1.47	0.44	1.42
Total (N=200)	Mean	4.52	2.77	0.57	1.75
	SD	5.16	3.75	0.70	2.35
Kruskal-Wallis test	χ^2	16.28 ***	20.24 ***	18.03 ***	4.32

Note: ^a. SD denotes standard deviation of corresponding variable; *** denotes significance at 1% probability level.

3.2 Participation Model Empirical Results and Discussion: Participation in export horticulture was defined in terms of a dichotomous variable that takes the value of 1, if households cultivated a horticultural export crop and 0, otherwise. As expected the estimated coefficients of the hypothesized explanatory variables have the *priori* expected signs and most of the coefficients are statistically significant at the 10 percent (or better) probability level. The likelihood ratio statistic was used to test the significance of the entire Probit model. The model chi-square value of 79.44 at 11 degrees of freedom was found significant at the 1% level implying that the independent variables, taken together, significantly influences a household's decision to cultivate a horticultural export crop (Table 2). The pseudo-R² value, a measure of the goodness of fit implies that 60.3% of the original variation of the dependent variable is explained by the fitted model and still there are other determinants of participation in export horticulture that are not included in the model. Nevertheless, the model correctly predicted 82% of participation status in horticultural exports for the sampled households. Age, participation in non-farm occupation, land endowment, nature of road network, access to capital inputs and cultivation of local cash crops significantly influences the household's decision to cultivate NTEs.

The results showed that the age of head had a strong negative effect on cultivation of NTEs, implying that households with older heads are unlikely to cultivate NTEs. This is anticipated because the cultivation of export crops requires much care and risk in terms of new technology and precision in the application of various cultural practices that may not be of paramount interest to older farmers. Moreover, the existence of a large cohort of younger farmers in the sample could have attributed to this observation. These were mostly resident natives, city returnee natives and other immigrants, who have basically opted into farming mainly because of the perceived lucrative nature of export horticulture coupled with the lack of equal alternative income earning opportunities compared with the older farmers, who have been engaged in the cultivation of traditional crops as their means of livelihood long before the introduction of export horticulture in the study area. Participation in off-farm occupation has a significant positive effect on the likelihood of cultivating NTEs at the 10 percent probability level. Thus variables indicating participation in other economic activities (wage employment and the operation of a non-farm enterprise) appear to be positively associated with being a horticultural smallholder. This relationship could be explained by the fact households with off-farm occupation would be able to obtain some capital for the initial investment in capital inputs required for producing the labour intensive NTEs. On the other hand it is also possible that the lucrative nature of the export horticulture industry provides households originally not engaged off-farm with sufficient income to diversify their income sources as a surety for their livelihood needs.

The total land endowment of households was highly significant and positively related to the probability of cultivating NTEs. This seems to indicate that a decision-maker with a higher land

access usually cultivates NTEs. Thus households who have more hectares of land could easily afford allocating separate land parcels for cultivating both staples and NTEs. The positive relationship with land endowment could be justified because households with more access to land could also afford following already harvested fields for some years and shift to cultivating other land parcels while allowing for nutrient regeneration on the temporarily fallowed land. The same could not be likened to households with a comparatively smaller endowed land more so if permanent tree crops are to be cultivated.

Table 2: Probit function for the Likelihood of Participation in Horticultural Export Crop Production, Southern Ghana, 2004

Variable	Marginal effect	Standard error	T-statistics
Intercept	0.479***	0.149	3.205
Age of head	-0.009***	0.002	-3.734
Educational level of head	0.000	0.006	0.063
Residential status (dummy)	-0.034	0.052	-0.658
Household size	0.002	0.009	0.211
Non-farm occupation (dummy)	0.104*	0.062	1.674
Land endowment	0.050***	0.009	5.472
Nature of road network	-0.049**	0.024	-2.069
Capital input access (dummy)	0.092*	0.055	1.689
TLUs	0.001	0.003	0.515
Cultivate local cash crops (dummy)	-0.286***	0.060	-4.803
Frequency of extension visits	-0.005	0.014	-0.387

Dependent variable: Adoption of Horticultural Export Crop
Model Chi-Square=79.44*** ; **Log Likelihood function**=-70.49; **Pseudo R²**=0.603
Households correctly predicted: 82% ; **Number of observations**= 200 ;
*, ** and *** denotes significance at 10%, 5% and 1% levels respectively.

The nature of the road network from farms to major marketing centres has a negative significant relationship. This seems to indicate that bad roads increase the likelihood of adopting NTEs. However, taking cognisance of the fact that, responses to this variable constituted an ordinal subjective evaluation of households, the interpretation of this rather surprising observation must be done with extreme caution. On a comparative basis, fields where NTEs are cultivated generally have a bad road network than for alternative crops in the study area. Moreover, by the nature of the marketing arrangement for NTEs, transportation of produce is solely the responsibility of exporters and other subsidiary buyers and hence it is rational for farmers to locate staple and other crops on plots closer to their abode where road motorability is comparatively better than for the NTEs. Furthermore, the cultivation of some NTEs such as pineapples usually requires bringing new land under cultivation (partly due to the extensive root feeding system of crop) as compared to the cultivation of other alternative annual crops, most of which could be easily cultivated on continuously cropped fields. In addition, the observed distant location of export crops such as pineapple might reflect household perception of cropping choices by matching crops with appropriate soils as confirmed by GOLDSTEIN and UDRY (1999). Such a development constitutes one of the major bottlenecks confronting exporters who are sometimes saddled with spending a whole day with their tractors in trying to meander their way through to their warehouses after purchasing produce from farmers' fields. This is usually occurs in the rainy season when most feeder roads become unmotorable. Access to capital inputs had a positive effect on the probability of adopting NTEs at the 10% level. This means that households with better access to capital inputs or credit access to purchase the requisite inputs for cultivating NTEs are more likely to participate in the sector than those who have relatively poor access to

capital inputs and credit. Typically, the cultivation of NTEs requires a higher initial capital outlay in terms of planting material and agrochemicals which cannot be afforded by marginal farmers. Therefore, good access to credit either in the form of inputs or cash for paying hired labour costs or both would increase a household's probability of cultivating horticultural export crops. Finally, cultivating of other local cash crops had a highly significant negative effect on the adoption of NTEs. This means that households cultivating local cash crops of insignificant export value are unlikely to indulge in NTE cultivation. This might be on account of fact that some households rather opt for cultivating these local cash crops which have a lower profit returns compared to the NTEs but at the same time have a lower marketing risks in terms of produce rejection and payment duration. Since these local cash crops are also equally labour intensive, there is the possibility for them to compete for similar production resources with perceived changes in the comparative advantages for various households.

3.3 Empirical Results and Discussion of Income Determination Model: Three different empirical proxies of the influence of human capital are used as explanatory variables. The dependency ratio has a statistically significant negative influence (Table 3) on total household income. This means that the higher the number of children and elderly household members in relation to the number of active adult work force, the lower the household income. An increase in the ratio by one unit increases income by 18.1%. Contrary to the findings of the model of participation in export horticulture, the age of household head has a positive, non-significant relationship with household income, emphasizing the role played by other productive activities outside export horticulture in the income earning power of the sampled households.

The residential status of households, though negatively related to household income is not statistically significant. This somehow confirms that, with regards to residential status, there is the potential for immigrants to be more market-oriented than resident natives. Households involved in the production of local cash crop have the propensity to increase their income by 26.3% whereas production of staple crops increases household income by 3.13%, although not statistically significant. This confirms the lower incomes of Non-horticultural households, many of whom earn their major incomes from staple crop production. The impact of education on household income within the agricultural sector is a subject of intense debate within the literature. Nevertheless, the results are consistent with that of JOLLIFFE (1998), who reports specifically for Ghana that, schooling has a negative influence on income from agricultural self-employment, whereas it has a positive impact on total and off-farm income. Generally, variables related to household physical capital endowment turned out to be important determinants influencing agricultural activity choice, with an additional hectare of land raising household income by 4.1% while an additional livestock unit increases it by 1.4%. As might be expected, the index of welfare facilities has a positive and statistically significant but very small influence on income. Unsurprisingly, the more assets a household has the higher its income, but the dummy variable related to credit access is neither strongly nor statistically significantly associated with higher income. This is a reflection of the inadequate levels of credit required to realize higher incomes from the various productive activities in the study area, a fact that was evident with our respondents. Generally, hiring out of labour is expected to increase household income. Indeed, incomes from agricultural wage labour are very low, in comparison with other "hard to find" alternatives, thereby leaving most households with the only rational option of utilizing family labour for their own managed productive activities. This is justified by the high positive and significant relationship between family labour capacity for agricultural production and total household income. Consequently, households with the ability to hire-in labour also tend to have higher incomes and returns from crop production. Different occupations have statistically significant implications for income as households engaged in paid public employment and other

self employed activities tend to have substantially higher incomes. Not surprisingly, receipt of miscellaneous income (transfers and remittances) is associated with a lower income. Finally, the explanatory variables that are related to the intensity cultivation of NTEs play a very significant role in determining household incomes with a unit increase in the ratio of the area cultivated by NTEs to total farm size, in percentage terms increasing household income by 1.6%. Similarly, an additional year of experience in the cultivation of NTEs increases household income by 4.2%.

Table 3: Parameter Estimates of the Determinants of Total Household Income

Variable	Coefficient	Standard error	T-statistics
Intercept	14.7535***	0.3661	40.2996
Land endowment	0.0411**	0.0186	2.2134
Food crop cultivation (dummy)	0.0313	0.1612	0.1931
Other local cash crop (dummy)	0.2625**	0.1040	2.5628
Age of head	0.0014	0.0042	0.3413
Education of head	0.0276**	0.0133	2.0731
Residential status (dummy)	-0.1555	0.1122	-1.3855
Years of cultivating export crop	0.0420***	0.0135	3.1096
Dependency ratio	-0.1810***	0.0644	-2.8116
On-farm family labour capacity	0.0007***	0.0002	3.1588
Labour hired out (dummy)	0.1697	0.1256	1.3511
Credit/Input access (dummy)	0.0367	0.0989	0.3714
Tropical livestock units	0.0141***	0.0047	2.9732
Public paid employment (dummy)	0.4405***	0.1082	4.0727
Trade and services (dummy)	0.2671***	0.0911	2.9311
Miscellaneous income (dummy)	-0.2363*	0.1402	-1.6855
Facilities welfare index	0.0397*	0.0229	1.7348
Ratio of NTEs area to total farm size	1.5941***	0.2299	6.9353

Dependent variable: Natural log of Total household income
F=26.31; **R²=0.711;** **Adjusted R²=0.684;** **N=200 ;**
Probability>F= 0.00; **Breusch-Pagan chi-squared** for heteroscedasticity correction =98.70
*, ** and *** denotes significance at 10%, 5% and 1% levels respectively.

4. CONCLUSION: The results of the model of income determination support the findings from the analysis of the descriptive statistics and model of participation. Clearly, households cultivating horticultural export crops are better off than Non-horticultural households. We find evidence that the NTE sector has increased the opportunity for higher earnings for smallholders and that the much higher land sizes owned by horticultural smallholders are indeed a cause or a consequence of their participation in the sector. We conclude that non-traditional exports as a source of livelihood among smallholder farmers depends on several factors including; access to local institutional services, technological know-how, policy environment, trends in international markets and most importantly, their interplay with livelihood adopting strategies.

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