

The Micro-level Distributional Effects of Horticultural Export Value Chains Among Smallholders in Southern Ghana

Victor Afari-Sefa

AVRDC-The World Vegetable Center, Arusha, Tanzania

Increasing foreign exchange problems and deteriorating prices of traditional exports have led policy makers and donor agencies to seek diversification in export crop production. In Ghana, crops such as pineapples and mangoes appear promising because of their high labour intensity and expanding demand for fruits in Europe. Notwithstanding, there is a possible trade-off between export and food crop production because of the possibility of resource re-allocation. So far the major concern of government has been the growth in export earnings while the micro-level distributional effects remain under-investigated. The study focused on a household survey undertaken in the forest and coastal-savannah transition zones, where the farming system has undergone transition from an established food-crop farming for urban markets to an intensive production of horticultural products for export. Logistic regression and Gini coefficient approaches were used to estimate the determinants of household food availability and income distribution respectively. Though, households engaged in export horticulture appear better-off than those that do not, the sole adoption of either staple or export crop is not sufficient for improving food availability. Consequently, linkages which allow simultaneous and reliably access to equitable distribution of resources and services are critical for household survival in competitive global food markets.

Keywords: export horticulture, global trade and food accessibility, global food chain, inequality, Ghana

Introduction

Since the past two decades, export horticulture has been identified as one of the fastest growing sectors to enhance economic growth in sub-Saharan Africa. Development partners and donor agencies have equally extolled the need for African countries to diversify their export base as a poverty alleviation strategy. In this light, several African countries have tended to focus on non-traditional exports which reflect their comparative advantage, and for many countries, the export of horticultural crops has been favoured. In Ghana, crops such as pineapples, papaya and mangoes appear promising as options to diversify the traditional export base comprising of cocoa, timber and gold, because of their high labour intensity and the expanding demand for fruits in industrialized nations.

The contribution made by non-traditional exports to gross domestic product (GDP) has been increasing on annual basis possibly due to promotion and support of the sector received from government and the declining

Victor Afari-Sefa, Agricultural Economist and Global Team Leader-Consumption, AVRDC-The World Vegetable Center.

Correspondence concerning this article should be addressed to Victor Afari-Sefa, P.O. BOX 10, Duluti, Arusha, Tanzania.
Email: victor.afari-sefa@worldveg.org.

terms of trade for traditional exports. For example, the sub-sector's contribution to total foreign exchange earnings from agriculture rose from 17% in 2002 to 22.7% in 2004 (Ghana Export Promotion Council, 2005). Horticultural products most especially pineapples continue to be the leading contributor to export receipts from agricultural non-traditional exports. For example, pineapple has, since the advent of the trade liberalization, been the highest contributor, about 20% to the total non-traditional agricultural export earnings in Ghana (Ghana Export Promotion Council, 2005).

Indeed potential synergy effects have been identified between cash-crop investment and food productivity in sub-Saharan Africa, whereby positive spill over benefits of increased input are made possible for food crops through cash crop delivery channels (Dione, 1989; Goetz, 1993; Goverah & Jayne, 2003; Von Braun, 1995). Notwithstanding, a number of studies (see for example, Von Braun & Kennedy, 1986; Weber, Staatz, Holtzman, Crawford, & Bersten, 1988) have raised concerns about the microeconomic performance of non-traditional export crops (NTEs) 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 one another other. The authors argue that such positive benefits of agricultural commercialization 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. In the case of export crops where international trade is a pre-requisite for welfare improvement of farm households, the situation is even more complicated. Under this system, the people who need food are not the same people who benefit from foreign exchange earned from agricultural exports. Even when part of the foreign exchange earnings are used to import food, the food is not basic staples, but items geared to the eating habits of the better-off urban dwellers.

Although self-sufficient in fruits, vegetables, root crops and fish, Ghana is a net importer of food and beverages. Not surprisingly, poverty has been identified as the major cause of food insecurity in Ghana, precluding access of many people to food even when it is available. Many food producers are actually net purchasers of food due to the seasonality in production. Data from the fourth round of the Ghana Living Standards Survey (Ghana Statistical Service, 2000) indicates that poverty is primarily a rural phenomenon with 16% of the rural population living in extreme poverty.

Another crucial dimension of the food crop versus cash crop debate stems from the insecure and unstable nature of the world market and the associated recent deterioration in the terms of trade especially for horticultural products such as pineapples. There is considerable evidence for an increasing preference shift in demand for organic and more health conscious products by most importers of the European Union (EU) (Jaffee, 2003; Fulponi, 2006; Humphrey, 2006). This can be exemplified by the recent preference for the MD-2 pineapple variety¹ to the smooth cayenne (CBI, 2006), which has hitherto been the major export boom variety in Ghana. This development has even shifted trends in comparative advantages of crops. In addition, though trade agreements such as the Lomé Convention give preferential treatment to African exports in the EU, the competition for export may increase in the future as more countries enter the marketplace.

Within the Ghanaian context, the main effects of the introduction of export cropping have been the

¹ MD-2 pineapple is currently the preferred variety by consumers in the European Union. It was developed by Del Monte of Costa Rica and has been positioned on the market as a premium pineapple variety with extra sweetness, longer shelf-life with no aesthetic problems in comparison with the traditional smooth cayenne variety.

significant deterioration in access to land as smallholder food crop farms are being consolidated into larger scale export crop farms (Goldstein & Udry, 1999). Given the pattern of recent changes in the global political and economic environment, as well as ongoing processes of globalization and integration of agricultural and food markets, the livelihood of smallholders within the global food chain seems to be threatened. Horticultural exports must meet strict quality standards set by the overseas importers and supermarkets. These standards are dynamic and increasingly demanding, and sometimes require fundamental changes in production methods and structures with significant capital investments. They often involve process monitoring of credence attributes plus traceability requirements. Conversely, there is an information asymmetry between the smallholders and the exporters regarding produce specifications such as shape, colour, weight of fruits. For example, farmers would typically spray fruits for harvesting to attain a colour typically acceptable in local markets or in the preceding year's international market standard only to find out from exporters at the time of sale that the preference of consumers in Europe have changed for that reference year.

So far, the major concern of policy makers has been macroeconomic growth in terms of physical output and export earnings of these new crops. At the microeconomic level, the short and long-term impacts of the dynamic export horticultural market vis-à-vis its contribution to pro-poor growth still remain under-investigated. In an attempt to fill this gap, this paper attempts specifically to explore the relationship between export horticulture and food availability within a locale whereby 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 vegetables for export to Europe. Specific objectives of the study include: (1) To identify and explore the factors most closely associated with varying levels of food consumption among smallholders; and (2) To assess the micro-level distributional effects of land and income in the light of horticultural export boom in the study area.

The rest of the paper is organized as follows. Section 2 reviews key theoretical considerations and conceptual issues of the study. A description of the study area, and empirical methods employed is provided in section 3. In section 4, the results are presented and discussed, while section 5 offers conclusions and policy recommendations.

Theoretical Background

The background of this study is the recognition of the prime importance of trade and economic development theories, dating back to works done by Adam Smith and David Ricardo. Nevertheless, the conceptualisation of economic development theories and their application to developing country settings has not had an easy path. Undoubtedly, different conceptions of the content and pattern of economic development and different historical, geographical and political circumstances have often caused theoretical contradictions (Addo & Marshall, 2000). Numerous theories and strategies, including those of international trade, have been discussed in the economic development literature from three broad perspectives: neoclassical or modernization, dependency, and state-mediator (Baum & Tolbert, 1985; Grant & Agnew, 1996; Frank, 1966; Hogendorn, 1992; Kirmani, 1995; Park, 1979; Thirwall, 1989; Todaro, 1989). Much as each perspective is relevant, no single theory is adequate to account for all the variations or trends in economic development in developing countries (Addo & Marshall, 2000).

The first school of thought involving mainstream development economists and neoclassical trade theorists argues based on the theory of comparative advantage that international trade is an engine of growth. In order to

reap the full benefits of trade, there should be, among other things, a reduction in trade barriers, free international mobility of capital, and diffusion of technological know-how and skills. To this end, most researchers would agree that export diversification matters, and it is especially important for developing countries. The literature has, so far, focused on identifying transmission channels. For example, developing countries' exports tend to be concentrated on a few products, often commodities, with very volatile demand. This translates into high income instability, which in turn provokes high growth volatility. The promotion of NTEs, particularly export horticulture in this setting has the advantage of creating a more stable income inflow. Others view the benefits from diversification in terms of the spillovers in the economy as a result of having a more diversified production structure (Hausmann & Klinger, 2006).

Dependency theorists on the other hand link underdevelopment in developing countries to international trade and argue that natural resources are essentially a "curse"—that they condemn low-income countries to underdevelopment. The linkage portrays a weaker and subjugated role of developing countries compared with an imperialistic and exploitative role of developed nations. Thus, the continued promotion of primary products such as horticultural products will continue to widen the imperfections in terms of trade between developing and industrialized nations. Dependency theorists also contend that comparative advantage in the agricultural sectors has not been fully realized because of high trade barriers including dynamic standards imposed by developed nations. Poverty effects under can be expected to be particularly large, if small farmers are not disadvantaged compared to large farmers when diversifying into horticultural production (Weinberger & Lumpkin, 2007).

Additionally, the theorists argue that the neoclassical trade theory does not adequately discuss how unfavourable terms of trade and balance of payments impede economic growth in developing countries (Frank, 1966; Mabogunje, 1989). More recent literature on international trade that cuts across the three enumerated schools of thought (usually referred to as new trade theories) indicate that the formulation of trade theories relevant to developing countries should take into account the main features of the imperfect market in which they trade (Krugman, 1995; Hummels & Levinsohn, 1995). Some economists for example have asked whether it might be effective for a nation to shelter infant industries until they had grown to sufficient size to compete internationally (Owusu-Sekyere, 1992; Wong & Kirmani, 1997; Yeates, 1995). The features include: the technological dominance and increasing protectionism by the developed countries, the rise in power and influence of various multinational corporations, the production of synthetic substitutes for traditional primary products of developing countries.

The third school of thought known as State-mediator theorists, emphasizes the poor fit of both neoclassical and dependency theories to developing areas. They maintain that local contextual factors are very crucial in understanding the variations in economic performance. Administrative capabilities, political ideologies and practices, perception of economic crises and pitfalls, technocratic autonomy, and power exercised by public officials are important factors that account for the variations in economic performance. These factors account for the differences even among countries that were once under the same colonial hegemony (Bienen, 1990; Callaghy, 1990; Grant & Agnew, 1996; Mohan, 1996). State-mediator theorists further maintain that if the term "economic development" is to have any analytical meaning in developing countries, it must be held against the possibility of political stagnation or decay (Addo & Marshall, 2000).

Over the last two decades, agricultural export diversification has been pushed as an economic development strategy for most sub-Saharan African countries. Traditional export crops such as cocoa, coffee and cotton and timber are all suffering from large price variability and declining world market prices. Diversification into the so-called non-traditional agricultural exports is therefore being tried in commodities such as vegetables, fruits, cut flowers, fish, bee products, herbs, spices, nuts, dyes, essential oils and organically grown traditional export crops (Delgado, 1995; World Bank, 1994, 2000). Since 1983, the Ghanaian government has been very pro-active in pursuing diversification policies. International donors including the World Bank, International Monetary Fund (IMF) and German Development Cooperation (GTZ) have generously supported this policy, providing both expertise and financial means. After several years of export diversification in Ghana, it is worth reviewing this development strategy vis-à-vis smallholder livelihood coping strategies in the survey area.

Study Area and Methods

Overview of the Horticultural Export Industry and Study Area

Ghana's horticultural industry has grown significantly over the past twenty years. Producers of fresh fruits and vegetables for export can generally be classified into three main categories: smallholders, non-resident commercial farmers, and large-scale producer-exporters. Smallholders are the indigenous rural inhabitants who operate their farmland in their own villages. Non-resident commercial farmers are those who reside in cities, but lease land from traditional rulers in rural areas for horticultural production. Large-scale producer-exporters are those who have vertically integrated production and export. Commercially, produced fruits and vegetables are mostly grown within a 50 km radius of the capital, Accra. This is due to the proximity of the international airport in Accra and the presence of a major seaport in Tema. The perishable nature of the produce and underdeveloped transport networks in rural areas is the main reasons for this observed concentration. In addition, both export and local processing companies producing fruit juice are concentrated on the cities of Accra, Nsawam and Tema. Furthermore, these cities offer a major domestic market for fresh fruits. According to Takane (2004), these factors constitute an advantage for the peri-urban regions, and the rural population in remote areas have less chance of participating in horticultural export production.

It has been estimated that about 15% of the population of Ghana depend on horticultural export related production and or marketing for their livelihood (Ghana Export Promotion Council, 2002). Unlike, other non-traditional exports such as frozen fish and sea foods, the vast majority of Ghana's horticultural output is produced by smallholders operating less than 2 ha for whom it represents an important source of cash income. Most suppliers of export fruits and vegetables are found within the semi-deciduous forest and coastal savannah agro-climatic zones of the eastern, central and greater accra regions of the country. The products of significant export importance within southern Ghana are pineapples, mangoes, papaya, chillies and okra. However, this study essentially zeroed on pineapples and mangoes, the two major products with current remarkable export importance for smallholder farmers in the study zone.

The Akwapim south district was selected as the case study zone for pineapple production because it contributes about 60% of the total exportable pineapples from Ghana. Its population density of 289 persons per km² is more than three times of the national average (Ghana Statistical Service, 2000), giving an indication of the extent of pressure on land both for human settlement and farming. The district is located within a radius of 23 km

from the capital city, making it easily accessible to the national airport and major seaport at Accra and Tema respectively (see Figure 1). The export boom tends to drive agricultural intensification by accentuating the problem of agricultural land scarcity caused by a combination of increased population and urbanisation activities in the study locale.

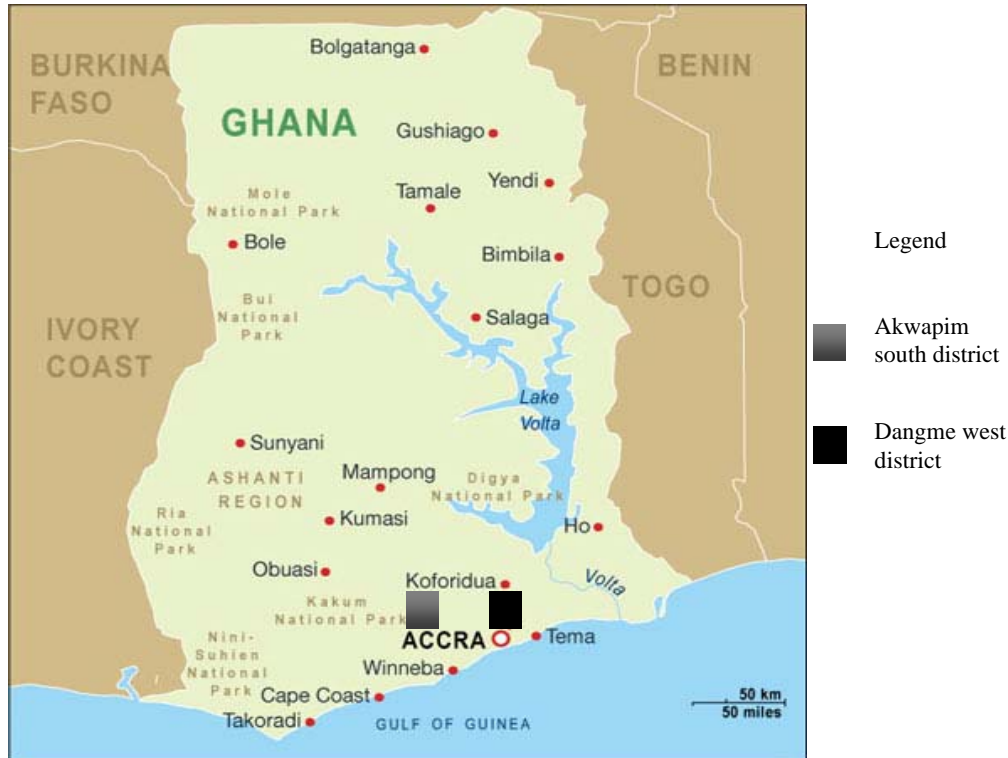


Figure 1. Map of Ghana with study area located in Southern Ghana.

Mango production on the other hand is currently dominated by large-scale farmers scattered across the coastal and Guinea savannah agro-climatic zones. This is by virtue of the fact that, it is probably the youngest export perennial crop within the industry with the oldest plantations being just over a decade ago. Small scale farmers engaged in grafted mango production are particularly constrained by the high initial investment cost of procuring agrochemicals and difficulties associated with engaging in permanent tree cultivation of lands which they had leased for periods of 3-5 years or even less in some cases. Consequently, the Dangme west district has the highest number of smallholders producing mangoes in the country and therefore befits the target group for the purpose of this study. Dangme west district has the highest number of smallholder mango producers because most parts of the district are characterized by fragmentation of family lands into smaller parcels due to urbanization and population pressure whereas other soil types suitable for mango are located relatively farer away from the national capital where individuals have access to and can procure or lease large parcels of agricultural lands.

Besides, these two districts represent strong regional differences in terms of the agricultural potential within their identified agro-climatic zones and food consumption patterns due to cultural differences. Average annual rainfall ranges between 1,250-2,000 mm at the semi-deciduous forest of the “Akwapim south” district to 800-1,220 mm at the coastal savannah of the Dangme west district. Whereas, the sampled villages within the

Akwapim south district are dominated by moist semi-deciduous forest located on the gentle foot slopes of the Akwapim range, the Dangme west district, where villages sampled are predominated by thickets of coastal savannah short grass interspersed with tall trees and shrubs. Very little of the original forest remain today due to uncontrolled exploitation of timber resources and pressure on land for farming and human settlement. The ravaging effects of seasonal bushfires that sweep across most parts of the survey zone especially during the dry season further tend to depreciate the quality of vegetation. The differences in the two agro-climatic zones have implications for the food production potential of each locale. The projected population size for the Akwapim south district in 2004 was 122,998 with a growth rate 1.7%. The population estimates in 2004 for Dangme west district on the other hand was 106,974 inhabitants with an annual growth rate of 2.1%. Their closeness to the national capital also explains the high degree of agricultural commercialization in these zones resulting from the strong backward and forward linkages between agricultural growth, employment opportunities and the demand for goods and services arising from both on-farm and off-farm enterprises.

Sampling Approach and Household Characterization

The study is based on a primary data set collected from a survey of 200 farm households in southern Ghana. The field survey was carried out from May to October 2004, covering the 2003/2004 cropping season mainly with the use of semi-structured questionnaires. In accordance with the importance of the various horticultural crops to total export earnings (pineapples for example contributed 63% of the total value of export horticulture in 2004, GEPC, 2005), seven villages (i.e., Oboadaka, Fotobi, Yaw Duodu, Nsakyé, Dago, Ahwerase-Damang and Brekuso) with 20 households each within the pineapple cultivated based communities of the Akwapim south district and three villages (Doryumu-Ayikuma, Agomeda and Abrampa) 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. Selection bias for the two stage strata to account for different cropping patterns in the study locale was accounted for by employing weighting techniques to justify a higher sample size for pineapple producing communities. The total of 200 respondents for the survey included households engaged in only cash crop production, households producing both food and cash crops and households engaged in only food crop production.

Descriptive statistic tools were initially used to categorize the sampled farm households into three main groups based on the type of crops grown and other socio-economic characteristics. On the basis of this typology, the respondents comprised of 44 non-horticultural households, 118 horticultural and staple households, and 38 horticultural households. The major differences and similarities among the three household categories have been outlined based on the extent of participation in export horticulture (McCulloch & Ota, 2002).

Computation of Household Income

Total household income² was calculated by aggregating the income obtained from all sources during the 2003/2004 cropping season, which represented the reference period for the survey. As income is defined as the output of activities, it measures both cash and in-kind contributions. All the goods and services produced in activities are valued at market producer prices regardless of their use. In accordance, all own-farm products are valued at the same price as if they were sold (Ellis, 2000). The income from agricultural labour and paid

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employment included wages and fringe benefits such as food. Farming income consists of three components: the sum of sales and own consumption for all cultivated crops minus the costs of farm capital and input and factor purchases; agricultural labour income and income from livestock activities.

Income from petty trading and other trading activities was calculated as the estimated value-added of the enterprise net the depreciated costs of business assets.³ Table 1 reports the disaggregated income from the various sources for each household category. The results show that the mean annual income per capita is ¢12,735,745 Cedis for the total sample. Per capita income of horticultural households is the highest, followed by horticultural and staple households with non-horticultural households having the lowest income.

Table 1

Disaggregates of Annual Household Income in Local Currency Units (LCU)^a

Income type		Hort-Hh (N = 38)	HortSt-Hh (N = 118)	NonHort-Hh (N = 44)	Total (N = 200)	Chi-square ^b
Cropping income	Mean	96,397,249	56,938,477	8,081,618	53,687,134	64.83***
	SD	100,175,559	95,427,917	8,226,872	89,716,159	
	Median	48,975,000	29,689,168	5,453,576	25,401,219	
Agricultural labour	Mean	42,105	183,474	207,159	161,825	7.01**
	SD	259,554	877,687	575,810	735,220	
	Median	0	0	0	0	
Livestock income	Mean	791,842	513,475	342,614	528,775	5.94**
	SD	2,284,891	1,604,349	1,363,458	1,704,910	
	Median	0	100,000	0	65,000	
Farming income	Mean	97,231,197	57,635,426	8,631,391	54,377,734	65.25***
	SD	100,531,306	95,667,392	8,392,049	89,972,076	
	Median	48,975,00	30,132,289	6,127,755	26,006,006	
Paid employment	Mean	1,800,000	1,155,932	961,818	1,235,600	0.61
	SD	4,496,485	4,978,772	2,626,335	4,461,474	
	Median	0	0	0	0	
Trade and services	Mean	7,905,789	7,057,797	4,898,182	6,743,800	2.17
	SD	11,962,321	12,381,794	5,455,624	11,146,462	
	Median	6,180,000	4,530,000	4,800,000	4,800,000	
Non-farm income	Mean	10,105,789	8,699,237	6,202,273	8,417,150	2.92
	SD	12,631,957	13,854,072	6,650,748	12,399,542	
	Median	7,500,000	4,800,000	6,000,000	6,000,000	
Miscellaneous income	Mean	400,000	485,508	342,273	437,750	1.57
	SD	1,968,399	1,449,967	896,310	1,460,727	
	Median	0	0	0	0	
Total income	Mean	107,336,986	66,334,663	14,833,663	62,974,884	69.06***
	SD	98,939,350	101,046,837	11,807,532	93,531,892	
	Median	65,343,593	36,800,224	12,018,003	31,149,696	
Per capita income	Mean	27,148,943	11,712,217	3,032,899	12,735,745	72.26***
	SD	28,750,511	14,202,203	1,976,078	18,281,873	
	Median	17,496,250	7,091,250	2,705,708	6,440,081	

Notes. ^a At the time of the field survey: {1\$ USD = ¢9,200 old Ghana Cedis}; ^b Chi-square values were computed from the mean ranks of the Kruskal-Wallis one way ANOVA test; SD: denotes standard deviation; *** denotes significance at 1% probability level; ** denotes significance at 5% probability level; Hort-Hh: denotes horticultural households; HortSt-Hh: denotes horticultural and staple households; NonHort-Hh: denotes non-horticultural household.

³ Even though, caloric availability is a widely accepted indicator of food security, recognition is made of the fact that it measures only quantity of food. It does not incorporate other possible dimensions of food security, including nutritional adequacy, safety, or cultural acceptability (Oshaug, 1994) and utilization as per USAID's definition (Babu & Sanyal, 2009; Maxwell et al., 2009). The definitions of food security in recent times, according to Maxwell (1996), reflect a "cornucopia of ideas". Consequently, this study will, for the most part, use the term that more accurately reflects the focus of the study—food or caloric availability—rather than the broader multidimensional term "food security".

The Kruskal-Wallis test results (see Table 1) further show that farming income, specifically crop production is the dominant income source for all three household categories with little evidence of variations between incomes from non-farming occupation. The difference between the combined mean total farm income for the two horticultural export crop producing households and the non-horticultural group is considerably large, reflecting the difference in the size and quality of resources owned as well as the quality produced by these households. Due to the highly skewed distribution of the various income sources, the median income for each source is also reported in addition to the mean and standard deviation so as to minimise potential distortions caused by measurement error. While the median ranking of total and per capita income for the various household categories remains unaltered, the median ranking for non-farm occupation income categories is slightly different from the ranking using the mean, with horticultural households maintaining their rank with the highest median scores followed by non-horticultural smallholders and horticultural and staple households in descending order. The Kruskal-Wallis test did however not show any statistically significant differences between the non-farm income sources in the three household categories.

An overview of the descriptive statistics and the income figures presented earlier suggests that households who participated in the horticultural industry are on the average better off than non-horticultural households. There is also evidence that households which cultivated only horticultural crops are on the average doing relatively better than those who spend part of their resources to produce staples to feed their family. However, computations with average values do not give a true reflection of poorer households and other disadvantaged groups.

Modeling of Household Food Security

Households have the choice of consuming own produced food or market purchased products accessible via their purchasing power. Following standard consumer demand theory, households derive utility from the consumption of foods through the satisfaction found in a set of taste characteristics as well as the health effects of the nutrients consumed with emphasis being placed on the amount of food available for consumption and its caloric content. Two objective methods of food security measurement have been widely used in most food security studies. They are the consumption level of a given household during a given period and the caloric content of a 24-hour diet recall. In addition to the lack of such appropriate data for this study, Feleke, Kilmer and Gladwin (2003) note that neither method provides a full assessment of food security because they fail to take into account the vulnerability and sustainability elements of food security and hence neither method has been universally accepted as a “gold standard” for an analysis of household food security. In this study, a standard logistic model is used to examine the determinants of food security⁴.

Consequently, food availability in this paper refers to whether the household has enough available calories either from own produced or market purchased staples to utilize and meet caloric requirements of household members year round. An independent food security index was developed for the logistic regression to estimate the determinants of food availability. In what follows, the details of the empirical model for determining food

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availability within a household are further outlined.

Emphasis is placed on the fact that, among the various nutrients derived from the consumption of foods, only calories are considered in the present study. Typically, once the demand for both home-produced and market-purchased goods is determined based on available income, prices of the goods in question and price of substitutes products, the amount of calories (C_i) available in the respective food items can be calculated (Barnum & Squire, 1979). Given that the indicator of food security is defined by calorie availability (C_i) and consumption needs in calories γ , household food security is determined by the difference between calorie availabilities and needs. The calorie availability (supply side) can be calculated using calorie conversion factors. The needs (demand side) are computed based on the requirement of the family members depending on various demographic characteristics including age, household size among others. Basically:

$$C_i^* = C_i - \gamma_i \quad (1)$$

where C_i is measure of food security and defined as whether the household has enough available calories either from own produced or market purchased staples to utilize and meet caloric requirements of household members year round, γ is the consumption needs for the i th household, $C_i^* > 0$ corresponds to the consumption demand exceeding the household calorie needs, while $C_i^* < 0$ corresponds to the consumption demand failing to meet the household calorie needs. Hence, the unobserved calorie availability can be expressed in a linear functional form as:

$$Z_i = \sum_{j=1}^{n=k} \beta_j X_{ij} + \varepsilon_i \quad (2)$$

where X_{ij} are explanatory variables of the regression, β_j are parameter estimates and ε_i is the error term. The observed variable is food security where $Z_i = 1$ when $C_i^* > 0$ and $Z_i = 0$ when $C_i^* < 0$ for the i th household. The household observed to be food secure ($Z_i = 1$) has a consumption demand or calorie availability greater than or equal to its needs, and the household observed to be food insecure ($Z_i = 0$) has a consumption demand/calorie availability less than its needs.

Bearing in mind that the observed dependent variable, Z_i is a discrete variable, the food security model can thus be casted as a qualitative response model, with P_i representing the probability of food security within the household being expressed in the form:

$$P_i = \text{Prob} (Z_i = 1) = \text{Prob} (\sum \beta_j X_{ij} + \varepsilon_i > 0) \quad (3)$$

Based on equation (3), a logistic regression model of food security as proposed by Demaris (1992) can be specified as follows:

$$\ln \left(\frac{P_i}{1 - P_i} \right) = \beta_0 + \sum_{j=1}^{k=13} \beta_j X_{ij} + \varepsilon_i \quad (4)$$

where P_i the conditional probability of food security, β_j is parameters to be estimated, X is vector of explanatory variables while β_0 is the constant term.

By rearranging equation (4) where the dependent variable is in log odds, the resultant logistic regression can be interpreted in terms of conditional probabilities instead of log odds or odds using the equation:

$$P_i = \frac{e^{(\beta_0 + \sum_{j=1}^{k=13} \beta_j X_{ij})}}{1 + e^{(\beta_0 + \sum_{j=1}^{k=13} \beta_j X_{ij})}} \quad (5)$$

The “partial” effects of the continuous individual variables on household food security can be calculated using the conditional probabilities computed for each sample household as follows:

$$\frac{\partial P_i}{\partial X_{ij}} = P_i(1 - P_i)\beta_j \quad (6)$$

In the light of the observed behavioural patterns within the study area, households which have adequate stored food from either own or purchased food for 9-12 months in the survey year were considered to be food secure, whereas households which did not have sufficient produced or market purchased food available for more than 9 months were considered to be food insecure.

The explanatory variables of the food security model are categorized into four broad groups, namely, location variables, human capital, asset and access variables and household cropping livelihood objectives. The definition of the variables, unit of measurement and expected signs are presented in Table 2.

Table 2

Definition of Explanatory Variables in the Food Security Model

Variables	Units of measurement	Expected sign
Agro-climatic location variable: • District dummy for Akwapim south	1 = Akwapim south 0 = Dangme west	\pm
Human capital/demographic characteristics: • Age of head • Residential status of head • Educational level of head • Household size	Years 1 = Native, 0 = Migrant Categorical variable Number of persons	\pm \pm - -
Asset and access variables: • Total farm size • Tropical livestock units • Household hiring out labour • Access to credit/capital inputs	Hectares Livestock units 1 = Yes, 0 = No 1 = Yes, 0 = No	+ \pm \pm +
Income and food provision objectives: • Cultivation of food crops • Cultivation of Horticultural export crop • Cultivation of other local cash crops • Household engaged in off-farm occupation	1 = Yes, 0 = No 1 = Yes, 0 = No 1 = Yes, 0 = No 1 = Yes, 0 = No	+ \pm \pm +

A dummy variable of geographic location of respondents was included to account for different food production levels or differences in access to food within the two districts. The idea is to capture the agro-climatic differential access to market infrastructure between the semi-deciduous forest and the coastal savannah zones.

Human capital constitutes factors such family size and education (Huffman, 1977; Rahm & Huffman, 1984; Wharton, 1963). The size of the household indicates both the family labour supply and its food requirements. Because resources are very limited, increasing family size may put extreme pressure on consumption than it contributes to production. Food requirements increase with the number of persons in a household and hence a negative effect is expected. The effect of the household head's age on food security is difficult to predict. Older people have in the study area traditionally been more engaged in the cultivation of staple crops which should lead to a positive impact on the food security status of their households. Conversely, their lower purchasing power may also affect their ability to supplement home production with market purchased produce if necessary. The

residential status of the household can have either a positive or negative impact on food security. Whereas, migration may be a coping strategy option for survival in the light of the export boom, observations from the field survey showed that there were different categories of migrants. Some immigrant households had the much needed resources to establish economically, while other were just surviving on incomes from hiring out labour and were yet to get settled in their new environs. Education is expected to have a positive impact on the food security status of households through improved access to market information and price signals, thus enhancing the long-term financial planning decisions of households.

For a given income fluctuation, food consumption can be stabilized through changes in assets and debts. Hence, the more liquid assets the household has, the better its access to credit and the safer it is to undertake investment activities. The total cultivated land area is generally expected to exert a positive effect on caloric availability in that the more land is put under cultivation the greater the output assuming equal land quality. Moreover, the more land put under cultivation by non-horticultural households, the higher the expected crop harvest for home consumption whereas for households engage in export horticulture, which means a higher income from crop sales to meet domestic food needs. The effect of livestock holdings on food security is difficult to hypothesize *a priori*. As a proxy for household wealth, the value of livestock can be expected to be positively associated with food security. The value of livestock owned can be expected to affect a household's ability to withstand abrupt changes in production, prices, income, or unforeseen events that create the need for additional expenditures. Against the background of imperfect credit markets in most parts of sub-Saharan Africa, livestock wealth may thus ease capital and cash constraints, for example, by their ability to pay for additional labour during the peak-planting season when family labour is inadequate. However, intensive livestock rearing may also reduce the subjective time and resource preference for obtaining food self-sufficiency under rainfed crop production because the correlation between livestock rearing and income for household's food needs may not be clearly established for obvious socio-cultural reasons. Hiring out of labour by some households may be a coping strategy especially during peak seasons. It may thus possibly reflect the lack of adequate purchasing power to meet food needs as the returns to hired labour are relatively low compared to an investment in the household's own production decisions. Hence, this variable was included in the model to assess its effect on the food security status of households. An important factor that may influence the food security status of households is their ability to access the necessary capital for farm investment decisions. Therefore, membership in a rural credit system either in the form of inputs or cash implies a positive role for the food security status.

Four factors were specified to account for household income and food provision objectives of the household. The increasingly accepted view of African smallholders operating within a system of agricultural and non-agricultural markets has more recently led to an examination of the impact on the options open to the household (see for example, Humphrey, 2006) when one or more markets within this system do not function effectively. Also, rural food markets often do not provide stable and low cost supplies throughout the year for purchase by rural households (Al-Hassan, Egyir, & Timpo, 2001). If smallholders cannot depend on these markets whenever they need them, this limitation will affect the type of food security strategy the household adopts. A major objective of the farm household in the presence of missing food markets may be the idea to be partly or fully self-sufficient in staple food production. Alternatively, the lower returns from food crop production coupled with difficulty in predicting yields caused by possible weather failure also imply that some households may decide to

rather concentrate more on increasing their food purchasing power through the cultivation of alternative crops that yield higher returns to productive resources. Hence, a household's cultivation of staples was included in the model. An equally important livelihood objective of the household may be to obtain sufficient income from cultivating NTEs and other local cash crops. Although these two variables are "ceteris paribus" related to the income earning power of households, the motive is to access the effect of households cultivating horticultural export crops on food availability in the light of the possibility of competition for land and other productive resources between staples and other alternative crops in the study area. Income from sale of NTEs and other cash crops is expected to enhance household food supply through food purchases. However, experience from other studies shows that income from cash crops in general may not necessarily be used for food purchases. The extent to which income from NTEs and other local cash crops is spent on food needs may depend on who controls cash income in the household and who is responsible for the provision of food (Al-Hassan et al., 2001). Nevertheless, results from the field survey indicate a significant correlation between the incomes of NTE based households and their food expenditure patterns. Since households have the choice to cultivate different cash crops, a separate dummy variable for NTEs and other local cash crops are included in the model. Households with other income generating occupations are more likely to improve their purchasing power for food. Here again, the extent to which food is available to the household depends on how this income is used. Farmers with additional occupation outside farming are expected to have a more diversified income source and hence to be able to use such income to boost the food needs of their household. On the contrary, rural labour markets often do not provide year round opportunities for stable off-farm earnings. This too will affect the strategies a household chooses to ensure its survival. Researchers have recently used these conditions to explain the observation that smallholders often do not respond to cash crop price incentives as strongly as policy makers expect (Fafchamps, 1992; Key et al., 2000).

Finally, an assessment of the impact of export horticulture on land and income distribution is explored using the absolute poverty (McCulloch & Ota, 2002; Weinberger & Lumpkin, 2007) profiling and Gini coefficient decomposition approach (Adams & Alderman, 1992; Ellis & Bahiigwa, 2003).

Results and Discussion

Land Ownership Status of Sampled Households

Table 3 identifies seven means by which farmers can acquire land in the study area. Whereas, ownership by inheritance, outright purchase, owner cum tenant and long-term lease represent relatively secure land endowment status of households, open access land, short-term lease and share cropping reflect insecure ownership status. The original farming system involving food crop farming based on the bush fallowing system is gradually given way for a more intensive and permanent cultivation of horticultural export crops due to the changing demographic features and increased migratory activities in the study area. This observation has led to increase pressure on land for both human settlement and farming activities with the associated complexities in tenurial and leasing patterns in the land market (Ghana Statistical Service, 2000). It is therefore not surprising that short-term and long-term leasing combined together (45.5%) dominate the system of land acquisition in the study area (see Table 3). Consequently, 35.5 percent of the total respondents secured their lands through inheritance. This is followed by 14.5 percent who owned part of their lands and also rented other size holdings while sharecropping, open access land for free usage and outright land purchases shared 2%, 1.5% and 1% respectively of the total sampled

households compared to other categories. An interesting revelation from the intra household comparison of land ownership status is the higher proportion (36% respondents) of short-term leasers within the non-horticultural household category. It is obvious from the insecure nature of their ownership status, that they would face serious limitations in deciding to adopt the cultivation of export crops such as mangoes which take a minimum of 3-4 years for the first exportable fruits to attain maturity. This observation might also explain the reason why most of the respondents within the horticultural household category tend to have secured land ownership status as indicated by 47% of them being long-term leasers while 31% acquired their lands through inheritance (see Table 3).

Table 3

Land Ownership Status of Sampled Households, 2003/2004

Acquisition status	Horticultural households (<i>N</i> = 38) %	Horticultural and staple households (<i>N</i> = 118) %	Non-horticultural households (<i>N</i> = 44) %	Total in percent (<i>N</i> = 200)	
				<i>N</i>	Percent of total <i>N</i>
Inheritance	31.58	38.98	29.55	71	35.5
Outright purchase	2.63	0.85	0.00	2	1.0
Open access land	0.00	0.85	4.55	3	1.5
Owner cum tenant	7.89	16.10	15.91	29	14.5
Long-term lease	47.38	25.42	9.09	52	26.0
Short-term lease	10.53	16.10	36.06	39	19.5
Share cropping	0.00	1.69	4.55	4	2.0
Total	100.00	100.00	100.00	200	100.00

Marketing of Horticultural Export Crop Produce

Figure 2 gives a general overview of horticultural export marketing channels in Ghana. Channels are similar for both pineapple and mango value chains. As indicated earlier in the sub-section on overview of the horticultural export industry and study area and from Figure 2, several possibilities exist for smallholders to be integrated into local and international markets depending on the quality and volume of production vis-a-vis the marketing opportunities emanating from specific value chains.

Data from the Ghana Export Promotion Council (2004) indicated that 1,025 companies (including 65 pineapple exporters) were registered as exporters of 34 different horticultural produce although not all were actually exporting. Exportable fresh produce are mainly shipped to export markets such as Germany, the Netherlands, Switzerland, Italy, Belgium and the United Kingdom by air or sea. Air freight is usually constrained by inadequate cargo space and higher comparative freight charges and hence constitutes only 20% of total exports with the remaining 80% being sent by sea. Export fruit processing most especially pineapples has also increased in recent years, with a few foreign companies being involved in the manufacturing of single-strength juice, juice concentrate and vacuum-packed sliced fruits for export. These include the British owned Blue Skies Company Ltd. and the Dutch owned Tongu Fruits Ltd. who have both established plants for processing pineapple into slices and other mixed fruit (pineapples, mangoes, papaya, water melons and passion fruit) salads for export. In addition to the export market, a fairly sizable domestic market for pineapples exists in Ghana. A number of local processing companies are active in producing pineapple juice for urban consumers, and fresh pineapples, papaya and mangoes are readily available on roadsides and in local open markets (see Figure 2). The domestic market absorbs a large quantity of fruits when there is an excess supply or when the produce does not meet export quality. Producers usually prefer to sell their produce to exporters and the export processing companies because of the high prices offered. Local processing companies for the local market come next in terms of price offered,

and itinerant traders who sell in the local markets offer the lowest price. Nevertheless, the itinerant traders are the ones to whom smallholders have the easiest access.

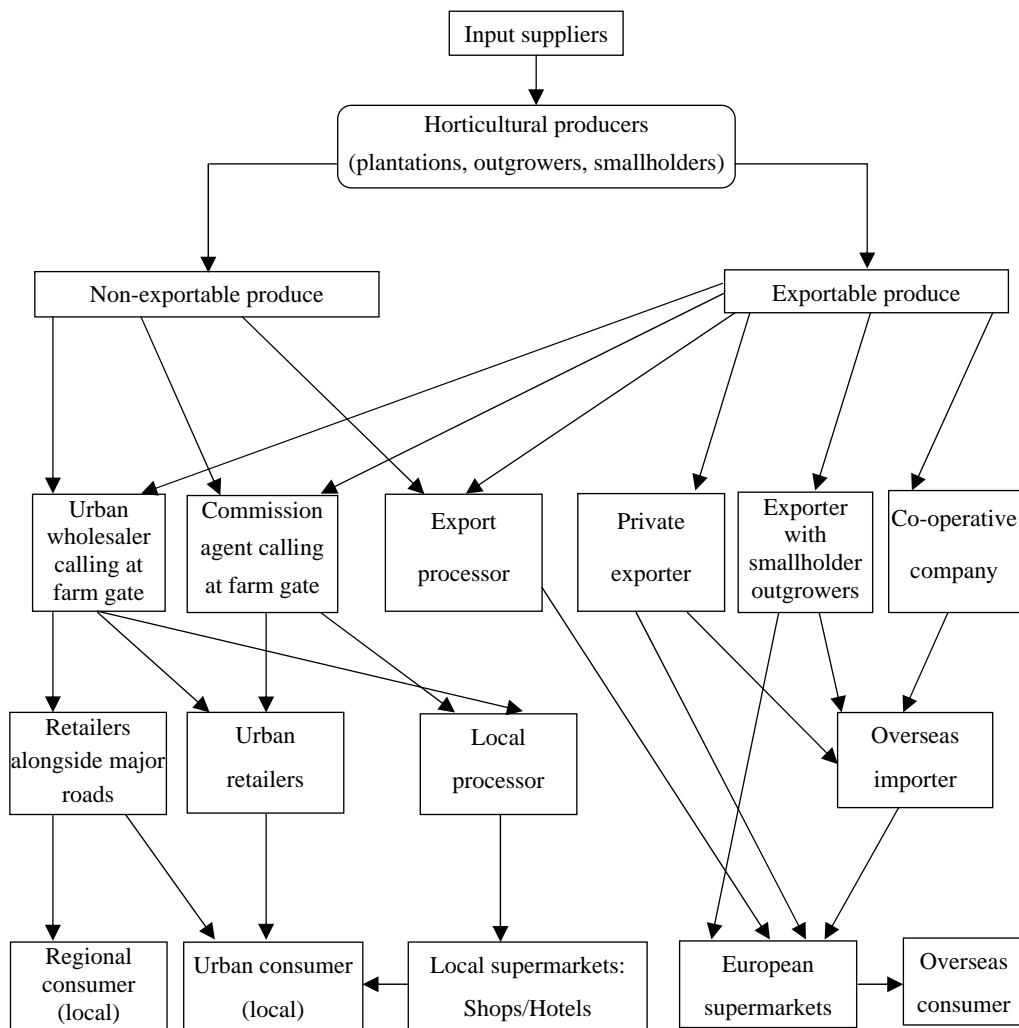


Figure 2. Overview of export horticultural marketing channels.

The major marketing outlets for exportable fruits of horticultural crops are illustrated in Figure 3. The figure is a revelation of the dominance of private exporters in the purchase of fresh fruits from farm households as represented by 70.3% of the 145 respondents who had sold products in the survey season. These private exporters include large-scale producer cum exporter companies who are sometimes faced with the need for outsourcing fresh fruits from smallholders in order to meet the export volumes demanded by their European importers. Large-scale producer cum exporter companies typically operate and manage their own large-scale plantation farms and complement their produce with outsourced fruits from contracted outgrower schemes and other individual smallholders to meet their export volumes. Several marketing constraints tend to reduce the competitiveness of Ghana's horticultural export crops in the international market. For example, the nature of marketing arrangement is such that farm households would have to wait for a period of 2-3 months in order to receive payment for their produce. This is on account of the nature of the terms of international trade payments,

whereby exporters would also have to wait until their importing partners in Europe acknowledge receipt and acceptance of shipped consignments and other documentation before claiming payments.

Meanwhile, the difficulties in enforcing contractual agreements with importers within the framework of international trade create a lot of risk for exporters who also find it is difficult to honour their payment obligations to smallholders in case of force majeure or when the unexpected happens. In the course of the field survey, some respondents confirmed having had terrible past experiences with exporters to the extent where, payments for whole plots of harvested fruits have still been outstanding for periods ranging from few months to as many as seven years.

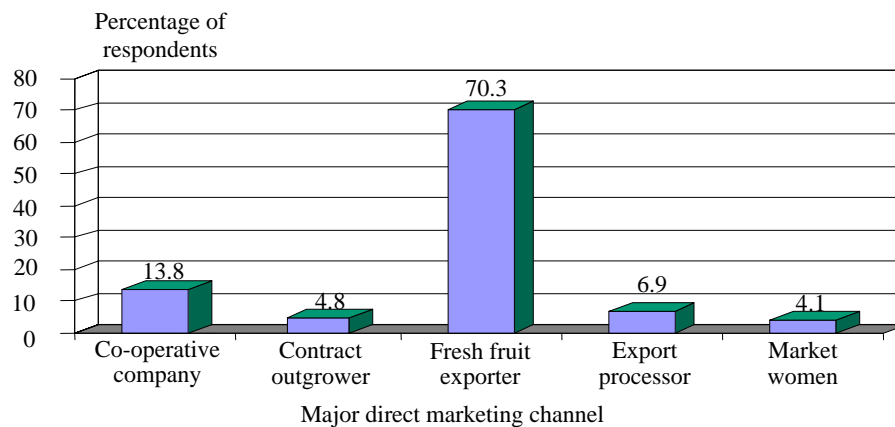


Figure 3. Direct marketing channels for households engaged in export horticulture.

On the contrary, members of the co-operative company, a farmer ownership model co-operative is under contractual obligation to sell their exportable fruits to the company. They constitute 13.8% of the respondents. At the commencement of the company's operations in September 1999, members used to receive payments for their produce two weeks after fruit submission. Changing competitive trends and ever increasing emphasis on meeting quality standards⁵ in international markets coupled with internal management problems have necessitated an increase in the payment duration for farmer shareholders than originally foreseen. In mid-2004, the company was in management crisis and payments to members for produce submitted for the past five months were still outstanding.

A further 4.8% of the households, who are engaged in official outgrower schemes with exporting companies, received payments for their produce two months after fruit submission to their contract partners. Ten respondents in all sold their produce mainly to the export processing company (i.e., Blue Skies Company Ltd.) located in a free zone region of the Akwapim south district. Depending on the prevailing market situation, most mango farmers receive instant payment whereas pineapple farmers received their payment two weeks after fruit submission to this monopoly export processing company in the study area, and a probable indication of the fact that establishing more processing companies may improve value addition and the payment duration for smallholders. Indeed, problems of risk in contract enforcement and quality control of sliced fresh fruits to overseas importers could be reduced to the barest minimum at the factory level compared to the rather long

⁵ For some perishable horticultural products, such as pineapples, exporters may sometimes have to wait for results of quality control tests to be conducted in importing European countries notably, Germany and Switzerland before shipments are accepted and approved for payment (usually on consignment basis after sale of produce). This is the case because the requisite facilities for effective quality control tests were not readily available in Ghana at the time of the field survey in 2004.

marketing chain associated with the export of raw fresh fruits abroad. In principle, almost all producing households sell smaller fruits which are not selected for export on the local market to manufacturers of local soft drinks and consumers of fresh fruits at reduced prices. Six households were forced under circumstances beyond their control to sell their whole plots of exportable and non-exportable fruits to local market women at cutthroat prices. These were mainly new entrants of pineapple cultivators who had not established relationships with known exporters not forgetting the gradual eroding preference for the traditional smooth cayenne pineapple variety by European consumers.

Payment duration for smallholder's horticultural produce tends to differ from one direct marketing outlet to the other, based on the nature of the crop, the quality of the fresh fruit, pre-financed institutional arrangements with farmers and the extent of value addition prior to exporting produce to international markets. Longer payment duration has some cases led to market failure for some households and poses serious liquidity problems for farmers making it difficult for them to survive in the industry and or to be integrated into global value chains.

Determinants of Household Food Availability

The marginal effects which are partial derivatives of probabilities with respect to the vector of independent variables as computed by the Logit model are presented in Table 4. The proportion of food secure households is higher among horticultural households (78.9%) than among horticultural and staple households (69.5%) and non-horticultural households (52.3%). A summary of descriptive statistics showing variations between food secure and food insecure households for the variables used in estimating the Logit model is also provided in Appendix.

Table 4

Logit Function for the Likelihood of Household Reserving Sufficient Own Produced or Market Purchased Staple Food Year Round, 2003/2004

Variable	Marginal effect	Standard error	T-statistics
Intercept	0.5312 ^{***}	0.1883	2.822
District dummy for Akwapim south	-0.1548 ^{**}	0.0728	-2.148
Age of head	-0.0065 ^{***}	0.0023	-2.878
Education of head	0.0018	0.0141	0.124
Residential status (dummy)	-0.1202 ^{**}	0.0575	-2.089
Household size	-0.0307 ^{***}	0.0097	-3.175
Off-farm job (dummy)	0.0799	0.0565	1.414
Total farm size	0.1384 ^{***}	0.0176	7.849
Other local cash crops (dummy)	-0.0756	0.0602	-1.256
Adoption of NTEs (dummy)	-0.1137	0.0691	-1.645
Food crop cultivation (dummy)	0.0106	0.0683	0.156
Credit/Input access (dummy)	0.1560 ^{**}	0.0662	2.356
TLUs	-0.0014	0.0032	-0.435
Labour hire out (dummy)	-0.1684 ^{**}	0.0797	-2.113

Notes. Model chi-square = 74.94; Log Likelihood function = -88.65; Pseudo R^2 = 0.482; Households correctly predicted: 76%; Number of observations = 200; ** and *** denotes significance at 5% and 1% levels respectively.

With regards to the model characteristics, the likelihood ratio chi-square statistic was used to test the dependence of food security on the selected variables in the model. The model chi-square statistic was 74.94 and highly significant at 13 degrees of freedom with a maximum likelihood regression model fit of 0.482 (see Table 4). The model chi-square shows a significant association between observed food security/insecurity and model prediction of food security/insecurity. The model correctly predicts the food security status of 76% of the

sampled households.

Among the 13 factors considered in the model, seven are found to have a significant impact on determining household food security (see Table 4). These are the total farm size, district dummy, age of head, residential status of head, household size, credit access and labour hire out. A positive and significant relationship is found between farm size and the probability of food security, implying that the probability of food security increases with farm size. The “partial” effect of a unit increase in farm size is 0.1384, indicating that the probability of food security increases by 0.1384 for a one hectare increase in farm size.

Geographical location is a supply-side factor that is found to have a significant relationship with household food security. Thus the regional location of the household is also important, and this probably affects food availability through its influence on food consumption patterns. On a comparative basis, households located in the coastal savannah zone have the propensity to increase their food security status by $P_i = 0.1548$ as opposed to households in the semi-deciduous forest zone.

Household size has a negative and significant relationship with the probability of food security, implying that the probability of food security decreases with family size. Each additional increase in household size reduces the probability of food security by 0.0307.

The age of the head has a negative significant relationship with food security with an additional year increase in age reducing the food security status of a household by a probability of 0.0065. This could be explained based on the fact that most staple producing households, according to the NTE participation model, were of the older and resource poor group. This could have accounted for the lack of sufficient produced food or insufficient availability of purchasing power to meet food needs. The residential status of the household has a negative significant relationship with food security at the probability level of 10%. This shows that immigrant households tend to improve their livelihood status by engaging in export horticulture.

Access to credit and or capital inputs has a positive effect on the probability of a household being “food secure” at the 10% probability level. This means that households with better access to capital inputs or credit access to purchase the requisite inputs for production of various crops are more likely to be food secure than those who have relatively poor access to capital inputs and credit. The ability of a household to hire out labour to other households is negatively and significantly related to household food security. Consequently, a shift from not hiring out labour to hiring out decreases the probability of being food secure by 0.1684. As stated earlier, this might be a reflection of the poor resource base of the household for using labour for own productive resources since the comparative returns to hiring out labour in the study area is obviously on the lower side. The amount of tropical livestock units owned is not statistically significant with the food security status of a household. Surprisingly, it is negatively related to the probability of being “food secure”, implying that the household food security decreases with increasing number of livestock. Each unit increase in livestock is estimated to decrease the probability of food security by 0.0014. The negative insignificance of Tropical Livestock Units (TLUs) is probably attributed to the fact that households may prefer to reduce current consumption so as to save for future consumption. Access to off-farm work does not have a significant impact on the probability of household food security. However, it is positively related to the probability of food security as anticipated, implying that the probability of food security increases with access to off-farm work. The resulting increase in the food security has

an expected probability of 0.0799. The low magnitude of the “partial” effects is most probably related to the comparatively lower level of wages and unavailability of alternative off-farm jobs as desired.

Cultivation of food crops is positively related to food security but not significant. The marginal effect was 0.0106. This can be explained by the poor and inadequate productive resources available to most non-horticultural households. It also explains the fact that horticultural and staple households may still not be food self-sufficient based on the staples they produce from their resources alone. Indeed, reasons of weather failure means that most staple food-producing households have to buy cassava or maize during certain seasons of the year to supplement food needs. The dummy variables related to the cultivation of NTEs and other local cash crops have negative insignificant relationships with food security. The “partial effects were 0.1137 and 0.0756 respectively for NTEs and other local cash crops. This might reflect the possible competition of resources between these cash crops and food crops. Meanwhile, it is expected that proceeds from the cultivation of the high value crops would compliment food needs but these may not happen automatically for all due to a combination of factors ranging from poor staple yields due to agro-climatic factors beyond the control of the rainfall dependent farmer, other household specific missing staple food markets, longer payment duration for NTEs and possibly on decisions taken by persons controlling income within the household” (Al-Hassan et al., 2001). As observed from the field survey, it can thus be claimed that some households may at certain times of the year not be consuming the regular basic staples considered in this model.

In comparison to livestock and off-farm income, correlation analysis showed very strong relationships between cropping income (and ultimately total household income) and total processed and non-processed food expenditure in food deficit NTE households. This means that the expenditure on food, which is taken as a proxy for food security is related to cash income for households with NTE-based systems. Several researchers have also reported positive relationships between income and expenditure on food consumption and food security by cash cropping systems (Kennedy & Bouis, 1993; Staatz & Bernstein, 1992; Von Braun, Bouis, & Pandey-Lorch, 1992). The level of education of the household head did not significantly affect household food security, even though the relationship was positive with an additional year in schooling having a rather lower marginal effect of 0.0018 implying that other evolving strategies for ensuring the food security status of households were stronger than the head’s educational status.

Effect of Export Horticulture on Income and Land Distribution

Even though, results from the income computation suggests that households engaged in export horticulture are better than those which do not, the results are only indicative of a partial representation of the extent to which export horticulture has reduced poverty since the poor are not usually “average” households. To explore the absolute levels of poverty in the sampled households therefore, a poverty profile of the sampled households is constructed based on the income data. This is also on account of the fact that, as at now, the differences in resource endowment between households that combine export horticulture with staple crop production and those that cultivate only export crops have not been clearly established. An overview of the income distribution by quintile group in Table 5 reveals that income is strongly unequally distributed among the 200 sampled households. The upper highest 20% quintile household group earn 61.36% of the total income of the sample. Surprisingly, 57.5% of this wealthiest group including the top three richest households come from the

horticultural and staple household group, with the remaining 42.5% originating from the horticultural household group while none of the non-horticultural group was in this category.

Table 5

Annual Total Household Income Distribution by Poverty Quintile Groups (Cedis), 2003/2004

Household type	Poorest quintile (2.82% of income)	2nd quintile (6.18% of income)	3rd quintile (10.25% of income)	4th quintile (19.39% of income)	Richest quintile (61.36% of income)
Horticultural (<i>N</i> = 38)	12,750,000	20,777,786	33,215,599	57,451,736	191,623,862
Horticultural and Staple (<i>N</i> = 118)	10,092,369	19,159,278	31,775,058	62,254,433	193,432,320
Non-horticultural (<i>N</i> = 44)	8,062,809	18,625,816	34,347,735	54,068,500	0
Total for quintile group	353,538,821	775,778,188	1,287,671,996	2,435,383,876	7,706,167,530

The results show that horticultural and staple households are the richest group as confirmed by their comparatively higher average incomes in the fourth and fifth quintiles (see Table 5). Yet there is a comparatively high inequality of resource distribution found within this group (see Table 6) and also confirms the fact that some richer households still consider staple food self-sufficiency very high on the agenda of their farming priority goals. Conversely, the poorest households within the sample contribute only 2.82% of the total income of the sample. As might be expected, this quintile consists of 65% from the non-horticultural household group while 32.5% come from the horticultural and staple households with only one respondent from the horticultural household group. The majority of the richest households are found in the third poverty quintile. These results are further substantiated by the Gini coefficient values presented in Table 6.

Table 6

Decomposed and Total Gini Coefficients of Income and Land Distribution per Sampled Household Category, 2003/2004

Variable	Horticultural (<i>N</i> = 38)	Horticultural and staple (<i>N</i> = 118)	Non-horticultural (<i>N</i> = 44)	Total (<i>N</i> = 200)
Total income	0.469	0.529	0.382	0.571
Per capita income	0.492	0.783	0.869	0.838
Land endowment	0.468	0.486	0.449	0.494
Cultivated land	0.489	0.525	0.433	0.524

The highest Gini coefficient of 0.529 for total household income was observed among horticultural and staple households. In comparison with the two other household categories, income is also fairly unevenly distributed among non-horticultural households with a total household income Gini coefficient of 0.382. Per capita income is however strongly unequally distributed among non-horticultural households with a Gini coefficient of 0.869. Ownership of land is weakly equally distributed even though the amount of cultivated land is unequally distributed. Not surprisingly, it was found that there is a strong correlation between household income and land endowment with a spearman's correlation coefficient of 0.645. On the whole, the highest inter-household inequality was observed among horticultural and staple households while distribution of land and income is comparatively fairly distributed among horticultural households.

Conclusions

Households cultivating horticultural export crops are on the average better off than those that do not. Notwithstanding the enormous contribution of horticultural exports to foreign exchange earnings, the micro level distributional effects have not favoured the chronically poor households who are structurally impeded from seizing the existing opportunities of the export boom by virtue of their poor resource endowment and liquidity constraints.

Results from the logistic regression did not show any evidence that, the mere cultivation of staple crops was a sufficient condition for improving the food security status of households. The most important food availability determining factors include: the total farm size, regional location, age of household head, residential status of head, household size, credit access and hiring out of labour to other households. The results also gave an indication that there were other significant factors such as weather failure and soil quality parameters that were beyond the scope of the study and were thus not included in the analysis.

The majority of households are possibly exposed to the risk of inadequate technological know-how in meeting the ever increasing quality standards and health control traceability requirements by European consumers, price collapse on the export market and a break down of local marketing institutions. The findings from this paper therefore calls for an integrated policy framework approach aimed at improving rural market imperfections. Efforts to achieve the desired impacts requires the strong need for investment in infrastructure and a shift towards value-added export oriented production, whereby small farm households are progressively integrated into the changing preferences of a dynamic global food chain. The future of smallholders is even more uncertain, because the most traditional varieties of fruits including the smooth cayenne pineapple that enable Ghana enjoy horticultural export booms in the previous two decades are no longer the preferred fruit cultivars in European markets.

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Appendix: Descriptive Statistics of Logit Model of Household Food Availability Variables by Food Secure (N = 135)

Versus Food Insecure (N = 65) Categories

Variable	Mean averages			Standard deviation
	Food secure	Food insecure	Overall	
Dependent variable (Food secure)	1.00	0.00	0.68	0.44
District dummy (Akwapim south)	0.70	0.69	0.70	0.46
Age of head	41.49	45.05	42.64	12.1
Education of head	9.57	9.06	9.48	4.10
Residential status (dummy)	0.30	0.40	0.33	0.47
Household size	5.62	6.43	5.89	3.32
Off-farm job (dummy)	0.77	0.69	0.75	0.44
Total farm size	3.74	1.51	3.01	4.95
Other local cash crops (dummy)	0.32	0.35	0.33	0.47
Adoption of NTEs (dummy)	0.80	0.68	0.76	0.43
Food crop cultivation (dummy)	0.78	0.85	0.80	0.40
Credit/Input access (dummy)	0.30	0.18	0.27	0.44
TLUs	2.94	3.74	3.20	9.86
Labour hire out (dummy)	0.06	0.20	0.11	0.31