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Agricultural Policy Research in Africa

AGRICULTURAL COMMERCIALISATION PATHWAYS AND GENDERED LIVELIHOOD OUTCOMES IN RURAL SOUTH-WESTERN GHANA

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ACRONYMS

APRA	Agricultural Policy Research in Africa
CRE	correlated random effects
CREP	correlated random effects probit
CSO	civil society organisation
FHH	female-headed household
FP	fractional probit
HCI	Household Commercialisation Index
HHI	Herfindahl Index
MHH	male-headed household
NGO	non-governmental organisation
PPP	purchasing power parity

EXECUTIVE SUMMARY

It is widely assumed that agricultural commercialisation leads to increased incomes and therefore better livelihood outcomes for farmers, including smallholders. But are the gains from commercial agriculture equitably distributed? Are there pathways to agricultural commercialisation that are more effective than others in empowering women and improving their nutrition security? Do non-crop livelihood options matter for rural households in vibrant crop commercialisation zones, and what is the influence of gender in this scenario?

In this paper, I use household panel data from 1,330 farm households in south-western Ghana to address these salient questions. The paper first uses descriptive analytical techniques that compare household behaviour and outcomes across levels of commercialisation. It then goes beyond the descriptive statistics and applies econometric methods that make it possible to account for other factors that could confound the relationship between the key outcome variables (women's empowerment, women's dietary diversity, productive and consumption asset wealth, and seasonal food insecurity) and the main covariates of interest (specialisation versus diversification pathways to agricultural commercialisation and income shares). The salient findings are outlined below.

First, households in the sample are highly market-oriented: they devote most of their land to the production of oil palm and cocoa (61 and 15 per cent of cropland respectively), which shows a high degree of specialisation in export crops. The high degree of specialisation is also evident with the sample mean Herfindahl Index (HHI) of 0.75, which is a very high level of specialisation in non-food cash crops. This finding is in sharp contrast to the notion that African farmers aim first and foremost to attain food self-sufficiency.

Although combining oil palm and cocoa yields higher commercialisation than specialisation in either of the two, only 19 per cent of farm households are able to combine the two crops, and those that are able to do so have 65 per cent more land than those that specialise. Women are left behind in this high-level commercialisation pathway.

Our empowerment indicator shows that only 49 per cent of women are empowered. However, empowerment varies markedly across the decision-making domains of farm production, income/revenue utilisation, employment and care workload, with decisions about commercial agriculture revenue utilisation the domain where women are most disempowered. Yet the difference in men and women's labour contribution to commercial agriculture is not as large as the level of disempowerment suggests. After adjusting for other covariates and household-specific heterogeneity, we found a U-shaped relationship between women's empowerment and commercialisation. On the other hand, women's diet quality increases with the specialisation pathway to commercialisation, but at a decelerating rate, showing that 'overconcentration' of household resources on the production of non-food cash crops hurts women's welfare.

Food crop production is positively associated with both women's empowerment and dietary diversity because women have more control over revenues from these crops, which increases their probability of being empowered. Also, the autoconsumption of cassava (the foremost staple food crop) frees cash for purchasing other foods that the household does not produce.

Although the average per capita income in our sample is well above international poverty lines, 45 per cent of households experienced seasonal food insecurity; the situation is worse among female-headed households (54 per cent). This shows that even in these highly commercialised areas, farming does not provide enough income to ensure household food security. Off-farm income thus makes a difference, with 35 per cent of the income of farm households coming from non-agricultural sources; 17 per cent comes from livestock and the rest from commercial agriculture. It is therefore not surprising that off-farm employment share of income (relative to the crop commercialisation) is strongly correlated with poverty reduction. Additionally, gender-based welfare gaps fall as the share of income from off-farm employment increases.

Three policy messages stand out from our findings. First, given the already high levels of commercial

orientation among farm households in our sample, investments in rural infrastructure (feeder roads) that improve the gains from market participation need to be accelerated – rather than providing unsustainable handouts to smallholders. Only 38 per cent of communities in our sample could be reached via motorable roads all year round.

Second, general policies that aim at enhancing smallholder market participation may have unintended negative effects on women's empowerment because they can lead to resource concentration in the hands of men, further reinforcing gender inequities. Specific policies aimed at empowering women should rather address rural non-farm entry constraints. This could be achieved by deliberately channelling existing resources towards relaxing entry barriers to remunerative off-farm opportunities.

Third, the evidence that commercialisation through the specialisation (in non-food cash crop) pathway hurts women's food and nutrition security calls for campaigns that educate farmers in non-food cash crop concentrated rural areas. Such campaigns need to explain the importance of devoting a share of land towards the production of some food crops – at least in the short to medium term – until food markets improve enough to allow specialisation pathways to commercialisation that do not hurt household food security, particularly among women.

1 INTRODUCTION

This paper addresses two questions: which pathway to agricultural commercialisation (specialisation versus diversification) is most effective in empowering women and improving their nutrition security? How important are off-farm employment activities relative to agricultural commercialisation for poverty reduction in highly commercialised rural areas, and what is the influence of gender? We provide answers to these questions using household-level panel data collected from 21 rural communities in the oil palm belt of south-western Ghana.

The questions above were motivated by the following: first, although rural livelihoods are highly diversified, agriculture remains the dominant employment activity for most households – with about 61 per cent of the economically active population 15 years and older involved in agriculture (Ghana Statistical Service, 2022). At the same time, returns to agrarian livelihoods have been lower than in other sectors of the economy (Dzanku and Udry, 2017). However, there are important nuances that relate to commercialisation and crop choice (or the lack thereof). For example, poverty reduction has been faster among farmers engaged in export crop agriculture (cocoa, oil palm, rubber, and cashew) than among food crop farmers (Ghana Statistical Service, 2018). Should farmers therefore specialise in the production of one non-food cash crop in commercial quantities or should they diversify within/between non-food cash crops and food crops at the household level? Basic economic theory suggests that specialisation leads to economic progress – increased economic growth through technology utilisation – even if agroecological conditions create absolute regional or sub-regional advantages in the production of several cash crops. But the potential drawbacks of specialisation in the rural African context in particular – i.e., exposure to food price volatility and general price risks due to dependence on the market for food and on a single crop for income in the case of non-food cash crop specialisation – could lead to worsening outcomes, particularly seasonal food insecurity (Dzanku, Tsikata and Ankrah, 2021).

From a gender lens, it is important to ask what the implications of various commercialisation pathways could be for gender-inclusive rural poverty reduction. It is a stylised fact that women have lower initial commercialisation capacity due to lower access and control over commercialisation resources (land, labour and technology). Moreover, the evidence is mixed about whether crop choice is gendered in Ghana with some evidence (Doss, 2002; Carr, 2008; Lambrecht et al., 2018) showing no significant gender gaps, others showing that there are gender differences in some contexts (Dzanku, Tsikata and Ankrah, 2021), and that commercialisation rates are higher for men than women, as could be expected. Indeed, participation in oil palm production (the dominant cash crop in our study areas) is significantly greater among males than females in nationally representative surveys (Lambrecht et al., 2018). Therefore, our hypothesis is that devoting household resources (land, labour and capital) towards the production of a single crop or a few non-food cash crops 'squeezes' women out of commercial agriculture because such resources become even more concentrated under the control of men.

We argue that commercialisation through diversification of crop portfolios on the other hand allows women more space to participate in commercial agriculture. These arguments motivate our interests in examining women's empowerment and food security impacts of specialisation versus diversification pathways of commercialisation. Given that commercialisation increases income levels, one would expect a positive relationship with women's empowerment only if commercialisation does not leave women behind. Increased income levels could be expected to be positively correlated with women's empowerment (Duflo, 2012) only if women participate sufficiently in such income-generating activities and have control over the gains from production. Of course, on the other hand, one would expect women's empowerment to increase the ability to commercialise by reducing gender inequities in access to commercialisation resources (particularly access to land and household labour). Our interest in the relationship between commercialisation pathways and women's empowerment follows from the above.

Second, rising levels of agricultural commercialisation could provide varying opportunities for jobs because of potential linkages between agricultural growth

and rural non-farm employment that leads to overall structural transformation of the rural economy (Hazell, Haggblade and Reardon, 2007). Besides, agricultural households themselves are known to straddle on-farm and off-farm work, and the processes of commercialisation-induced rural transformation entails linkages between farm and non-farm activities. This is why questions about how to attain gender-equitable agricultural commercialisation do not have to focus on opportunities and constraints within agriculture alone, but how commercialisation processes are linked to the rural non-farm economy. Increased commercialisation is key to the realisation of strong farm-non-farm linkages that could mitigate rural unemployment and underemployment problems, particularly under rainfed agricultural production conditions.

Third, it has long been argued that the precarious environmental conditions under which farmers operate, as well as imperfect input and output markets in rural Africa, make household reliance on agriculture as the main source of income a recipe for deepening poverty, and that non-farm diversification is necessary for maintaining a minimum standard of living in most of rural Africa (Alderman and Paxson, 1994; Ellis and Freeman, 2004). Does this conclusion still hold – particularly in highly commercialised rural economies with export crop agriculture? Some body of literature (Babatunde and Qaim, 2010; Owusu, Abdulai and Abdul-Rahman, 2011) show positive impacts of non-farm employment on the welfare of rural households including improvements in food security. But does this mean that household-level non-farm diversification is necessary for attaining poverty reduction in highly commercialised agricultural zones or should some households specialise in export crop agriculture while others take up non-farm opportunities that arise through agricultural growth and rural transformation? Conventional theories of comparative advantage suggests that gains from specialisation could outweigh the costs, assuming no 'serious' distribution problems (Krugman, 1981). But, perhaps the most compelling rational for livelihood portfolio diversification is risk management, which is even more important in rural African agriculture and consistent with the adage: 'Don't put all your eggs in one basket.' In our study areas, however, it appears that farm households put most of their agricultural production resources in the 'non-food cash crop production basket' and thus, appear to defy conventional wisdom. Our hypothesis is that this apparent irrational crop portfolio management decision by farm households stems from the role that rural non-farm employment plays at the household level in these highly commercialised export crop production zones.

The rest of the paper is structured as follows: The next section describes the methods utilised for answering the research questions, including a conceptual framing of the key issues, the main variables used, the data, and the regression models. Section three presents the results from the analyses, and the last section concludes with a summary of findings and implications for policy and practice.

2 METHODS

2.1 Conceptual framing

Our analyses are framed around three main interrelated concepts: (a) agricultural market participation and economic specialisation/diversification, (b) rural transformation (farm/non-farm linkages), and (c) women's empowerment.

First, market participation (commercialisation) is related to specialisation and diversification through the concept of comparative advantage in trade, whereby households produce goods for which they have relatively better-endowed resources and trade a proportion to acquire goods and services that they do not produce. It is assumed that the welfare gains from market participation are expected to raise incomes and standards of living, according to the theory of comparative advantage. In the presence of sunk costs, specialisation allows for enterprise expansion (Barrett, 2008). In general, however, agricultural households in sub-Saharan Africa in particular are viewed as being subsistence oriented or at best, semi-subsistence producers with high proclivity towards autoconsumption. This behaviour of a large proportion of African smallholders has been attributed to missing (or thin) markets, including those for factors of production (land, labour, credit) and for agricultural produce (Dillon and Barrett, 2017). This framework allows us to understand the behaviour of farmers in our study areas given the research objective of identifying which pathway of commercialisation produces which outcomes. However, this framework does not tell us explicitly why there could be different outcomes for different groups. Therefore, to understand why women and men may experience commercialisation and its outcomes differently, we evoke Bernstein's four political economy questions of: Who owns what? Who does what? Who gets what? What do they do with it? The first question helps understand how the means of commercialisation (land, labour and credit) are distributed by gender in the rural political economy. The second helps understand the gendered nature of commercialisation pathways by unravelling constraints that may arise from inequities in the division of reproduction labour (household care work). The third frames our analysis of gender-based distribution and control of the gains from the various pathways of commercialisation. The fourth deals with the nature of social relations within the household that may lead to varying impacts of commercialisation, including on food security, and gendered implications for reproduction and accumulation given the assumption that women and men spend their incomes differently with varying effects on household food and nutrition outcomes (Hoddinott and Haddad, 1995; Duflo and Udry, 2004; Allendorf, 2007).

Second, our conceptual framing draws from the narrative about processes of agricultural transformation (Timmer, 1988) or structural transformation more broadly (Johnston and Kilby, 1975), which is related to the farm/non-farm linkages narrative of rural economic development (Hazell, Haggblade and Reardon, 2007). Agricultural growth through increased commercialisation raises incomes and leads to increased purchasing power of agricultural households, which, in turn, fuels demand for non-farm goods and services, further increasing demand for food and agricultural products in the rural economy. This virtuous cycle of farm/non-farm linkages through production and expenditure linkages creates more value (for labour), increases returns to farm and non-farm labour, and provides opportunities for rural employment. The extent to which these processes are observed in a particular context depends on the presence of structural incentives that promote the profitability of on- and off-farm activities, which depends on the functioning of formal and informal institutions (including those that determine access to resources by different groups of rural dwellers) and the availability of assets at the individual and community level. All these factors determine the cost of transactions, prices and risks associated with various livelihood activities (Winters et al., 2002). This framing allows us to examine heterogeneous participation in non-farm employment and the returns thereof, and how this compares with specialisation in export crop agriculture and the concomitant implications for household welfare in a rural economy dominated by commercial agriculture. Such heterogeneous analysis is important because whether the processes of rural transformation yield inclusive growth or not depends on the context (Johnston and Kilby, 1975; Mellor, 1976). For one thing, there could be changes in the control

of resources that determine who benefits most during the processes of rural transformation (Timmer, 1988) depending on power relations within households and in the rural economy.

Third, to understand the differential implication of commercialisation pathways and rural transformation processes for women's empowerment, we draw on the empowerment framework of Kabeer (1999). In this framework, empowerment (or power) is simply the ability to make own choices where such ability was previously absent. Kabeer (1999) distinguishes between three dimensions of empowerment (or power). This conceptualisation requires knowledge of a baseline level of power since if one has never been disempowered then the notion of empowerment is redundant. However, we use the term in the context of one's present ability to make choices whether or not there is information on baseline status. Kabeer (1999) identifies three related dimensions of empowerment: resources, agency, and achievements. The availability (and control of) resources (material, human, and social) is fundamental to the concept of empowerment as it enhances the ability to make choices and increases the range of livelihood possibilities. Intra-household and societal norms and relations condition the distribution of such resources. Agency regards the ability to define one's own goals, which, in our particular context, could mean choosing specific pathways of commercialisation or sector (farm versus off-farm) of employment in the rural economy, or to bargain or resist a position that is imposed – either within the household or by general societal norms. Achievement is concerned with outcomes, and this could be a function of choice or the lack thereof. In this framework, the mere observance of inequities in, for instance, levels of commercialisation between groups should not lead one to conclude that this is due to power inequalities since interest is in the agents' ability to make choices rather than differences in outcomes; women could choose to focus on non-farm employment rather than farming, in which case, observing gender gaps in commercialisation may not mean less empowerment.

2.2 Main study variables

The main variables for our analysis are: agricultural commercialisation, agricultural specialisation, women's empowerment, poverty, food security, and income shares.

Agricultural commercialisation and specialisation: although our study sites were selected based on oil palm production (see next section), farm households are known to produce a variety of other crops. This behaviour is consistent with the theory of portfolio selection – whereby diversification arises due to risk aversion (Chavas, 2011), particularly in an environment of climate variability. On this basis, we first construct agricultural commercialisation and specialisation/diversification indicators that consider all crops produced by households. The first indicator is the household commercialisation index (HCI), defined as:

$$HCI = (\text{gross value of crop sales}/\text{gross value of crops produced}) \times 100 \quad \text{(d1)}$$

The measure of overall commercialisation in definition (d1) is useful in food crop-dominated cropping systems. However, it is not useful in a cropping system dominated by non-food cash crops (cocoa, oil palm, rubber), as there is insufficient variability due to nearly all the crops produced being sold. Therefore, we also use the gross value of all crop output sold, as well as the share of land devoted to non-food cash crops (oil palm, cocoa, coconut, rubber, orange)[1] as measures of commercialisation. These indicators are useful, particularly among small-scale food crop farmers for whom the HCI could be misleading in the presence of distress sales (Papaioannou and de Haas, 2017; Dzanku, Tsikata and Ankrah, 2021).

We also measure the degree of specialisation or diversification directly using the HHI, following Kim et al. (2012). This measure takes on the value of 0 for an infinite number of crops and 1 for total concentration on one crop only. We construct two kinds of indices – one based on the value of each crop produced and the other based on farmland allocation to each crop. The crops involved are: oil palm, cassava, cocoa, plantain, coconut, maize, tomatoes, okra, rubber, pepper, cocoyam, garden eggs, orange, groundnut and yam, in decreasing order of participation.

Gender and women's empowerment: our gender analysis is carried out at the inter- and intra-household levels. At the inter-household level, some data only allowed a comparison between male-headed households (MHHs) and female-headed households (FHHs). Although there are limitations to this approach since it does not tell us about differences between men and women within the same household, and because FHHs are not homogeneous (Budlender, 2003), we do learn something from such a comparison (Brown and Van de Walle, 2021). Besides, household headship is not the only source of heterogeneity among households. For the intra-household analysis,

1 We use the term non-food cash crops to refer to crops not produced for food; even if a small quantity can be eaten (palm fruits and orange) it does not serve as the main mean for households.

we use women's empowerment indicators following Alkire et al. (2013) and Malapit and Quisumbing (2015). The overall women's empowerment indicator is based on questions about women's participation in decision making and the burden of unpaid care work. For decision making, we use four indicators related to who makes plot management decisions, who makes crop output management decisions, level of women's participation in revenue/income utilisation decisions, and level of women's control over personal employment decisions. For the burden of unpaid care work, which is an important empowerment indicator to the extent that it can limit women's labour market participation (Majlesi, 2016), we use the total number of hours spent on all household care work per day. A woman is empowered if she has adequate achievements in 80 per cent or more of these domains (Malapit and Quisumbing, 2015).

Poverty: we use two poverty measures given the multidimensional nature of welfare. The first is household per capita income, which is calculated as total net cash income from all sources (crops, livestock, off-farm employment, and transfers) divided by household size. The second is the monetary value of two categories of household assets (productive assets[2] and consumer assets[3]). The advantage of using assets over income is that income data collected through surveys is more prone to measurement error due to recall and response biases (Deaton, 1997) than asset data (Filmer and Scott, 2012).

Food (in)security: we use two indicators that measure the food access and nutritional adequacy dimensions of food security. The food access indicator is constructed from the question, 'Identify the months in the past 12 months during which you did not have enough food to meet your family's needs?' A seasonally food insecure household is one for which the answer to this question is yes for any month of the year. We also use the number of months for which there was not enough food in the household for measuring food insecurity. For the nutritional adequacy indicator, we use household dietary diversity – a measure constructed from gender-disaggregated descriptions of all meals eaten 24 hours prior to the survey. There were 12 dietary components following (FAO, 2010): cereals, roots and tubers, vegetables, fruits, meat, eggs, fish and other seafood, legumes, nuts and seeds, milk and milk products, oils and fats, sweets, and condiments and beverages. Our dietary diversity indicator is the fraction of the 12 food groups from which the respondent consumes.

Income shares: we distinguish between four broad sources of income: (a) crop income (net value of all crops produced); (b) livestock (income from livestock sales less cost associated with sales); (c) rural off-farm employment (net returns to household labour supply to any activity outside the household's own farm, including non-farm enterprises); and (d) non-labour income (transfers including migrant remittances). The income shares are constructed from these sources.

2.3 Data

We use data collected from the Ahanta West and Mpohor districts of the Western Region of Ghana. The choice of study site was guided by the objective of studying oil palm commercialisation. The two districts are in Ghana's oil palm belt where two of the 'big four' oil palm plantations (Norpalm Ghana Ltd and Benso Oil Palm Plantation) are located. Aside from oil palm, however, the production of cocoa is much more common in the Mpohor district than in Ahanta West. This source of difference between the districts allows us to study the impact of diversification within non-food cash crop production on outcomes of interest.

Our focus on oil palm as the basis for site selection was informed by the fact that, aside from cocoa, oil palm is the most important industrial crop in Ghana. Secondly, oil palm is a priority crop both under the Government of Ghana's Planting for Export and Rural Development initiative[4] and for the Tree Crops Development Authority.[5] Third, more than cocoa, oil palm production has an extensive local value chain because of the opportunities it provides for small-scale and artisanal processing, which create rural employment in oil palm-producing zones, particularly for women (Osei-Amponsah et al., 2018; Torvikey and Dzanku, 2022).

Our analysis relies on survey data. The survey uses balanced, two-period household panel data collected from 665 households (1,330 household observations) in 21 rural communities. The baseline survey was carried out in November-December 2017 and the follow-up, two years later (December 2019). The survey

2 The productive assets are: hoe, spade, axe, sickle, shears, knife, sprayer and water pump.

3 The consumer assets are: mattress, cooking stove, radio, television, mobile phone, fridge, bicycle, motorcycle and car/truck.

4 Planting for Export and Rural Development (PERD) - https://mofa.gov.gh/site/programmes/pfj/70-pfj/pfj-modules/326-planting-for-export-and-rural-development-perd

5 Tree Crops Development Authority - https://tcda.org.gh/

questionnaire collected individual, household and plot-level information covering household demographics, household economic activities, agriculture and land markets, assets, and food security.

2.4 Regressions

Aside from descriptive statistical analysis, we address our research questions using regression models. We examine the pathways to agricultural commercialisation (specialisation versus diversification) that are most effective in empowering women and improving food security. This is done by estimating regression equations with women's empowerment and dietary diversity (y_{it}) for household i in year t on the left-hand side, and specialisation/diversification measures as well as controls on the right-hand side:

$$y_{it} = \boldsymbol{\beta}' \boldsymbol{X_{it}} + \delta_t + c_i + \varepsilon_{it}, t = 2017, 2019. \quad (1)$$

where X_{it} is the vector of all covariates including indicators of commercialisation pathway; δ_t represents time dummies; c_i represents all time-invariant, unobserved household-specific factors that affect y_{it} and thus capture household-specific heterogeneity; β is the vector of parameters to be estimated. Panel data has the advantage of allowing us to model time-constant unobservable household-specific effects, c_i, that are correlated with the explanatory variables and our outcomes of interest. Thus, without panel data, our models suffer from endogeneity arising from omitted heterogeneity. This is particularly important because our main explanatory variables (commercialisation/specialisation and non-farm employment) are potentially endogenous. Our models could still suffer from endogeneity arising from correlation between time-varying unobserved factors and the random error term (ε_{it}) – in which case our results should be interpreted as correlations rather than causal effect.

When our outcome variable is not continuous or when we have a covariate of primary interest that is time-invariant, such as gender, and therefore cannot be distinguish from the fixed effect (c_i), our approach to modelling the unobserved effect is the correlated random effects (CRE) approach (Wooldridge, 2010) via the Mundlak-Chamberlain device (Mundlak, 1978; Chamberlain, 1980). In the application, this implies the inclusion of time averages of the time-varying covariates ($\bar{\boldsymbol{X}}_{\boldsymbol{i}}$) as additional regressors:

$$y_{it} = \boldsymbol{\beta_1}' \boldsymbol{X_{it}} + \boldsymbol{\beta}' \bar{\boldsymbol{X}}_{\boldsymbol{i}} + \delta_t + c_i + \varepsilon_{it}, t = 1, 2. \quad (2)$$

The outcome variables for answering our second research question are the value of household assets ($asset_{it}$) and the seasonal food insecurity indicator ($finsecure_{it}$). Since assets are accumulated over time and commercialisation and non-farm employment are potentially endogenous to asset accumulation our model is specified as:

$$asset_{i,2019} = \gamma_2 LSYsh_{i,2017} + \gamma_1 OFYsh_{i,2017} + \gamma_2 NLYsh_{i,2017} + \boldsymbol{\beta}' \boldsymbol{X_{i,2017}} + \varepsilon_i, \quad (3)$$

where $asset_{i,2019}$ is the level of asset holding for household i in 2019; $LSYsh_{i,2017}$, $OFYsh_{i,2017}$ and $NLYsh_{i,2017}$ are the shares of income from livestock, off-farm employment, and transfers (mainly remittances), respectively, for household i in 2017. This means that the share of income from agricultural commercialisation (or income from crop production) is the reference with which we compare the relative importance of the income-generating activities.

For the binary and count food insecurity variables, we apply equation (2).

3 RESULTS

3.1 Descriptives

Table 3.1 shows sample household behaviour and characteristics across levels of agricultural commercialisation – based on the gross value of crop sales; Table A1 (Appendix) shows behaviour by gender of household head. The following points stand out:

Commercialisation and specialisation: First, the various measures of agricultural commercialisation (rows 01–07) show that the sample households are highly market-oriented and that there is a very high degree of crop specialisation. The mean shares of land devoted to oil palm and cocoa are about 61 and 15 per cent, respectively, and more than three quarters (79 per cent) of cropland is cultivated to non-food cash crops (mainly oil palm and cocoa). The sample mean HHI of 0.75 for output concentration and 0.69 for farmland concentration show very high levels of crop and farmland specialisation/concentration (Kim et al., 2012). These findings are in sharp contrast to the longstanding notion that market failures in rural Africa lead farm households to devote most of their resources to self-provisioning of food that would otherwise be obtained from the market, and that such a self-insurance strategy dampens the rate of agricultural commercialisation (de Janvry, Fafcharmps, and Sadoulet, 1991; Fafchamps, 1992; Wiggins et al., 2014; Dzanku, 2015).

Second, concentration on oil palm production does not result in the highest commercialisation levels – the share of farmland under oil palm production remains largely constant as one moves from the lowest to the highest commercialisation quartile. By contrast, there is a general positive relationship between the level of commercialisation and the share of cropland devoted cocoa, and all non-food cash crops. The differences in the shares of land under cocoa and all non-food cash crops between the highest and lowest quartile are about 19 and 20 percentage points, respectively. Thus, the main source of difference is cocoa production – diversification within non-food cash crops increases commercialisation rates over and above specialisation in oil palm production. The Herfindahl indices tell a similar story: commercialisation increases with crop output and farmland diversification.

Third, MHHs and FHHs have similar shares of farmland under oil palm (the dominant crop in the study areas), although FHHs have 0.6ha less land under oil palm. The two groups also do not differ significantly on levels of crop output and cropland specialisation (the difference in their sample mean Herfindahl indices are not statistically different from 0 at the 0.05 level). What is striking, however, is that average levels of commercialisation are higher for MHHs than for FHHs, and this difference arises mainly from MHHs having significantly larger shares of cropland under other non-food cash crops (mainly cocoa). Therefore, the main source of heterogeneity between the genders is not oil palm production per se but the ability to diversify into other non-food cash crops.

Women's empowerment: rows 08–12 show the women empowerment indicators. First, we observe, based on the five areas of decision making (production, output, revenue, employment and care workload) that a high proportion of women in our sample are disempowerment – only 49 per cent of women could be classified as empowered based on adequate achievements in four out of the five domains. However, the level of empowerment in our sample is higher than the 33 per cent reported by Etuah et al. (2020) for a sample of 416 oil palm-producing households in Ashanti and Central regions of Ghana. Second, the domain in which women are most disempowered is the utilisation of revenues from commercial agriculture. One might suppose that this is because women are less involved in commercial agriculture than men within the household. While this is partly the case, the gender gap in farm work is not large – for households with both male and female adults present, 80 per cent of men worked on the farm compared with 77 per cent of women. This is reflected in result of women being more empowered when it comes to farm production decisions. Third, our descriptives show that empowerment falls with increasing commercialisation – the proportion of empowered women is 51 per cent at the lowest commercialisation quartile but 44 per cent at the highest quartile. The difference is seven percentage points, which is statistically significant (p-value = 0.012).

Table 3.1 Mean characteristics of the sample across commercialisation levels

	Variables	Total n = 1330	Lowest n = 334	2nd n = 325	3rd n = 339	Highest n = 332
01	Oil palm share of farmland (%)	60.7	59.2	66.7	58.3	58.6
02	Cocoa share of farmland (%)	14.8	6.1	9.8	18.5	24.9
03	Non-food crop share of farmland (%)	79.3	67.8	80.4	81.1	88.0
04	Herfindahl output concentration	0.75	0.85	0.78	0.65	0.73
05	Herfindahl farmland concentration	0.69	0.74	0.70	0.66	0.66
06	Value of crop sales (PPP US$)*	2782	287	1123	2508	7229
07	Crop commercialisation index (%)	81.0	68.2	83.4	83.2	89.3
08	Per cent empowered: production decisions	65.0	64.7	69.8	59.0	66.6
09	Per cent empowered: revenue decisions	31.6	38.3	35.4	29.8	22.9
10	Per cent empowered: employment decisions	86.5	84.4	84.6	89.1	87.7
11	Per cent empowered: care workload	75.7	82.0	71.4	76.7	72.6
12	Per cent empowered across all dimensions	47.9	52.1	50.5	45.4	43.7
13	Per capita income (PPP US$)	1559	627	966	1433	3218
14	Seasonally food insecure (%)	44.9	51.6	45.1	48.0	34.8
15	Number of months of food inadequacy	1.10	1.33	1.08	1.17	0.81
16	Female dietary diversity (%)	17.7	15.9	17.1	16.5	21.4
17	Real value of productive assets (2019 US$)	50.8	27.7	36.3	41.0	98.1
18	Real value of consumer assets (2019 US$)	373.7	233.8	254.1	340.9	665.1
19	Real value of household assets (2019 US$)	424.5	261.5	290.3	381.9	763.2
20	Crop income share (%)	48.3	37.4	49.7	33.6	72.8
21	Livestock income share (%)	16.5	22.3	16.9	19.1	7.4
22	Off-farm income share (%)	24.9	28.5	23.2	31.6	16.4
23	Non-labour income share (%)	10.3	11.8	10.2	15.7	3.4
24	FHH (%)	19.7	25.7	23.1	18.0	12.0
25	Age of household head	52.3	52.5	52.0	51.6	53.1
26	Household size	4.3	4.3	4.3	4.2	4.5
27	Number of female adults	1.5	1.6	1.5	1.4	1.5
28	Number of male adults	1.4	1.4	1.4	1.4	1.5
29	Number of under 15s	1.4	1.4	1.4	1.4	1.5
30	Head's years of schooling	7.6	6.5	7.4	7.5	9.1
31	Other adults mean years of schooling	8.5	7.9	8.3	8.2	9.7
32	Farmland (ha)	3.1	2.1	2.8	2.2	5.1
33	Farmland per capita (ha)	1.3	0.8	1.2	0.9	2.1
34	Oil palm farmland (ha)	2.2	1.9	1.9	2.1	2.9
35	Produced cocoa (%)	24.0	8.5	20.9	20.5	46.1
36	Produced cassava (%)	50.1	56.1	55.4	38.0	50.7
37	Produced plantain (%)	20.9	14.5	23.5	16.4	29.1
38	Produced vegetables (%)	8.8	13.1	9.6	6.9	5.5
39	Livestock wealth (cow equivalent)	1.9	1.7	1.8	2.0	2.2

40	Community population	2623	1845	2341	2514	3799
41	All-weather road to community (%)	33.4	29.6	30.5	36.0	37.3
42	Oil palm processing mill in community (%)	34.4	32.6	32.3	35.1	37.7

*Note: PPP means purchasing power parity.

Source: Author's own, based on Agricultural Policy Research in Africa (APRA)-Ghana panel survey.

Household welfare: rows 13–19 show the household welfare indicators. First, although mean household *per capita* income in our sample is well above national and international absolute poverty lines, a nontrivial proportion of households (45 per cent) experienced seasonal food inadequacy and, on average, experienced such food inadequacies 1.1 months per year. On average, women consumed from only 18 per cent of the 12 food groups, but this is similar to men's dietary diversity in the sample. Second, all household welfare indicators increase with level of commercialisation. For instance, female dietary diversity is 16 per cent at the lowest commercialisation quartile but 21 per cent at the highest quartile, and the difference is statistically significant at the 0.01 level. Third, comparing household welfare indicators between MHHs and FHHs (Table A1, Appendix), we find that aside from *per capita* income, which is not significantly different between the two groups, FHHs are poorer in all other welfare dimensions. For instance, 54 per cent of FHHs experienced seasonal food shortages compared with 43 per cent of MHHs; FHH diets are also less diverse.

Income shares: rows 20–23 show the various income shares. First, it is striking that even in these high commercial agriculture areas, farm households derive less than half (48 per cent) of their income from crop production (mainly oil palm and cocoa); the remainder comes from livestock (17 per cent), rural off-farm employment (25 per cent), and non-labour income (10 per cent). This shows more diversified economic livelihood behaviour among highly commercialised households than the crop specialisation indicators might suggest. Second, as could be expected, crop income shares generally increase across the levels of commercialisation. On the other hand, all the other income shares generally fall as one moves from the lowest quartile to the highest commercialisation level, suggesting an overall negative association between crop commercialisation and non-crop income-generating activities. This does not mean that there is no complementarity between farm and non-farm employment at the household level; we do not test this here. Third, Table A1 (Appendix) shows that FHHs differ from MHHs on only non-labour income shares (mainly migrant remittances) – average non-labour income share of total income is about seven percentage points higher for FHHs than for MHHs. This is mainly because these FHHs are mostly de facto heads and widows who receive remittances from absent spouses and relatives.

Household demographics: rows 24–31 show characteristics of household heads. Age, household size and composition are all similar across the levels of commercialisation. The only demographic difference is that FHH representation drops as the level of commercialisation increases – from about 26 per cent at the lowest quartile to 12 per cent at the highest commercialisation quartile.

Socioeconomics and resources: rows 32–39 show the overall socioeconomic, resource availability, and crop production behaviour of households across the commercialisation quartiles. Except for participation in cassava and vegetable production, which falls as we move from the lowest to the highest commercialisation quartile, all other indicators in this category increase with level of commercialisation. For example, households at the highest commercialisation quartile have 2.4 times the farmland of those at the lowest quartile (5.1ha versus 2.1ha). This suggests that initial resource endowment determines level of participation in commercial agriculture.

3.2 Commercialisation pathway, women's empowerment and nutrition security

Which pathway to agricultural commercialisation (specialisation versus diversification) is most effective in empowering women and improving their food security? We answer this question by estimating equation (2) using the CRE probit (CREP) and CRE fractional probit approaches for the binary women's empowerment and fractional women's dietary diversity outcomes, respectively. The number of observations reduce to the sub-sample of 'couple households' with adult females present – to which most of the empowerment and women's dietary diversity questions were asked. Appendix Table A2 shows the results using the Herfindahl crop concentration index as the main covariate of interest, whereas Table 3.2 presents the results with quartiles of the index as the main covariate to allow a visual inspection of the effect of agricultural commercialisation pathway on women's outcomes. The following are the main findings:

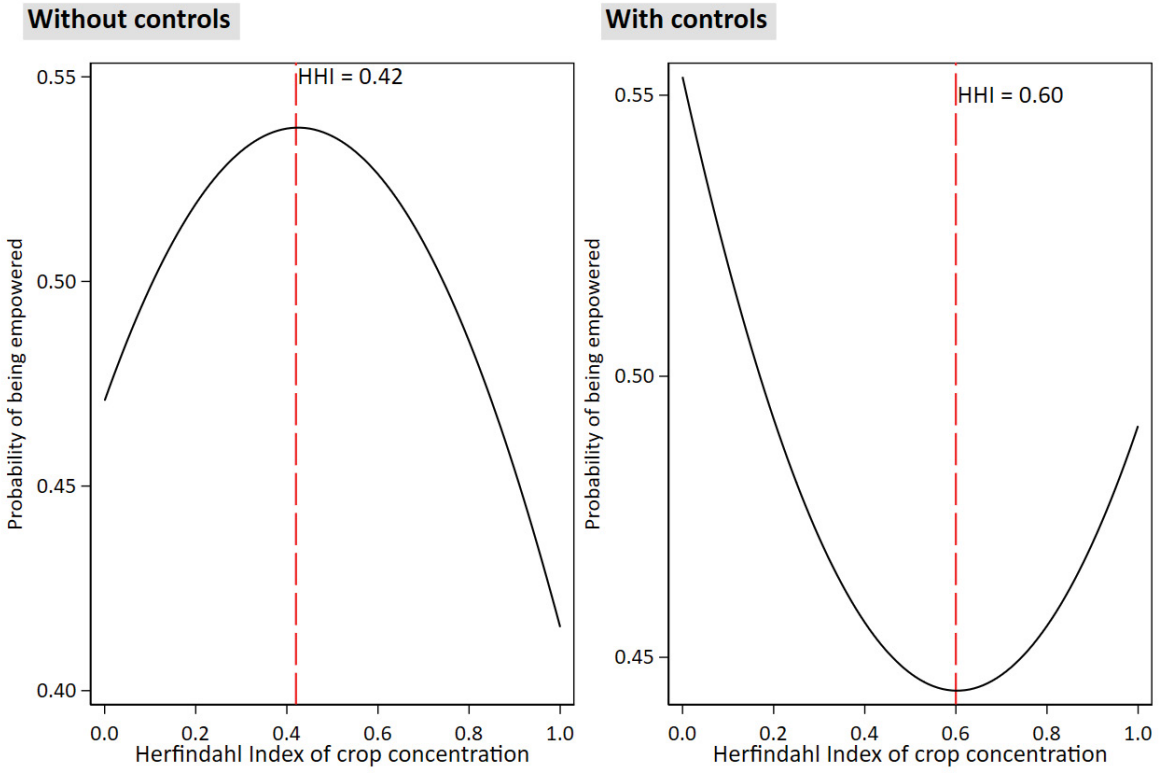
3.2.1 Commercialisation pathway and women's empowerment

First, we begin with a 'baseline model' that regresses the women's empowerment indicator variable on the HHI (the measure of specialisation or diversification pathway to crop commercialisation and its squared term), with and without adjustments for household-specific heterogeneity and other controls. The outcome of this exercise is graphed in Figure 3.1 and the results are striking. Without adjustment for other factors that may be correlated with women's empowerment (left panel graph), we find that empowerment rises with crop concentration and reaches maximum empowerment levels at HHI approximately equal to 0.42 and then begins to fall as crop specialisation increases. Since 84 per cent of the sample have an HHI above 42, the negative effect dominates. This result supports our hypothesis that devoting household resources (land, labour and capital) almost exclusively towards the production of a single crop or a few non-food cash crops disempowers women. This is because they tend to be 'squeezed out' of the gains from commercial agriculture as land and household labour get more concentrated under the control of men.

Second, after adjusting for other covariates and household-specific heterogeneity, a U-shaped relationship emerges between the specialisation pathway to commercialisation and women's empowerment (right panel graph of Figure 3.1). This indicates that increasing the concentration of land to non-food cash crop production has a negative effect on women's empowerment, but as specialisation crosses the 0.6 HHI threshold, the probability of being empowered begins to rise. Note that about 62 per cent of households in our sample have an HHI above 0.6. Why could this be the case? Households and communities with high non-food cash crop concentration also tend to have more women (relative to men) in rural off-farm employment. The above 0.6 result therefore means that women are being either 'pushed' into off-farm employment or that high levels of crop commercialisation and non-food cash crop concentration creates off-farm opportunities for women. Increasing women's off-farm participation (relative to men's) is positively correlated with their empowerment. Besides, most off-farm rural employment activities (e.g., food processing, petty trading, catering, hair dressing and sewing) are aligned to women's culturally assigned roles in Ghanaian society.

Table 3.2 shows that the probability of a woman being empowered is about 11 percentage points higher for those at the lowest level of land concentration compared with those at the second quartile, but thereafter we find no consistent and statistically significant pattern as one moves to higher levels of concentration. The fact that we observe negative but statistically insignificant overall associations after the second quartile, including

Figure 3.1 Association between crop commercialisation pathways and women's empowerment



Source: Author's own, based on regression analysis

other controls (Table 3.2), suggests that women's empowerment is partly a result of household-specific unobserved (to the researcher) nuances.

Third, we included controls for the production of food crop staples (cassava and plantain) and vegetables, which have higher participation rates for women (particularly cassava and vegetables) than men, as shown in Table A1 (Appendix). Strikingly, we find that the production of these crops significantly increases women's empowerment probabilities, although the vegetables effect disappears after accounting for household-specific heterogeneity. For instance, cassava and plantain production raised women's empowerment by nine percentage points, which is a high magnitude of effect (about 19 per cent of the effective sample's mean empowerment rate).

Fourth, as others (Alkire et al., 2013; Malapit and Quisumbing, 2015; Etuah et al., 2020), we show that household demographics and socioeconomic status matters for women's empowerment. Being a de facto female head of house[6] raises women's empowerment by a large magnitude (43 percentage points) and is highly statistically significant. The age gap between spouses also matters: a year increase in women's age relative to men's raises empowerment by 11 percentage points (i.e., 23 per cent of the effective sample's mean empowerment rate) and is significant at the 0.05 level. Attaining secondary school or higher levels of education (relative to primary education or less) raises empowerment probability by 17 percentage points, which is 36 per cent of the sample's mean proportion of empowered women, after adjusting for household-specific heterogeneity.

Household income and wealth are less important determinants of women's empowerment than the above, and although the likelihood of a women being empowered significantly falls with per capita household income at the 0.05 level, the effect is trivial (a two-percentage point decline in probability for a US$1,000 PPP increase in income, with other factors remaining unchanged).

Fifth, we include district-fixed effects which correspond to medium oil palm concentration areas (Mpohor communities) versus high concentration areas (Ahanta West communities). We found a large difference in women's empowerment between the two zones, for instance, the probability of a woman being empowered is 16 percentage points (or 34 per cent of the sample mean) less in the high concentration zone relative to the medium concentration zone. This supports our hypothesis that land concentration (on oil palm) does not promote women's empowerment.

3.2.2 Commercialisation pathways and women's nutrition

The debate about whether or not commercialisation improves nutritional outcomes remains mixed. Relatively recently, Carletto, Corral and Guelfi (2017) found no evidence of a positive effect using nationally representative survey samples for Malawi, Tanzania and Uganda, whereas Ogutu, Gödecke and Qaim (2020) found – from their cross-sectional sample of 824 farm households in two Kenyan counties – that commercialisation improves dietary quality. The following are our salient findings with respect to commercialisation pathways and women's dietary diversity:

First, we estimated a 'baseline model' without controls (left panel of Figure 3.2) showing that women's dietary diversity increases with the specialisation pathway to commercialisation up until a mean HHI of 0.68. This very high level of specialisation (Kim et al., 2012) in oil palm and cocoa production then begins to fall as crop concentration levels increase further. Here again, our hypotheses that high levels of specialisation in non-food cash crops hurt women's welfare is supported by the evidence from the naïve model. What happens after adjusting for other controls and household-specific heterogeneity? The right panel graph in Figure 3.3 answers this question – as with the 'baseline model', women's diet quality increases with specialisation but at a decelerating rate – women's diet quality begins to fall at high levels of specialisation in oil palm and cocoa production (i.e., at an average HHI of 0.88 and above). We note that about 41 per cent of households in our sample have an HHI above 0.88 – a striking result which suggests that indeed the 'overconcentration' of household resources on the production of non-food cash crops hurts women's welfare.

When we included quartiles of the crop concentration index, we show (Table 3.2) that those at the second quartile level of specialisation had three percentage points (about 15 per cent of the effective sample's mean) more diverse diets than those at the lowest level of crop specialisation. The difference is five percentage points at the highest quartile relative to the lowest quartile. While this shows that crop specialisation improves women's diet quality, which is consistent with the finding of Ogutu, Gödecke and Qaim (2020) that commercialisation raises incomes and enables households to increase their nutrient intake through purchased foods, our earlier finding demonstrates

6 This are situations where males are reported as head of household but do not live in the household.

Table 3.2 Marginal effects of the correlates between women's empowerment and dietary diversity

	Women's empowerment		Women's diet diversity	
	Probit	CREP	FP	CREP
Levels of specialisation (base is lowest)				
2nd quintile specialisation	–0.12***	–0.11***	0.03**	0.03***
	(0.04)	(0.04)	(0.01)	(0.01)
3rd quintile specialisation	–0.05	–0.04	0.03**	0.04***
	(0.04)	(0.04)	(0.01)	(0.01)
4th quintile specialisation	–0.06	–0.05	0.04**	0.05***
	(0.05)	(0.05)	(0.02)	(0.02)
Produces cassava	0.09***	0.09***	0.02*	0.02**
	(0.03)	(0.03)	(0.01)	(0.01)
Produces plantain	0.08**	0.09**	–0.01	–0.01
	(0.04)	(0.04)	(0.01)	(0.01)
Produces vegetables	0.22***	0.06	0.01	–0.02
	(0.05)	(0.08)	(0.01)	(0.02)
De facto FHH	0.43***	0.43***	0.01	0.01
	(0.05)	(0.05)	(0.02)	(0.02)
Age of women relative to men	0.11**	0.11**	–0.00	–0.00
	(0.05)	(0.05)	(0.01)	(0.01)
Pre-secondary vs primary or less	–0.07**	0.01	0.01	0.01
	(0.03)	(0.07)	(0.01)	(0.01)
Secondary and above vs primary or less	0.01	0.17**	–0.00	–0.00
	(0.04)	(0.08)	(0.01)	(0.01)
Men's years of schooling	0.00	0.01	0.00**	0.00**
	(0.00)	(0.00)	(0.00)	(0.00)
Women's off-farm participation	0.03	0.03	–0.00	–0.00
	(0.03)	(0.03)	(0.01)	(0.01)
Men's off-farm participation	–0.05	–0.05*	–0.01	–0.01
	(0.03)	(0.03)	(0.01)	(0.01)
Per capita income (US$1,000 PPP)	–0.02**	–0.02**	0.01***	0.01**
	(0.01)	(0.01)	(0.00)	(0.00)
Livestock wealth (cow equivalent)	0.01**	–0.00	–0.00	–0.00
	(0.00)	(0.01)	(0.00)	(0.00)
Farmland per capita	0.01	0.01	–0.00	–0.00
	(0.01)	(0.01)	(0.00)	(0.00)
Market access	0.04	0.04	0.03***	0.03***
	(0.03)	(0.03)	(0.01)	(0.01)
High vs medium concentration oil palm zone	–0.15***	–0.16***	–0.03**	–0.03***
	(0.04)	(0.04)	(0.01)	(0.01)
2019 vs 2017	0.05	0.05	–0.02**	–0.02*
	(0.03)	(0.03)	(0.01)	(0.01)
Observations	980	980	980	980
Sample mean of dependent variable	0.47	0.47	0.20	0.20

Notes: Standard errors in parentheses; * p<.10, ** p<.05, *** p<.01; FP denotes fractional probit.
Source: Author's own

that there is a threshold beyond which further concentration of resources on non-food cash crop production hurts food security. This result is related to the finding of Dzanku, Tsikata and Ankrah (2021) that 'overcommercialisation' hurts food security in general in some contexts.

Second, the production of cassava (an important staple food crop) increases women's dietary diversity.

The share of food groups from which women consume is two percentage points higher for households that produce cassava than for those that do not. The cassava production effect mechanism relates not only to the income gained from sales, but to the autoconsumption of the crop, which is produced more by women than men in our sample and frees up cash for purchasing other foods not produced by the household.[7]

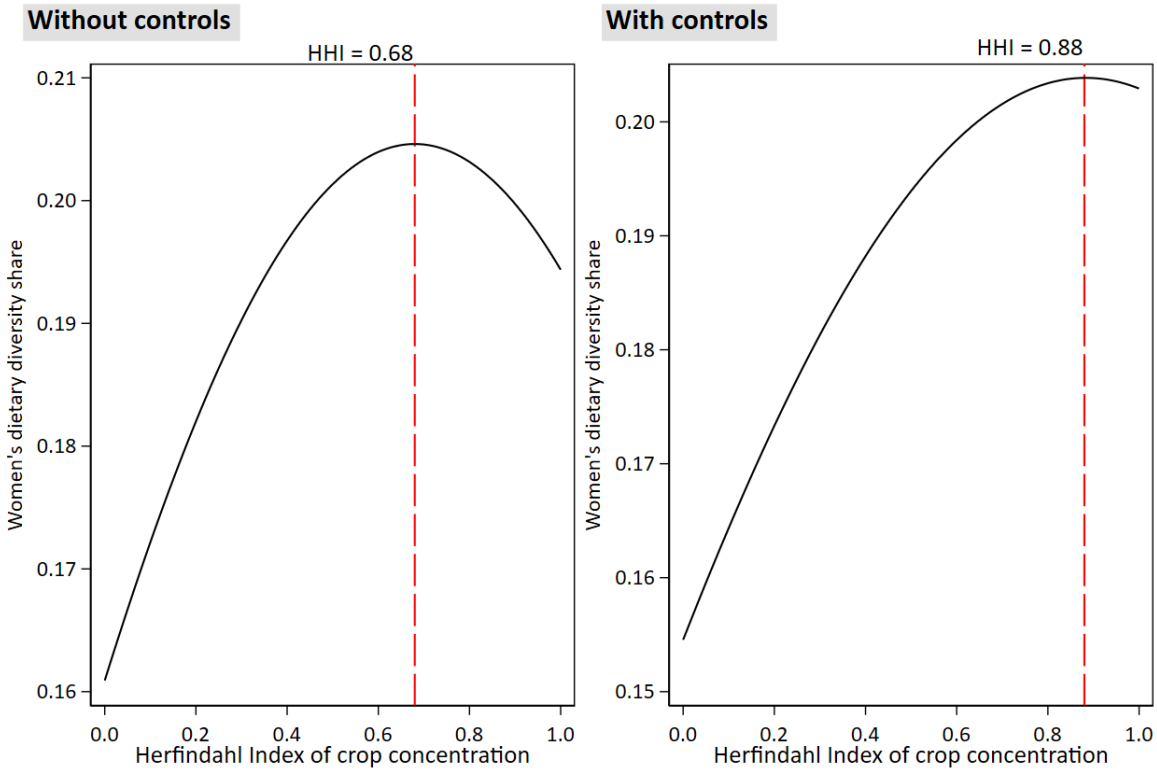
Third, women's dietary diversity is positively correlated with per capita income (which is expected) and men's level of education but not women's. The fact that women's level of education has no significant effect on their diet diversity means that perhaps the impact of men's education on women's diet diversity is linked to better non-farm labour market opportunities for men, which leads to higher household incomes that can be used for purchasing food.

Fourth, market access is positively correlated with women's diet diversity but living in the high concentration oil palm zone has a negative effect. Living in a community with improved market access[8] increases the share of food groups from which women consume by three percentage points, or about 15 per cent of the sample's mean diet diversity share. Relative to the medium concentration oil palm zone, living in the high concentration zone reduces diet quality by three percentage points. This result means that diversification within non-food cash crops (combining oil palm with cocoa in particular) has better outcomes for women's diet quality than focusing on oil palm alone, which again supports our hypothesis that a given level of crop diversification yields better outcomes for women.

3.3 Do non-crop income-generating activities matter for poverty reduction among highly commercialised farm households?

Given the high levels of crop commercialisation in our study areas, how important are non-crop livelihoods (livestock production and rural non-farm employment activities) for poverty reduction, and what is the impact of gender? We address this question by estimating equation 3 using productive and consumer assets as dependent variables; we report ordinary least squares estimates with heteroscedasticity consistent standard errors; and equation 2 using the CRE approach. We use the CREP model for the binary seasonal food insecurity indicator and the CRE zero-inflated negative binomial regression for the number of months in the

Figure 3.2 Association between crop commercialisation pathways and women's diet quality



Source: Author's own, based on regression analysis

7 We estimated the regressions (available from the corresponding author) with cassava commercialisation rather than production as he covariate and found no significant effect on women's dietary diversity.

8 This is measured as binary indicator of whether the community is connected by an all-weather road or not.

year that households had insufficient food.[9] The results are displayed in Table 3.3 and the following are the salient findings:

First, compared with the share of income from crop farming (mainly oil palm and cocoa), other non-crop income-generating activities do not have significant effects on investments in productive assets (mainly farm assets). However, income from off-farm employment in particular is strongly correlated with increased consumer asset accumulation and seasonal food insecurity reduction – even among highly commercialised farm households. Therefore, the answer to the question of whether non-crop income-generating activities matter for poverty reduction among highly commercialised farm households or not is in the affirmative. Increasing the share of total income from livestock makes a difference in consumer asset accumulation when compared with relying mainly on income from non-food cash crop commercialisation. Non-labour income (mainly remittances) also makes a huge difference in reducing seasonal food insecurity relative to relying mainly on cash from oil palm and cocoa production. This is particularly important for FHHs whose probability of receiving migrant remittances is 14 percentage points higher than for MHHs.

Even when we run the regressions controlling for crop commercialisation index and other covariates, we find that participation in rural non-farm employment increased productive and consumer asset accumulation by roughly 17 and 50 per cent, respectively, compared with non-participation. Non-farm employment participation also reduced the probability of experiencing seasonal food shortages by nine percentage points (Table A3, Appendix). These results are all striking and point to economic livelihood diversification as critical for poverty reduction and improving welfare, even in these highly commercialised agricultural zones.

On gender heterogeneity, in the relative importance of the various income-generating activities for poverty reduction, we are restricted to household headship-based analyses due to the absence of intra-household, gender-specific income data. The results show, as could be expected, that FHHs are poorer in both the asset and food security welfare dimensions than their MHH counterparts. For example, relative to MHHs, FHHs have roughly:

52 per cent less productive assets, 83 per cent less consumer assets, 16 percentage points more likely to be seasonally food insecure, and go approximately one month more out of the year without adequate food supply. To test how these gender gaps vary by the relative importance of rural income-generating activities, we interact sex of household head with off-farm employment income shares (relative to crop commercialisation). The results are significant: both the gender asset and food insecurity gaps fall as off-farm employment income shares are increased. For succinctness, we plot the results of this exercise in Figure 3.3 showing the off-farm income mediating role in the gender asset gap; and Figure 3.4 for the corresponding role of off-farm employment in reducing the gender-based food security gap. For example, at zero off-farm employment income share, the gender asset gap is roughly 68 per cent, but as off-farm employment participation deepens, the asset gap falls and turns statistically insignificant at the 0.01 level – at around 60 per cent off-farm employment income share (Figure 3.3). Similarly, for the food insecurity gap, the probability of being food insecure is about 18 percentage points higher for FHHs than MHHs, but this falls by 5 percentage point as off-farm employment deepens to 60 per cent share of income. The story here is that, at the current status quo, rural women's welfare may not be enhanced by simply focusing on crop commercialisation alone; improving opportunities in the rural non-farm sector is critical for reducing gender-based inequities in asset accumulation and food security.

Third, our results show other important household demographic and socioeconomic correlates of rural poverty: households with ageing heads are significantly worse-off; both men and women's education are positively correlated with welfare; increasing the number of dependants in the household is associated with trade-offs between productive and consumer assets (the presence of young dependants increases productive asset accumulation but decreases consumption asset holdings); *per capita* farmland is associated with increasing asset holdings and reduction in the likelihood of seasonal food insecurity; livestock wealth matters for asset accumulation but has no significant effect on seasonal food insecurity; cassava production reduces the number of months of inadequate food provisioning significantly at the 0.10 level.

Fourth, we find significant spatial welfare effects. For instance, both productive and consumer asset holdings are much lower in the high oil palm concentration zone than the medium concentration zone (by about 37 and 24 per cent, respectively), which is explained by the 'cocoa effect'. Compared with the high oil palm concentration zone, cocoa production in the medium concentration oil palm zone is significantly higher

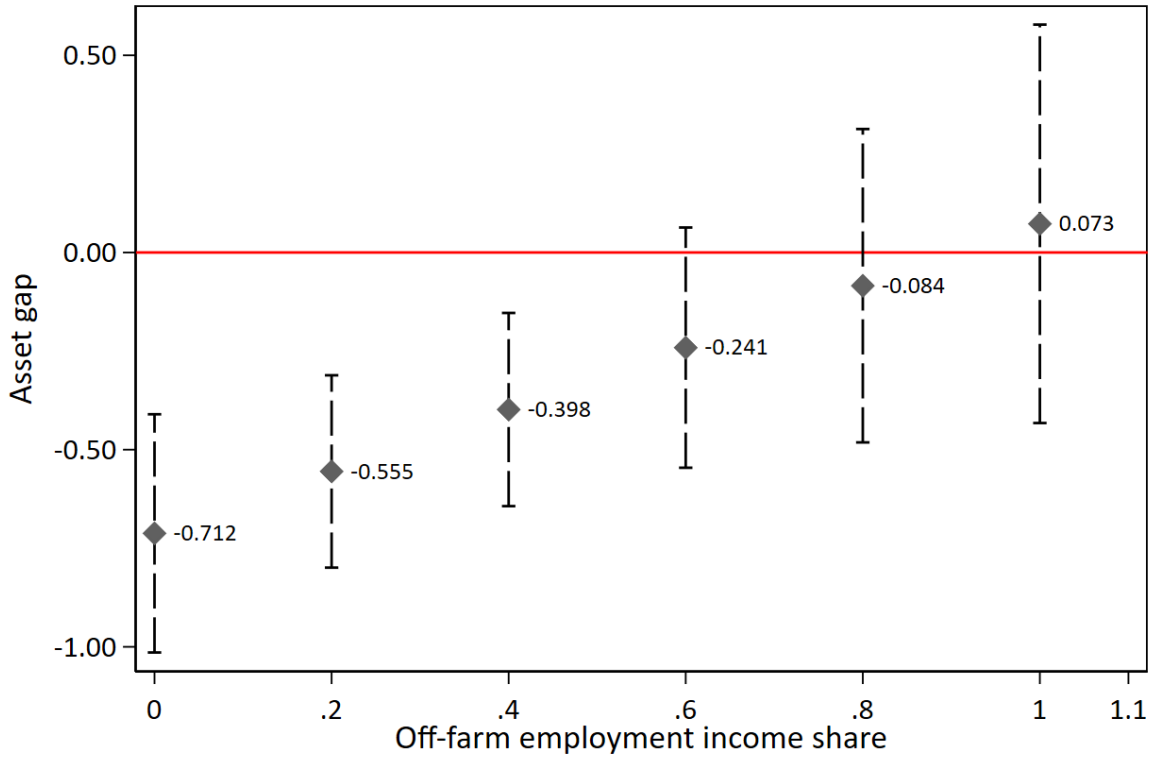
9 This is a count dependent variable with a mass at zero and with over dispersion.

Table 3.3 Regressions showing the importance of non-crop income-generating activities relative to crop commercialisation for poverty reduction

	Household assets (log)		Food insecurity	
	Productive	Consumer	Binary	Count
Income shares (reference is farm income share)				
Livestock income share	0.02	0.36**	–0.02	–0.09
	(0.11)	(0.15)	(0.05)	(0.20)
Off-farm employment income share	0.08	0.61***	–0.16***	–0.46**
	(0.11)	(0.16)	(0.05)	(0.21)
Non-labour income share	0.13	0.14	–0.21***	–1.04***
	(0.12)	(0.18)	(0.07)	(0.33)
FHH	–0.52***	–0.83***	0.16***	0.80***
	(0.09)	(0.15)	(0.04)	(0.23)
Age of household head	–0.00	–0.01***	0.00**	0.01**
	(0.00)	(0.00)	(0.00)	(0.01)
Basic education (men)	0.12	0.27**	–0.08**	–0.24*
	(0.08)	(0.13)	(0.04)	(0.14)
Secondary education (men)	0.12	0.41***	–0.08**	–0.29**
	(0.09)	(0.12)	(0.04)	(0.14)
Tertiary education (men)	0.48***	0.85***	–0.13**	–0.26
	(0.12)	(0.17)	(0.05)	(0.23)
Basic education (women)	0.21***	0.38***	0.02	0.09
	(0.08)	(0.11)	(0.03)	(0.13)
Secondary education or above (women)	0.09	0.47***	–0.06	–0.27**
	(0.10)	(0.13)	(0.04)	(0.13)
Number of female adults	0.10***	0.25***	–0.00	0.16
	(0.03)	(0.05)	(0.04)	(0.15)
Number of male adults	0.07*	0.15***	0.07	0.20
	(0.04)	(0.05)	(0.04)	(0.16)
Number of under 15s	0.05**	–0.07**	–0.00	0.05
	(0.02)	(0.03)	(0.01)	(0.04)
Farmland per capita	0.10***	0.17***	–0.02**	–0.08*
	(0.02)	(0.03)	(0.01)	(0.04)
Per capita income (log)			–0.03*	–0.04
			(0.02)	(0.08)
Producer cassava			0.02	–0.24*
			(0.03)	(0.13)
Produces plantain			0.03	0.23
			(0.04)	(0.17)
Produces vegetables			–0.04	–0.26
			(0.05)	(0.16)
Market access	–0.04	0.05	–0.04	–0.16
	(0.07)	(0.10)	(0.04)	(0.16)
High vs medium concentration oil palm zone	–0.37***	–0.24**	–0.14***	–0.44**
	(0.08)	(0.12)	(0.04)	(0.18)
2019 vs 2017			–0.08***	–0.01
			(0.03)	(0.12)
Observations	1330	1330	1156	1156
Sample mean of dependent variable	3.31	4.76	0.44	1.10

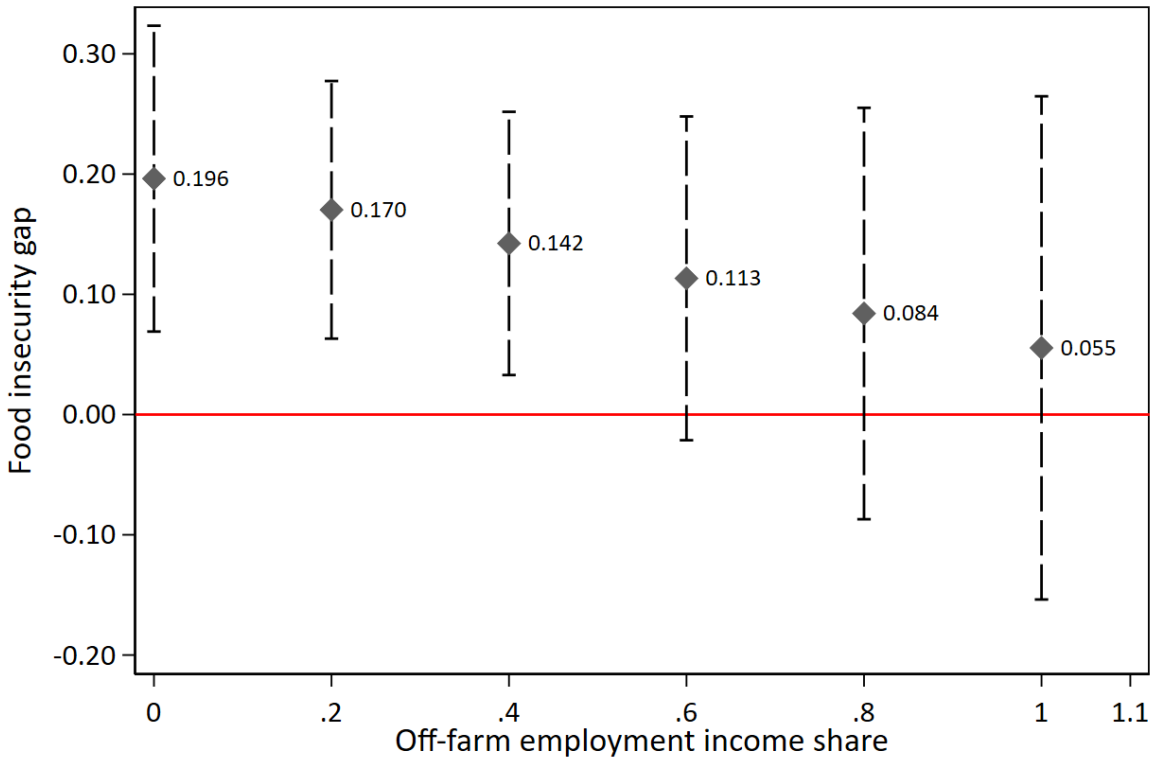
Note: Standard errors in parentheses * p<.10, ** p<.05, *** p<.01
Source: Author's own

Figure 3.3 Off-farm employment (relative to crop commercialisation) effect on gender-based productive asset gaps



Note: The spikes represent the 99% confidence intervals
Source: Author's own, based on regression analysis

Figure 3.4 Off-farm employment (relative to crop commercialisation) effect on gender-based food insecurity gap



Note: The spikes represent the 99% confidence intervals
Source: Author's own, based on regression analysis

(2.6ha versus 1ha) and cash from cocoa is often highly correlated with asset accumulation (Hill, 1997; Dzanku, Tsikata and Ankrah, 2021) because, on average, cocoa cash (compared with oil palm) comes in larger amounts at a time, which enables participating households to acquire relatively expensive assets. By contrast, the probability of seasonal food insecurity is 14 percentage points lower in the high oil palm concentration zone than in the medium concentration zone – this is a large magnitude of difference relative to the sample's mean food insecurity incidence of 44 per cent. The reason oil palm production has a seasonal food insecurity reducing effect (relative to cocoa) is the 'piecemeal' nature of smallholder oil palm fruit harvesting. This allows incomes to be spread over a longer period of time and thus, is essential for food security – more so than cocoa production.

Finally, food poverty (food insecurity) reduced significantly over the panel period. After adjusting for other covariates and household-specific heterogeneity, the probability of seasonal food insecurity fell from 48 per cent in 2017 to 40 per cent in 2019. This difference of eight percentage points is statistically significant at the 0.05 level (p-value = 0.016).

4 CONCLUSION AND IMPLICATIONS

Using household panel data, this paper has: (a) examined which pathway to agricultural commercialisation (specialisation versus diversification) is most effective in empowering women and improving their nutrition security; and (b) analysed the importance of non-crop livelihood activities (livestock production and off-farm employment) relative to crop commercialisation for poverty reduction in high agricultural commercialisation zones of south-eastern Ghana. The main findings from the descriptive and econometric analyses can be summarised as follows:

Farm households are highly market-oriented with a high degree of crop specialisation. More than three quarters (79 per cent) of farmland is cultivated to non-food cash crops (mainly oil palm and cocoa). This is also evident in the sample's mean HHI of 0.75, which shows very high levels of crop specialisation. These findings are in sharp contrast with the notion that African farm households dedicate most of their resources towards the achievement of food self-sufficiency, which reduces orientation towards commercial agriculture.

Combining oil palm and cocoa gives much higher rates of commercialisation than specialisation in one or the other. However, only 19 per cent of sampled household are able to combine the two cash crops successfully, and they do so because they have 65 per cent more land than those that specialise; women are left behind in this high-level commercialisation pathway. Indeed, the main source of heterogeneity between men and women with respect to difference in this pathway to commercialisation is not oil palm production per se but the ability to diversify into cocoa.

The majority of women (51 per cent) are disempowered. Although women's input into generating revenues from commercial agriculture is substantial at the household level, with only a three percentage point gap of participation in the family farm, only 32 per cent of women have a say in how such revenues are utilised. The study descriptives suggest an overall negative relationship between commercialisation and women's empowerment, however, adjusting for other covariates and household-specific heterogeneity reveals a more complex U-shaped relationship. This correlation indicates that women's empowerment falls with increasing concentration of land in the production of oil palm and cocoa, but turns positive at very high rates of specialisation when women are pushed or pulled into rural off-farm activities.

Women's diet quality increases with the specialisation pathway to commercialisation, but at a decelerating rate. Women's diet quality begins to fall at high levels of specialisation in oil palm and cocoa production showing that 'overconcentration' of household resources on the production of non-food cash crops hurts women's welfare.

Finding space to produce food crops in a highly-concentrated non-food cash crop environment is positively associated with women's empowerment and nutrition. Men are focused on producing more oil palm and cocoa whereas women produce more cassava and plantain in addition to oil palm and cocoa. This strategy put women at a better position with more control over revenues from food crops, which then increases their empowerment probability. Also, the autoconsumption of cassava frees up cash for purchasing other foods not produced by the household.

Household average per capita income is well above absolute poverty lines, but 45 per cent of households experience seasonal food insecurity (particularly FHHS – 54 per cent). Additionally, women consumed from only 18 per cent of the 12 food groups, but this rate of diet diversity is not different from men's.

Even in high crop commercialisation zones, farm households derive 35 per cent of their income from non-agricultural sources. Less than half (48 per cent) of farm household income comes from crop farming with livestock, for instance, providing 17 per cent. This point indicates highly diversified economic livelihood behaviour – even among highly commercialised households. There is an overall negative association between crop commercialisation and non-crop income-generating activities, but this should not be interpreted to mean that agricultural commercialisation and non-farm employment are competitors – we did not test this.

Off-farm employment income shares (relative to the crop commercialisation) are strongly correlated with poverty reduction. This study shows that non-crop income-generating activities, including livestock cultivation, matter for poverty reduction – even among the highly commercialised farm households – and that gender-based welfare gaps fall with deepening off-farm employment activities in the rural economy. While there are high levels of gender-based asset and food security gaps in our sample, increasing income from rural off-farm employment moderates the gaps, with no statistically significant gaps remaining at around 60 per cent share of income from rural off-farm employment.

At least three messages stand out from our findings for policy consideration: first, most of the smallholders[10] included in this study already have high proclivity towards commercial agriculture. These **smallholders will thus benefit more from market infrastructure investments such as improvements in rural roads;** currently, only 38 per cent of communities can be reached via all-weather roads.

Second, general policies and programmes that seek to address challenges of commercial agriculture with the aim to enhance smallholder market participation may have unintended negative effects on women's empowerment. This is due to commercialisation resources becoming concentrated in the hands of men, which further reinforces gender inequities. Therefore, **policies aimed at empowering women need not focus on agriculture, but rather address rural non-farm entry constraints** by, for instance, providing subsidised credit through village savings and loans associations, which will enhance women's off-farm employment opportunities. This could be achieved by deliberately channelling existing resources (MoF, 2022) towards relaxing entry barriers to remunerative off-farm opportunities, such as oil palm processing which is dominated by women (Torvikey and Dzanku, 2022). Such off-farm channels of empowering women, as our evidence suggests, would likely lead to better outcomes, including increasing women's capacity to commercialise if they so wish. With the current status quo, it is clear that **rural women's welfare may not be enhanced by focusing on crop commercialisation alone.**

Third, the emerging evidence that 'overcommercialisation' – particularly though specialisation in non-food cash crops – hurts women's food and nutrition security calls for campaigns that educate **farmers in non-food cash crop-concentrated rural areas to devote a share of land towards the production of some food crops** until food markets improve. This would allow for increased levels of crop specialisation that does not have negative impact on household food security.

While the state should lead in facilitating the changes required for more inclusive and gender- empowering commercialisation, other stakeholders (academia, private sector, civil society organisations (CSOs), non-governmental organisations (NGOs) and multilateral agencies) have a role to play. For academia, further qualitative research on why commercialisation tends to deepen gender inequities and how it could be mitigated is imperative. The private sector could partner with the state to improve off-farm employment opportunities in rural areas through agro-processing, particularly the setting up of community-based oil palm and related artisanal industries to create rural jobs. CSOs and NGOs involved in women's empowerment interventions should concentrate a lot more of their efforts on improving off-farm opportunities for women. Relatedly, multilateral agencies need to modify the current framing of their agricultural development agenda to include how to build stronger linkages to rural off-farm employment, even in highly commercialised agricultural zones.

10 Using the Ghana Statistical service definition of 5ha for tree crop agriculture, 82 per cent of the farm households in our sample are smallholders, yet they have similar commercialisation rates as their medium scale counterparts in terms of the share of output sold.

REFERENCES

Alderman, H. and Paxson, C.H. (1994) 'Do the poor insure? A synthesis of the literature on risk and consumption in developing countries', *Economics in a Changing World*, 48-78.

Alkire, S., Meinzen-Dick, R., Peterman, A., Quisumbing, A., Seymour, G. and Vaz, A. (2013) 'The Women's Empowerment in Agriculture Index', *World Development* 52: 71-91. doi:https://doi.org/10.1016/j.worlddev.2013.06.007.

Allendorf, K. (2007) 'Do women's land rights promote empowerment and child health in Nepal?' *World Development* 35(11): 1975-1988.

Babatunde, R.O. and Qaim, M. (2010) 'Impact of off-farm income on food security and nutrition in Nigeria', *Food Policy* 35(4): 303-311. https://doi.org/10.1016/j.foodpol.2010.01.006.

Barrett, C.B. (2008) 'Smallholder market participation: Concepts and evidence from eastern and southern Africa', *Food Policy* 33(4): 299-317. doi:10.1016/j.foodpol.2007.10.005

Bernstein, H. (2017) 'Political economy of agrarian change: Some key concepts and questions', *RUDN Journal of Sociology* 17(1): 7-18.

Brown, C. and Van de Walle, D. (2021) 'Headship and poverty in Africa', *The World Bank Economic Review* 35(4): 1038-1056.

Budlender, D. (2003) 'The Debate about Household Headship', *Social Dynamics* 29(2): 48-72. doi:10.1080/02533950308628675.

Carletto, C., Corral, P. and Guelfi, A. (2017) 'Agricultural commercialization and nutrition revisited: Empirical evidence from three African countries', *Food Policy* 67: 106-118. http://dx.doi.org/10.1016/j.foodpol.2016.09.020.

Carr, E.R. (2008) 'Men's crops and women's crops: The importance of gender to the understanding of agricultural and development outcomes in Ghana's Central Region', *World Development* 36(5): 900-915. doi:10.1016/j.worlddev.2007.05.009.

Chamberlain, G. (1980) 'Analysis of covariance with qualitative data', *Review of Economic Studies* 47(1): 225-238.

Chavas, J.-P. (2011) 'On the microeconomics of diversification under learning', *Journal of Economics* 104(1): 25-47. doi:10.1007/s00712-011-0202-3.

de Janvry, A., Fafcharmps, M. and Sadoulet, E. (1991) 'Peasant household behaviour with missing markets: some paradoxes explained', *The Economic Journal* 101(409): 1400-1417.

Deaton, A. (1997) *The analysis of household surveys: A microeconometric approach to development policy.* Washington DC: The World Bank.

Dillon, B. and Barrett, C.B. (2017) 'Agricultural factor markets in Sub-Saharan Africa: An updated view with formal tests for market failure', *Food Policy* 67(Supplement C): 64-77. https://doi.org/10.1016/j.foodpol.2016.09.015.

Doss, C.R. (2002) 'Men's Crops? Women's Crops? The Gender Patterns of Cropping in Ghana', *World Development* 30(11): 1987-2000. http://dx..org/10.1016/S0305-750X(02)00109-2.

Duflo, E. (2012) 'Women empowerment and economic development', *Journal of Economic Literature* 50(4): 1051-1079.

Duflo, E. and Udry, C. (2004) *Intrahousehold resource allocation in Côte d'Ivoire: Social norms, separate accounts and consumption choices*. NBER Working Paper 10498. New Haven: Yale School of Management.

Dzanku, F.M. (2015) 'Household-specific food price differentials and high-value crop production in rural Ghana', F*ood Policy* 57: 73-82. http://dx.doi.org/10.1016/j.foodpol.2015.09.004.

Dzanku, F.M., Tsikata, D. and Ankrah, D.A. (2021) 'The gender and geography of agricultural commercialisation: what implications for the food security of Ghana's smallholder farmers?' *The Journal of Peasant Studies* 48(7): 1507-1536. doi:10.1080/03066150.2021.1945584.

Dzanku, F.M. and Udry, C. (2017) 'Flickering decades of agriculture and agricultural policy', in: E. Aryeetey and R. Kanbur (eds.), *Ghana's Economy at Sixty*. Oxford: Oxford University Press.

Ellis, F. and Freeman, H.A. (2004) 'Rural Livelihoods and Poverty Reduction Strategies in Four African Countries', *The Journal of Development Studies* 40(4): 1-30. doi:10.1080/00220380410001673175.

Etuah, S., Ohene-Yankyera, K., Aidoo, R., Haleegoah, J., Wiggins, S. and Henley, G. (2020) 'Impact of oil palm-related activities on women's empowerment in Ghana', *World Development Perspectives* 19: 100225. https://doi.org/10.1016/j.wdp.2020.100225.

Fafchamps, M. (1992) 'Cash crop production, food price volatility, and rural market integration in the Third-World', *American Journal of Agricultural Economics* 74(1): 90-99.

FAO (Food and Agriculture Organization of the United Nations) (2010) *Guidelines for measuring household and individual dietary diversity*. Rome: FAO.

Filmer, D. and Scott, K. (2012) 'Assessing asset indices', *Demography* 49(359): 359-92.

Ghana Statistical Service. (2018) Ghana Living Standards Survey Round 7 (GLSS 7): poverty profile in Ghana (2005-2017). Accra: Ghana Statistical Service. Available at: https://www.statsghana.gov.gh/gssmain/fileUpload/pressrelease/GLSS7%20MAIN%20REPORT_FINAL.pdf (Accessed: 10 November 2018).

Ghana Statistical Service. (2022). *Ghana 2021 population and housing census general report volume 3E: Economic activity.* Accra: Ghana Statistical Service. Available at: https://statsghana.gov.gh/gssmain/fileUpload/pressrelease/2021 PHC General Report Vol 3E_Economic Activity.pdf?msclkid=73af94fdbb2811ec9fa0647d24d7d3c2 (Accessed: 4 March 2022).

Hazell, P.B.R., Haggblade, S. and Reardon, T.A. (2007) 'Structural transformation of the rural nonfarm economy', in: S. Haggblade, P.B.R. Hazell and T.A. Reardon (eds.), *Transforming the rural nonfarm economy: Opportunities and threats in the developing world*. Washington D.C: Johns Hopkins University Press.

Hill, P. (1997). *The migrant cocoa-farmers of southern Ghana: A study in rural capitalism*: LIT Verlag Münster.

Hoddinott, J. and Haddad, L. (1995) 'Does female income share influence household expenditures? Evidence from Côte d'Ivoire', *Oxford Bulletin of Economics and Statistics* 57(1): 77-96.

Johnston, B.F., and Kilby, P. (1975) *Agriculture and structural transformation: economic strategies in late-developing countries*. London: Oxford University Press.

Kabeer, N. (1999) 'Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment', *Development and Change* 30(3): 435-464. doi:10.1111/1467-7660.00125.

Kim, K., Chavas, J.-P., Barham, B. and Foltz, J. (2012) 'Specialization, diversification, and productivity: a panel data analysis of rice farms in Korea', *Agricultural Economics* 43(6): 687-700. doi:10.1111/j.1574-0862.2012.00612.x.

Krugman, P.R. (1981) 'Intraindustry specialization and the gains from trade', *Journal of Political Economy* 89(5): 959-973.

Lambrecht, I., Schuster, M., Samwini, S.A. and Pelleriaux, L. (2018) 'Changing gender roles in agriculture? Evidence from 20 years of data in Ghana', *Agricultural Economics* 49(6): 691-710.

Majlesi, K. (2016) 'Labor market opportunities and women's decision making power within households', *Journal of Development Economics* 119: 34-47. http://dx.doi.org/10.1016/j.jdeveco.2015.10.002.

Malapit, H.J.L. and Quisumbing, A.R. (2015) 'What dimensions of women's empowerment in agriculture matter for nutrition in Ghana?' *Food Policy* 52: 54-63. https://doi.org/10.1016/j.foodpol.2015.02.003.

Mellor, J.W. (1976) *The new economics of growth: A strategy for India and the developing world.* Ithaca: Cornell University Press.

MoF (Ministry of Finance) (2022) 'Government to Support Entrepreneurs to Grow and Expand Business through Youstart', *Ministry of Finance* [online], 30 January. Available at: https://mofep.gov.gh/news-and-events/2022-01-30/government-to-support-entrepreneurs-to-grow-and-expand-businesses-through-youstart (Accessed: 21 March 2022).

Mundlak, Y. (1978) 'On the pooling of time series and cross section data', *Econometrica* 46(1): 69-85.

Ogutu, S.O., Gödecke, T. and Qaim, M. (2020) 'Agricultural Commercialisation and Nutrition in Smallholder Farm Households', *Journal of Agricultural Economics* 71(2): 534-555. https://doi.org/10.1111/1477-9552.12359.

Osei-Amponsah, C., Agbotse, P., Swanzy, F. and Stomph, T. (2018) 'Role of small-scale enterprises in agricultural development agendas: Insights from oil palm processing enterprises in the Kwaebibirem District of Ghana', *Ghana Journal of Agricultural Science* 52: 131-144.

Owusu, V., Abdulai, A. and Abdul-Rahman, S. (2011) 'Non-farm work and food security among farm households in Northern Ghana', *Food Policy* 36(2): 108-118. doi:10.1016/j.foodpol.2010.09.002.

Papaioannou, K.J. and de Haas, M. (2017) 'Weather Shocks and Agricultural Commercialization in Colonial Tropical Africa: Did Cash Crops Alleviate Social Distress?' *World Development* 94: 346-365. https://doi.org/10.1016/j.worlddev.2017.01.019.

Timmer, P. (1988) 'The agricultural transformation', in: H. Chenery and T.N. Srinivasan (eds.), *The Handbook of Development Economics*, vol. 1. Amsterdam: North Holland Press.

Torvikey, G.D., and Dzanku, F.M. (2022) *In the Shadow of Industrial Companies: Class and Spatial Dynamics of Artisanal Palm Oil Processing in Rural Ghana.* APRA Working Paper 85: Brighton: Future Agricultures Consortium. Available at: https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/17214 (Accessed: 3 April 2022).

Wiggins, S., Argwings-Kodhek, G., Gebreselassie, S., Asuming-Brempong, S., Chirwa, E., Matita, M.M., Mdoe, N. and Mutabazi, K. (2014) *Cautious commercialisation: Findings from village studies in Ethiopia, Ghana, Kenya, Malawi and Tanzania.* FAC Working Paper 82. Brighton: Future Agricultures Consortium. Available at: https://assets.publishing.service.gov.uk/media/57a089aae5274a31e00001e6/FAC_Working_Paper_082.pdf (Accessed: 12 November 2018).

Winters, P., Davis, B., Reardon, T. and Stamoulis, K. (2002) 'Promoting farm/nonfarm linkages in developing countries', in: P. Winters, B. Davis, T. Reardon, and K. Stamoulis (eds.), *Promoting Farm/Nonfarm Linkages for Rural Development: Case Studies from Africa and Latin America.* Rome: Food and Agriculture Organization of the United Nations.

Wooldridge, J.M. (2010) *Econometric Analysis of Cross Section and Panel Data. 2nd ed.* Cambridge, MA: MIT Press.

APPENDIX

Table A1. Mean characteristics of the sample by gender of household head

		FHH	MHH	Difference
		n = 262	n = 1068	p-val.
01	Oil palm share of farmland (%)	57.2	61.6	0.092
02	Non-food crop share of farmland (%)	72.2	81.0	0.000
03	Val of crop sales (PPP$)	2073	2962	0.000
04	Crop commercialisation index (%)	76.7	82.1	0.000
05	HHI output concentration	0.69	0.71	0.345
06	HHI farmland concentration	0.62	0.66	0.053
07	Per cent empowered: production decisions	98.5	56.7	0.000
08	Per cent empowered: revenue decisions	95.0	16.0	0.000
09	Per cent empowered employment decisions	87.8	86.1	0.508
10	Per cent empowered care workload	71.8	76.7	0.063
11	Per cent empowered across all dimensions	95.4	36.2	0.000
12	Per capita income (PPP US$)	1570	1556	0.945
13	Seasonally food insecure (%)	54.4	42.6	0.000
14	Number of months of food inadequacy	1.66	0.79	0.000
15	Dietary diversity (%)	14.3	19.0	0.000
16	Real value of productive assets (2019 US$)	31.3	55.5	0.007
17	Real value of consumer assets (2019 US$)	180.5	421.1	0.001
18	Real value of household assets (2019 US$)	211.8	476.6	0.000
19	Crop income share (%)	45.7	49.0	0.188
20	Livestock income share (%)	14.3	17.0	0.154
21	Off-farm income share (%)	24.3	25.1	0.724
22	Non-labour income share (%)	15.6	8.9	0.000
23	Age of household head	55.0	51.6	0.000
24	Household size	3.6	4.5	0.000
25	Number of female adults	1.9	1.4	0.000
26	Number of male adults	0.6	1.6	0.000
27	Number of under 15s	1.1	1.5	0.000
28	Head's years of schooling	3.8	8.5	0.000
29	Other adults mean years of schooling	7.4	8.8	0.000
30	Farmland (ha)	2.2	3.3	0.000
31	Farmland per capita (ha)	1.1	1.3	0.020
32	Oil palm farmland (ha)	1.7	2.3	0.000
33	Cocoa producer (%)	18.9	25.2	0.024

34	Cassava producer (%)	61.8	47.0	0.000
35	Plantain producer (%)	21.0	21.0	0.918
36	Vegetables producer (%)	12.6	7.9	0.015
37	Livestock wealth (cow equivalent)	1.6	2.0	0.030
38	Community population	2398	2680	0.124
39	All-weather road to community (%)	37.0	38.8	0.588
40	Oil palm processing mill in community (%)	37.4	33.7	0.178

Source: Author's own

Table A2. Marginal effects of the correlates between women's empowerment and dietary diversity

	Women's empowerment		Women's diet diversity	
	Probit	CREP	FP	CREP
HHI of specialisation	–0.40*	–0.36*	0.10	0.12**
	(0.21)	(0.21)	(0.06)	(0.06)
Squared HHI of specialisation	0.32*	0.30*	–0.06	–0.07
	(0.18)	(0.18)	(0.05)	(0.05)
Produces cassava	0.10***	0.10***	0.01	0.01
	(0.04)	(0.04)	(0.01)	(0.01)
Produces plantain	0.09**	0.09**	–0.01	–0.02
	(0.04)	(0.04)	(0.01)	(0.01)
Produces vegetables	0.24***	0.08	–0.00	–0.03*
	(0.05)	(0.08)	(0.01)	(0.02)
De facto FHH	0.43***	0.43***	0.01	0.01
	(0.05)	(0.05)	(0.02)	(0.02)
Age of women relative to men	0.12**	0.11**	–0.00	–0.00
	(0.05)	(0.05)	(0.01)	(0.01)
Pre-secondary vs primary or less	–0.07**	0.02	0.01	0.01
	(0.03)	(0.07)	(0.01)	(0.01)
Secondary and above vs primary or less	0.01	0.18**	–0.01	–0.01
	(0.04)	(0.08)	(0.01)	(0.01)
Men's years of schooling	0.00	0.01	0.00**	0.00**
	(0.00)	(0.00)	(0.00)	(0.00)
Women's off-farm participation	0.03	0.03	–0.00	–0.00
	(0.03)	(0.03)	(0.01)	(0.01)
Men's off-farm participation	–0.05*	–0.05*	–0.01	–0.01
	(0.03)	(0.03)	(0.01)	(0.01)
Per capita income (US$1,000 PPP)	–0.02**	–0.02*	0.01***	0.01**
	(0.01)	(0.01)	(0.00)	(0.00)
Livestock wealth (cow equivalent)	0.01**	–0.00	–0.00	–0.00
	(0.00)	(0.01)	(0.00)	(0.00)
Farmland per capita	0.01	0.01	–0.00	–0.01
	(0.01)	(0.01)	(0.00)	(0.00)
Market access	0.04	0.04	0.03***	0.03***
	(0.03)	(0.03)	(0.01)	(0.01)
High vs low oil palm zone	–0.16***	–0.17***	–0.02**	–0.02**
	(0.04)	(0.04)	(0.01)	(0.01)
2019 vs 2017	0.07**	0.06**	–0.03***	–0.03***
	(0.03)	(0.03)	(0.01)	(0.01)
Observations	980	980	980	980

Note: Standard errors in parentheses * p<.10, ** p<.05, *** p<.01
Source: Author's own

Table A3. Welfare regressions showing the importance of rural non-farm employment

	Assets		Food insecurity	
	Productive	Consumer	Binary	Count
Crop commercialisation index	0.18	0.26	–0.09	–0.36
	(0.12)	(0.18)	(0.06)	(0.23)
Rural non-farm employment participation	0.17***	0.50***	–0.09***	–0.11
	(0.06)	(0.09)	(0.03)	(0.12)
FHH	–0.52***	–0.87***	0.15***	0.70***
	(0.09)	(0.14)	(0.04)	(0.22)
Age of household head	–0.00	–0.01***	0.00	0.01
	(0.00)	(0.00)	(0.00)	(0.00)
Basic education (men)	0.12	0.29**	–0.09**	–0.28**
	(0.08)	(0.13)	(0.04)	(0.14)
Secondary education (men)	0.10	0.37***	–0.09**	–0.32**
	(0.08)	(0.12)	(0.04)	(0.14)
Tertiary education (men)	0.46***	0.80***	–0.14***	–0.31
	(0.12)	(0.16)	(0.05)	(0.23)
Basic education (women)	0.20***	0.34***	0.02	0.12
	(0.08)	(0.11)	(0.03)	(0.13)
Secondary education or above (women)	0.09	0.47***	–0.06	–0.24*
	(0.10)	(0.13)	(0.04)	(0.13)
Number of female adults	0.08**	0.23***	0.01	0.12
	(0.03)	(0.05)	(0.04)	(0.14)
Number of male adults	0.05	0.11**	0.07*	0.21
	(0.04)	(0.05)	(0.04)	(0.17)
Number of under 15s	0.04**	–0.07**	0.00	0.06
	(0.02)	(0.03)	(0.01)	(0.04)
Farmland per capita	0.09***	0.14***	–0.02*	–0.05
	(0.02)	(0.03)	(0.01)	(0.04)
Livestock wealth (cow equivalent)	0.03***	0.05***	–0.00	0.00
	(0.01)	(0.01)	(0.00)	(0.02)
Per capita income (log)			–0.02	–0.01
			(0.02)	(0.07)
Produces cassava			0.02	–0.24*
			(0.03)	(0.14)
Produces plantain			0.04	0.23
			(0.04)	(0.17)
Produces vegetables			–0.03	–0.23
			(0.05)	(0.16)
Market access	–0.05	0.05	–0.04	–0.14
	(0.07)	(0.10)	(0.04)	(0.15)
High vs low oil palm zone	–0.36***	–0.17	–0.15***	–0.43**
	(0.08)	(0.11)	(0.04)	(0.19)
2019 vs 2017			–0.07**	0.02
			(0.03)	(0.12)
Observations	1330	1330	1156	1156

Note: Standard errors in parentheses * p<.10, ** p<.05, *** p<.01
Source: Author's own

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