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An analysis of diverging livelihood trajectories and outcomes of engagement in tree-crop value chains in Ghana

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Publication date
2023

Link to publication

Citation for published version (APA):
Ataa-Asantewaa, M. (2023). *Uncovering smallholder heterogeneity: An analysis of diverging livelihood trajectories and outcomes of engagement in tree-crop value chains in Ghana*. [Thesis, fully internal, Universiteit van Amsterdam].

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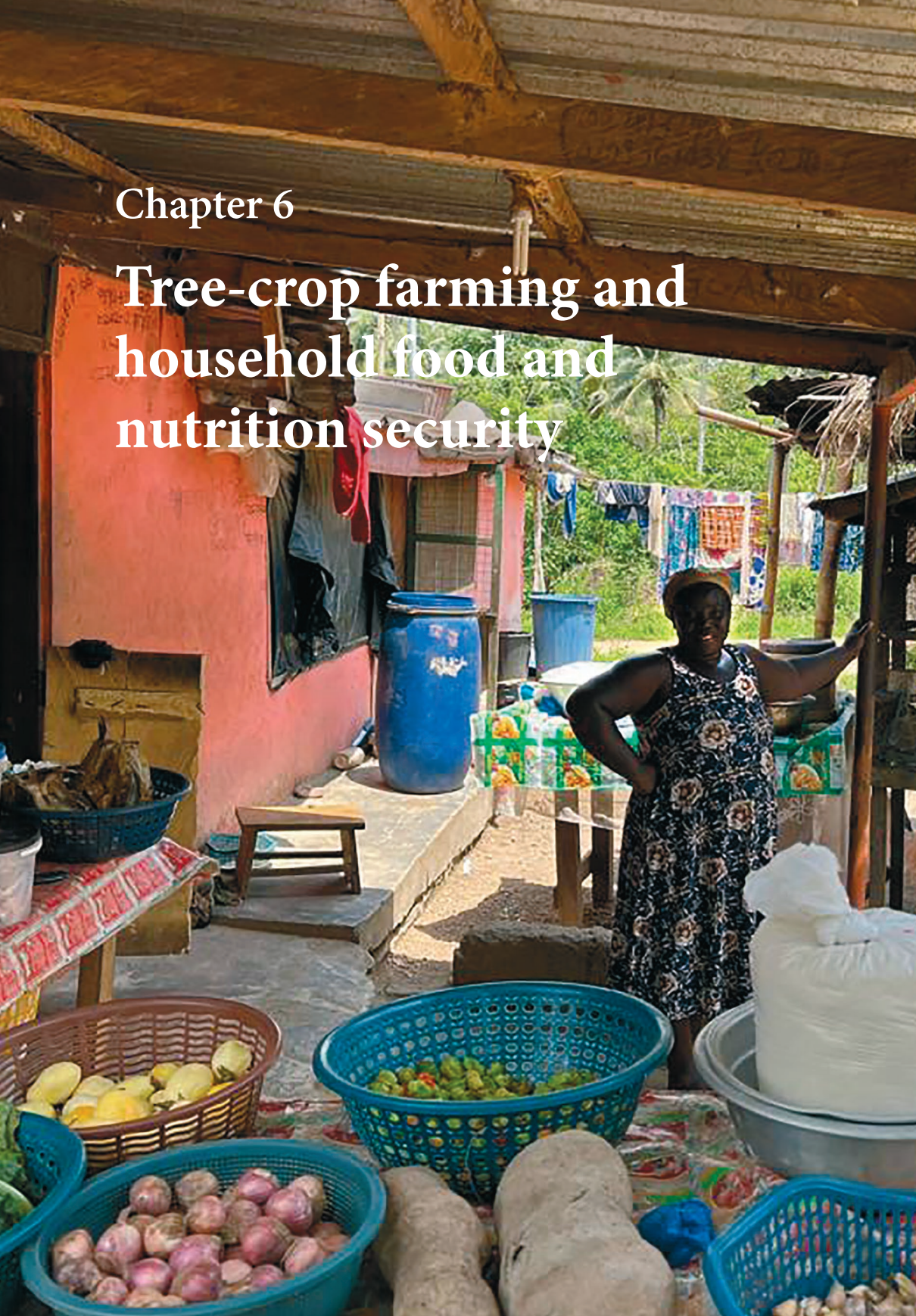


Chapter 6

Tree-crop farming and household food and nutrition security

6.1 Introduction

The previous two chapters demonstrated that household profiles and livelihood trajectories differ across smallholder tree-crop farmers and that there are substantial differences among them regarding farm and non-farm orientation and income capacity. Assuming this also affects their food and nutrition security (FNS), this chapter analyses the effects of farming households' engagement in the tree-crop sector on their FNS (see 6.2). FNS is defined as a situation in which *"all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"* (FAO 2008:1). It encompasses four dimensions – availability, access, utilization, and stability (FAO 2008) (see 1.2.5).

I further explore whether FNS differs between cocoa and oil-palm farming households (see 6.3). I do so based on the assumptions that (i) the effects of tree-crop expansion on land available for food production hits oil-palm-dominated areas harder than cocoa-dominated areas because food and cocoa are intercropped during farm establishment but not in the oil-palm plantations (Asubonteng et al. 2018), (ii) oil-palm producing households enrolled in outgrower schemes are heavily indebted (see Chapter 5), and (iii) women (generally tasked with food-crop production) in oil-palm producing households are more often engaged in oil-palm processing than in food-crop cultivation (Vos 2017).

Finally, this chapter raises the question of whether the FNS concept does sufficient justice to critical dimensions of food provisioning, such as autonomy over food production and marketing and the sustainability of production. These dimensions are more explicitly emphasized in the food sovereignty concept, defined as:

> "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. It puts those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations" (Via Campesina 2007, cited in Patel 2009:666).

Farmers and their preferences are central to this definition. I, therefore, analyse farmers' perceptions of the changes in food production and availability from the perspective of selected food sovereignty dimensions (in particular, autonomy over crop choice and sustainability) (see 6.4).

The research question addressed in this chapter is: how does smallholder farm households' engagement in the tree-crop sector affect their food and nutrition security,

including dimensions of autonomy and sustainability? This will be analysed through the following sub-questions:

1. How does the food and nutrition security (FNS) of smallholder tree-crop farm households differ across profiles, and how can these differences be explained?
2. How does FNS differ between cocoa and oil palm farmers, and how can these differences be explained?
3. What changes in food production and FNS have farmers experienced over the past decades, and how can these changes be explained?
4. What are farmers' perspectives on autonomy and the sustainability of food and agricultural production?

Section 6.5 discusses the main findings and their implications and the limitations of the analysis, while Section 6.6 answers the research questions. The chapter uses survey data from 168 households collected between 2015 and 2017, four focus group discussions held in 2018 with 95 farmers, 88 of whom are also survey respondents, and individual life history interviews conducted in 2017 (see Chapter 2).

6.2 Food and nutrition security across household profiles

Sections 6.2.1-4 analyse the four dimensions of household FNS across the different household profiles.

6.2.1 Food availability by profile

Food availability is the presence of enough food through agricultural production, imports, and food aid (WFP 2013). Below I analyse what food is at farmers' disposal through their production, markets, and shops.

The survey results show that most households (n = 157; 94%) grew food crops. Overall, 64% of households (n = 101) interplant food crops in tree-crop farms; 20% of households (n = 31) grow them in food-crop farms called *mmaafuo* (women's farm); and a minority (n = 25; 16%) combine interplanting and food-crop farms (see Table 6.1).[76] There are no statistically significant differences between the profiles regarding growing food, but three differences regarding where households grow food crops come to the fore. First, the proportion of interplanting households is significantly higher among landless farmers and relatively lower among multiple tree-crop farmers. This is likely due to the recent establishment of the tree-crop farms among sharecroppers, which still allows intercropping, whereas this is no longer possible on mature farms that prevail among multiple tree-crop farming households (see Chapters 4 and 5). Second, a significantly

[76] Total of those growing food solely in one of the categories plus those combining the two sources.

larger proportion of absentee households grow food in *mmaafuo,* and a relatively lower proportion among landless households does so. Having caretakers to manage their tree-crop farm, absentee households have more time for a separate food-crop farm. Third, around one-fifth of single and multiple tree-crop households combine interplanting and a food-crop farm, but among landless and absentee households, this combination is an exception, with a significantly lower proportion among landless households (see Table 6.1). The reasons are obvious: landless households hardly ever have land for food cropping.

Table 6.1 Tree-crop farmer households' food production by source and profile

Profile / Food production	Landless farming households (n = 30)[a]		Single tree-crop households (n = 48)[a]		Multiple tree-crop households (n = 64)[a]		Absentee households (n = 26)[a]		Total households (N = 168)	
	N	%	n	%	n	%	n	%	n	%
Total growing food	30	100	46	95.8	58	90.6	23	88.5	157	93.5
Of which: Interplanting in tree-crop farm	27	90+	30	65.2	31	53.4–	13	56.5	101	64.3
Growing in the food-crop farm (mmaafuo)	2	6.7–	5	10.9	15	25.9	9	39.1+	31	19.8
Combination of inter-planting and mmaafuo	1	3.3–	11	23.9	12	20.7	1	4.3	25	15.9

[a] n refers to the total number of households per profile; b n refers to the number of households in the profile growing food; Chi-Square test where minimum cell frequency is 5 or higher; Fisher's exact test where minimum cell frequency is less than 5. Test significant at $p \leq 0.05$. * = statistically significant relationship based on a value of the adjusted residue (AR), +: adjusted residue (AR) > 2; –adjusted residue (AR) < –2. P-value total growing food: 0.174; P = value place of growing food crops: 0.001*.

Source: Survey, 2015; 2017.

Within 12 months prior to the survey, 81% of households (n = 136) had harvested food crops: plantain (n = 125; 92%), cassava (n = 113; 83%), cocoyam (n = 82; 60%), vegetables (n = 76; 56%) and maize (n = 41; 30%), with only a few households mentioning rice (n = 5; 3.7%) (see Table 6.2). There was no significant difference between household profiles. On average, each household profile harvested three different food crops in the 12 months preceding the survey, with no significant difference between the household profiles (see Table 6.3).

Table 6.2 Food crops harvested in the 12 months preceding the survey

Food crops harvested \ Profile	Landless farming households (n = 23)[a]		Single tree-crop households (n = 40)[a]		Multiple tree-crop households (n = 53)[a]		Absentee households (n = 20)[a]		Total households (N = 136)		P-value
	n	%	n	%	n	%	n	%	n	%	
Plantain	22	95.7	38	95.0	47	88.7	18	90.0	125	91.9	0.701
Cassava	19	82.6	31	77.5	44	83.0	19	95.0	113	83.1	0.416
Cocoyam	15	65.2	28	70.0	27	50.9	12	60.0	82	60.3	0.301
Maize	5	21.7	8	20.0	20	37.7	8	40.0	41	30.1	0.167
Rice	1	4.3	1	2.5	3	5.7	0	0	5	3.7	0.861
Vegetables	13	56.5	23	57.5	27	50.9	13	65.0	76	55.9	0.762

[a] n refers to the number of households in the profile growing food; Chi-Square test where minimum cell frequency is 5 or higher; Fisher's exact test where minimum cell frequency is less than 5. Test significant at $p \leq 0.05$.

Source: Survey, 2015; 2017.

Table 6.3 Diversity of harvested food crops reported by the households in the 12 months preceding the survey

	Landless households (n = 23)	Single tree-crop households (n = 40)	Multiple tree-crop households (n = 53)	Absentee households (n = 20)	Total households (N = 136)
Min	1.00	1.00	1.00	1.00	1.00
Max	6.00	6.00	6.00	5.00	6.00
Mean	3.26	3.23	3.17	3.50	3.25
SD	1.39	1.25	1.30	1.10	1.26
Median	3.00	3.50	3.00	4.00	3.00

Kruskal-Wallis one-way analysis of variance means significant at $p \leq 0.05$. P-value 0.733,

Source: Survey 2015; 2017.

A relatively high proportion (n = 100; 74%) of households that harvested food crops in the 12 months preceding the survey reported selling at least some food crops. This was high for the primary staple foods, plantain (n = 90 of the 125 plantain-growing households; 72%) and cassava (n = 58 of the cassava-growing households; 51.3%), with no significant differences across the household profiles. Assuming that farm households only sell surpluses, this suggests sufficient food availability.

Table 6.4 Household rearing of livestock by profile

Food production \ Profile	Landless farming households (n = 30)[a]		Single tree-crop households (n = 48)[a]		Multiple tree-crop households (n = 64)[a]		Absentee households (n = 26)[a]		Total households (N = 168)		P-value
	N	%	n	%	n	%	n	%	n	%	
Total rearing livestock	23	76.7	35	72.9	48	75	15	57.7	121	72.0	0.352
Of which:											
– Chickens	15	65.2	26	74.3	38	79.2	13	86.7	92	76.0	0.467
– Sheep	13	56.5+	10	28.6	12	25	2	13.3	37	30.6	0.024*
– Goats	10	43.5	24	68.6+	23	47.9	8	53.3	65	53.7	0.196
– Pigs	0	0	0	0	2	4.2	1	6.7	3	2.5	0.392
Other livestock	0	0	0	0	2	4.2	1	6.7	3	2.5	0.186

[a] n refers to the total number of households per profile; [b] n refers to the number of households in the profile rearing livestock; Chi-Square test where minimum cell frequency is 5 or higher; Fisher's exact test where minimum cell frequency less than 5.*: $p \leq 0.05$. +: adjusted residue (AR) > 2; – adjusted residue (AR) < −2.

Source: Survey, 2015, 2017.

Most households also reared livestock (n = 121; 72%), mainly small stock such as chickens (76% of households), goats (54%), sheep (31%), and pigs (2.5%). Only three households (2.5%) reported having other livestock, including cattle (2) and donkeys (1), and these were multiple tree-crop and absentee households. No statistically significant differences existed between the profiles regarding rearing livestock, except for sheep, raised by a higher proportion of landless households than the other profiles (see Table 6.4). This may be explained by the 'keep & share' arrangements prevailing among landless households (see 5.2.1).

In conclusion, households in all profiles have sufficient food and small stock available through their own production. However, due to a lack of own land for food-crop production, landless households mainly interplant their food crops with tree crops, while food-crop production in *mmaafuo* prevails among some absentee farmers who may have given their tree-crop farms to caretakers and are no longer directly engaged in tree-crop farming.

6.2.2 Food accessibility by profile

Food access is the ability to obtain enough food, both economically (having enough resources to buy or grow food) and physically (having physical access to food markets) (FAO 2017b). Economic access is ensured when households have sufficient resources to obtain appropriate foods through production, purchase, or donation (Gross et al. 2000).

Regarding *physical* access, respondents in all 18 study communities can buy or sell food items at markets or provision stores within 2 km. Among the items bought at the market or shops are fish, meat, rice, noodles, salt, sugar, spices, drinks, and cooking oil, while plantain and cassava are the products most sold by households. Despite the availability of food markets in and around all communities, there were significant differences between household profiles regarding *economic* access to these markets. Economic access is defined here as the ability to purchase the food needed by the household. A significantly lesser proportion of landless households and a higher proportion of multiple tree-crop households reported buying some food from food markets than the other profiles (see Table 6.5). These differences may be explained by the lower income capacities of most landless households (see Chapters 4 and 5), making them dependent on their own food production, whereas multiple tree-crop households with their higher income capacities can afford to buy food from the market.

In the focus group discussions, farmers confirmed that particularly caretakers depend on food obtained from their own farm, on labour-for-food arrangements, and food from the wild rather than on food markets, while the better-off single and multiple tree-crop households can afford to buy foods like noodles and perfume rice[77] (see Table 6.13 in 6.4.1).

Table 6.5 Households that reported buying food from the market

Profile / Access	Landless households (n = 30)		Single tree-crop households (n = 48)		Multiple tree-crop households (n = 64)		Absentee households (n = 26)		Total households (N = 168)		P-value
	n	%	n	%	n	%	n	%	N	%	
Economic access	9	30–	21	43.8	42	65.6+	14	58.3	86	51.2	0.008*

Chi-Square test, X^2 (9, n = 168) = 11.865, Cramer's V= 0.266, test significant at $p \leq 0.05$. *: $p \leq 0.05$. +: adjusted residue (AR) >2; – adjusted residue (AR) < –2.

Source: Survey, 2015; 2017.

A standard measure of the access dimension of food insecurity is the Household Food Insecurity Access Scale (HFIAS, see 2.7.5).[78] We adopted four generic questions of the HFIAS, which referred to the 30 days preceding the interview (see Coates et al. 2007 and Chapter 2):

[77] Perfume rice is a processed rice, usually jasmine rice that has an aroma.

[78] The original HFIAS consists of nine generic occurrence (yes/no) questions that represent increasing levels of severity of food insecurity and nine frequency of occurrence questions that measure how often the household experience that level of food insecurity (Coates et al. 2007). We adopted four occurrence and four frequency of occurrence questions (see Chapter 2).

- *Measuring anxiety over food insecurity:* Do you ever worry that your household will not have enough food?
- *Measuring food quality:* Was your household unable to eat the preferred food?
- *Measuring food quantity:* Did your household ever have to eat smaller meals?
- *Measuring hunger:* Did your household ever run out of food?

Answers could score 0 (certainly not); 1 (seldom, i.e. 1-2 times in the past 30 days); 2 (occasionally, i.e. 3-10 times in the past 30 days); or 3 (regularly, i.e. > 10 times in the past 30 days). Thus, with four questions, the HFIAS score could range from zero (0) to twelve (12) –signifying food and nutrition security if the value is zero (0) and indicating some level of food insecurity if the HFIAS ranges from one (1) to twelve (12). Having thus identified the experience of food (in)security based on the HFIAS score, households were further classified into levels of food (in)security depending on the answers to the questions on the occurrence of experienced food insecurity and the frequency of occurrence (Coates et al. 2007). Values range from being food secure (0-1; with no or just seldom anxiety over food access), mildly food insecure (2-6 with occasional or regular anxiety over food access or compromised food quality), and moderately food insecure (6-9; with anxiety over access to food and compromised food quality, with or without seldom and occasional compromise on food quantity) to severely food insecure (9-12; regular compromises on food quantity or occasionally even running out of food).

Table 6.6 shows that with an average HFIAS score of 2.61, households in all profiles experienced some level of food insecurity over the last 30 days. The results show significant differences across the profiles, specifically between the landless and single tree-crop households and multiple tree-crop households.

Table 6.7 shows that food insecurity is widespread across the profiles, with just about 42% of households being food secure. Except for the multiple tree-crop households, over half of the households in the other three profiles had experienced some food insecurity over the past 30 days. Over 18% of all households had experienced severe food insecurity within the month preceding the survey, varying from 8% among multiple tree-crop households to as high as 31% among single tree-crop households. The differences in food insecurity levels across profiles were not statistically significant, although there were more single tree-crop and fewer multiple tree-crop households with severe food insecurity.

Most multiple tree-crop households have the income capacity to access food markets, which improves their food access compared to other profiles, especially that of the landless and single tree-crop households. Therefore, food and nutrition security is relatively better among multiple tree-crop households.

Table 6.6 Mean Household Food Insecurity Access Scale (HFIAS) scores by profile

	Landless households (n = 30)	Single tree-crop (n = 48)	Multiple tree-crop (n = 64)	Absentee households (n = 26)	Total households (N = 168)	P-value
Min	0.00	0.00	0.00	0.00	0.00	
Max	8.00	9.00	7.00	8.00	9.00	
Mean	3.33[a]	3.56[a]	1.16[b]	2.31[ab]	2.61	0.004
SD ±	2.71	3.29	2.11	2.71	2.79	
Median	3.50	3.50	0.00	1.50	2.00	

Kruskal-Wallis one-way analysis of variance means significant at $p = \leq 0.05$. Superscript letters (a, b) indicate clusters that are statistically different (a-b) (a-a; b-b) are similar to each other.

Source: Survey, 2015; 2017.

Table 6.7 Household food insecurity access prevalence (HFIAP) among household profiles

Profile / Category	Landless households (n = 30)		Single tree-crop households (n = 48)		Multiple tree-crop households (n = 64)		Absentee households (n = 26)		Total households (N = 168)		P-value
	n	%	n	%	n	%	N	%	n	%	
Food secure	9	30.0	16	33.3	34	53.1	12	46.2	71	42.3	
Mildly food insecure	6	20.0	4	8.3	12	18.8	3	11.5	25	14.9	
Moderately food insecure	9	30.0	13	29.1	13	20.3	6	23.1	41	24.4	0.060
Severely food insecure	6	20.0	15	31.3+	5	7.8–	5	19.2	31	18.4	

Fisher's exact test. Test significant at $p \leq 0.05$.
Source: Survey, 2015; 2017.

6.2.3 Food utilization by profile

Food utilization refers to the safety and quality of food and determines households' nutritional status (FAO 2008). Here I use the household dietary diversity score (HDDS), which measures households' use of 12 food groups within the 48 hours preceding the survey as a measure of nutritional adequacy and economic ability of the household to access a variety of food (Kennedy et al. 2013).

Table 6.8 Mean household dietary diversity score (HDDS) by profile

	Landless households (n = 30)	Single tree-crop households (n = 48)	Multiple tree-crop households (n = 64)	Absentee households (n = 26)	Total households (n = 168)	P-value
Min	4.00	3.00	3.00	3.00	3.00	
Max	12.00	12.00	12.00	12.00	12.00	
Mean	8.23	8.44	7.94	7.42	8.10	0.375
SD	2.30	2.70	2.30	2.82	2.50	
Median	8.00	9.00	8.00	7.00	8.00	

One-way analysis of variance (ANOVA) means significant at $p = \leq 0.05$.
Source: Survey, 2015; 2017.

Table 6.9 Household consumption of 12 food groups by profile

Profile / Crops	Landless households (n = 30)		Single tree-crop households (n = 48)		Multiple tree-crop households (n = 64)		Absentee households (n = 26)		Total households (N = 168)		P-value
	n	%	n	%	n	%	N	%	n	%	
Cereals	25	83.3	38	79.2	48	75.0	18	69.2	129	76.8	0.610
Root & tubers	28	93.3	46	95.8	60	93.8	24	92.3	158	94.0	0.884
Vegetables	29	96.7	46	95.8	61	95.3	25	96.2	161	95.8	1.000
Fruits	21	70.0	32	66.7	40	62.5	11	42.3–	104	61.9	0.136
Meat	5	16.7–	28	58.3+	32	50.4	10	38.5	75	44.6	0.003*
Fish	28	93.3	40	83.3	57	89.1	23	88.5	148	88.1	0.650
Eggs	16	53.3	31	64.6	32	50.0	9	34.6–	88	52.4	0.097
Legumes	25	83.3	31	64.6	43	67.2	17	65.4	116	69.0	0.311
Dairy	8	26.7	16	33.3	16	25.0	5	19.2	45	26.8	0.591
Sugars	21	70.0	36	75.0	39	60.0	18	69.2	114	67.9	0.455
Oils	25	83.3	39	81.3	53	82.8	18	69.2	135	80.4	0.480
Condiments	16	53.3	22	45.8	25	39.1	14	53.8	77	45.8	0.469

Chi-Square test where minimum cell frequency is five or higher; Fisher's exact test where minimum cell frequency is less than 5. Test significant at $p \leq 0.05$ * = statistically significant relationship indicated with a value of adjusted residue; +: adjusted residue (AR) >2; – adjusted residue (AR) < –2.

Source: Survey, 2015; 2017.

Table 6.8 shows that the mean household dietary diversity score among the household profiles has an overall mean of eight out of the 12 food groups. There were no statistically significant differences between the profiles.

An analysis of the 12 food groups indicates that households ate relatively similar diets within the 48 hours preceding the survey except for meat, which was consumed by a significantly high proportion of single tree-crop households compared to landless households (see Table 6.9).

In conclusion, household dietary diversity did not vary among the profiles, implying that households ate relatively similar diets. A likely explanation is that these households depend more on their own production than on the food market, as indicated by the low consumption of food items that farmers do not produce themselves, such as dairy. This also means that households' income capacity did not necessarily influence their diet, at least at the time of the survey, as higher incomes are channelled into household expenses other than food, such as school fees. However, the focus group discussions generated more nuanced insights (see 6.4).

6.2.4 Food stability by profile

Stability is a temporal determinant of FNS and refers to availability, access, and utilization. A distinction can be made between chronic food insecurity, which recurs seasonally, and transitory food insecurity, for instance, caused by a disaster (Barrett 2010). This section looks into seasonal food insecurity, which is reported among both cocoa and oil palm farmers (c.f. Vos 2017; Bymolt et al. 2018). Over half of all households across three profiles struggled to access food during specific periods of the year (see Table 6.10). This applied less to the multiple tree-crop households, which have a greater income capacity to buy food on the market. Most landless and single tree-crop households experience seasonal food insecurity. Unlike the multiple tree-crop farming households and some absentee households, they cannot buy food on the market and supplement their own production during food-scarce months due to their low-income capacity and indebtedness to outgrower schemes or purchasing clerks. Further details on the occurrence and causes of seasonal food insecurity are presented in 6.4.1.

Table 6.10 Seasonal food insecurity by profile

Profile	Landless households (n = 30)		Single tree-crop households (n = 48)		Multiple tree-crop households (n = 64)		Absentee households (n = 26)		Total households (N = 168)		P-value
	n	%	n	%	n	%	n	%	n	%	
Households experiencing seasonal food insecurity	23	76.7+	34	70.8+	26	40.6–	15	57.7	95	56.5	0.001*

Chi-Square test, X^2 (3, n = 168) = 15.496, Cramer's V= 0.304. Test significant at $p \leq 0.05$. * = statistically significant relationship based on a value adjusted residue; +: adjusted residue (AR) > 2; – adjusted residue (AR) < –2.

Source: Survey, 2015; 2017.

6.3 Differences in FNS between cocoa, oil-palm, and mixed cocoa/oil-palm farming households and geographical regions

Based on the assumptions outlined in Section 6.1, this section looks at the differences in FNS between cocoa, oil -palm, and mixed households. Based on the reconnaissance survey (see Chapter 2), I assumed that cocoa-farming households were mainly concentrated in the Tepa area, oil palm-producing households in the Kade area and the Dunkwa area would have a combination of those. Data confirmed that these assumptions were correct regarding Tepa and Dunkwa (see Table 6.11). However, in the Kade area, despite being characterized in the literature as oil palm-dominated (Osei-Amponsah et al., 2012; Asubonteng et al. 2018), a significant majority of 73% of households (n = 37) cultivated both cocoa and oil palm (see Table 6.12), while a surprisingly low number of households (n = 5) was growing oil palm only.

Table 6.11 Households' tree-crop orientation in the three study areas

Study district / Tree crops	Upper Denkyirah East (Dunkwa area) n = 57		Kwaebibirem Municipal (Kade area) n = 51		Ahafo Ano-North District (Tepa area) n = 60		Total households N = 168		P-value
	N	%	n	%	n	%	n	%	
Cocoa	29	50.9	9	17.6–	49	81.7+	87	51.8	
Oil palm	3	5.3	5	9.8	0	0.0–	8	4.8	0.001*
Cocoa & oil palm	25	43.9	37	72.5+	11	18.3–	73	43.4	

Fisher's exact test. Test significant at $p \leq 0.05$. *: = statistically significant relationship based on a value of the adjusted residue (AR), +: adjusted residue (AR) > 2; –adjusted residue (AR) < –2.

Source: Survey, 2015, 2017.

Based on the earlier finding that oil palm-producing households enrolled in outgrower schemes are heavily indebted (see Chapter 5), I further looked into the FNS status of eight households growing oil palm only. Five of these are involved in an outgrower or smallholder scheme with a big oil palm company. Although the findings should be interpreted with caution due to the low number of households involved, analysis reveals the following:

- *Food availability:* three households cultivated food crops and six reared animals.
- *Food access:* all eight had access to food markets within 2 km of their dwelling; four reported limited income capacity to buy food on markets; and only one household could be classified as food secure; three were moderately food insecure; and four were severely food insecure based on the HFIAP. Of the latter, three were involved in an outgrower or smallholder scheme.
- *Food utilization:* the mean dietary diversity score of these households (8.00) was similar to that of single tree-crop households growing cocoa (8.29).
- *Food stability:* six households (four of which were involved in an outgrower or smallholder scheme) reported experiencing food insecurity from January through July.

Table 6.12 Tree-crop orientation by household profiles

Profile / Tree crops	Landless households (n = 30)		Single tree-crop households (n = 48)		Multiple tree-crop households (n = 64)		Absentee households (n = 26)		Total house-holds (N = 168)		P-value
	n	%	n	%	n	%	n	%	n	%	
Cocoa	30	100+	43	89.6+	0	0.0	14	53.9	87	51.8	0.001*
Oil palm	0	0.0–	5	10.4+	0	0.0	3	11.5	8	4.8	
Cocoa & oil palm	0	0.0–	0	0.0–	64	100+	9	34.6	73	43.4	

Fisher's exact test. Test significant at $p \leq 0.05$. *: = statistically significant relationship based on a value of the adjusted residue (AR), +: adjusted residue (AR) >2; –adjusted residue (AR) < –2.

Source: Survey, 2015; 2017.

Oil palm households hardly grow their own food, mainly because the integration of food crops in oil palm plantations is not encouraged in outgrower schemes, and most households do not have extra land for food-crop production. Households in outgrower schemes often put all their land under tree crops to the detriment of food-crop lands (Asubonteng et al. 2018), negatively affecting their FNS.

6.4 What the FNS concept does not tell us

This section analyses farmers' perceptions of the changes in food production and availability from the perspective of the food sovereignty dimensions of production and availability of culturally appropriate food (see 6.4.1), farmers' autonomy over production and consumption (see 6.4.2), and sustainability of production (see 6.4.3). Data was gathered through interviews and focus group discussions (further abbreviated as FGDs) and, where appropriate, are presented separately for the Kade, Tepa, and Dunkwa areas to identify context-specific factors.

6.4.1 Farmers' perceptions of changes in the production and availability of culturally appropriate food

This section analyses and reflects on farmers' perceptions of their food and nutrition security using a seasonal calendar (see Appendix 8) and historical timelines with proportional piling.[79] These methods reveal seasonal food insecurity as well as changes in their production landscape and food production in the (context-specific) past, present (2018), and anticipated near future (2018-2023)[80] (see Figures 6.1-3); the factors that caused these changes; and the effects on food availability across profiles. Farmers in the Kade and Dunkwa areas used the introduction of oil palm outgrower schemes in the 1960s (Kade) and 2006 (Dunkwa) as their reference points in the past. In the Tepa area, farmers used the aftermath of the 1983 bushfires that destroyed their cocoa farms as the reference point.

Seasonal food and nutritional insecurity

In all three areas, farmers face seasonal food insecurity with similar trends of FNS in the period from August through December as one in which the household is mostly food secure. During this period, they can harvest their food crops (including vegetables) and fruits such as papaya, avocado, and citrus from the wild or on the farm while they receive revenue from the sale of cocoa and oil palm. During this period, farmers are able to eat their main traditional daily 'fufu' meal[81]:

> "We eat fufu every day. Some of us say that if we don't eat fufu every evening, we sleep on an empty tummy" (FGD Dunkwa, July 2018).

[79] Proportional piling is a semi-quantitative participatory ranking method used to determine the relative importance of, for instance, income sources, wealth, problems or priorities. Participants receive a fixed amount of pebbles or beans (or whatever is available) and assign these proportionally to visual or written representations of the categories to be ranked (Mariner & Paskin (2000).

[80] A five-year period was chosen as a long term to observe change especially considering that most cocoa and oil palm start fruiting from the 4-5th year.

[81] *Fufu* is a traditional food in Ghana, made by boiling pounded starchy foods such as cassava, yam, cocoyam, and plantain.

For most households, the months after December (January-March) are characterized by mild to moderate food insecurity due to the dry harmattan period, making the soil dry and harvesting, especially root and tuber crops, difficult. Moreover, there is the risk of bushfires destroying unharvested crops. The rains start in April but pose food and nutrition security problems through July because they cause cassava to regenerate new leaves that spoil tubers and make them too starchy to be used as food. The rains furthermore come with windstorms that may destroy plantain plants. As a result, food becomes scarce with the start of the rainy season.

Despite a relatively stable income from oil palm throughout the year, there was no difference between oil palm and cocoa or food-crop farmers in terms of experiencing food insecurity during these months, when leafy vegetables and wild fruits like mango often come to the rescue:

> "These months can be terrible, and local mangoes are an important food during this period. Sometimes households solely depend on mangoes for a day" (FGD Tepa, August 2018).

The months of June-July mark a period of severe food insecurity because farmers virtually run out of food on the farm and have no money to obtain food from the market. Often food is scarce on the market and expensive at this time of the year. Farmers reported that they often eat many maize foods such as *banku* or cassava-made *konkonte* or *gari* flakes during the months of food insecurity, as these are easy to store:

> "We eat a lot of maize food here – *banku*, *Fanti kenkey*. *Konkonte* feels like *fufu,* so we eat that often. *Fufu* is still common during this period, but because cassava often is spoiled, you cook and end up with little *fufu* which cannot feed the whole family" (FGD Tepa, August 2018).

Farmers reported that foods are often prepared with fish (dried or fresh) or meat, but especially in June and July, cheap local salted fish (*koobi* and *momoni*) is often used. Some households even make food without meat or fish:

> "June and July are the worst months for meat or fish. We normally eat without meat or fish because we have no money in these months" (FGD Dunkwa, July 2018).

> "Some of us eat without fish or meat in it [during these months]. We do leafy vegetable soups. Those who have water near the farm also get crabs. You can

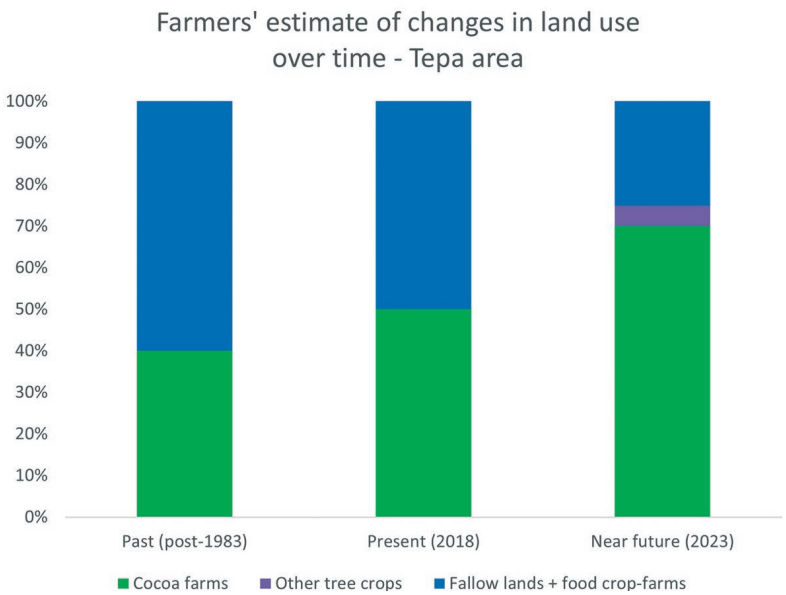
get grasscutters if you are a hunter. Snails are scarce now. We eat mushrooms once in a while" (FGD Kade, September 2018).

"In June and July, we mostly eat vegetable soups without meat. However, those who raise small stock can also depend on it, but not for the full two months; you always run out. There is hunting too for the men except in August-September when you are not supposed to hunt" (FGD Tepa, August 2018).

It can get so bad in some households that the mothers sacrifice their meals for their children on certain days:

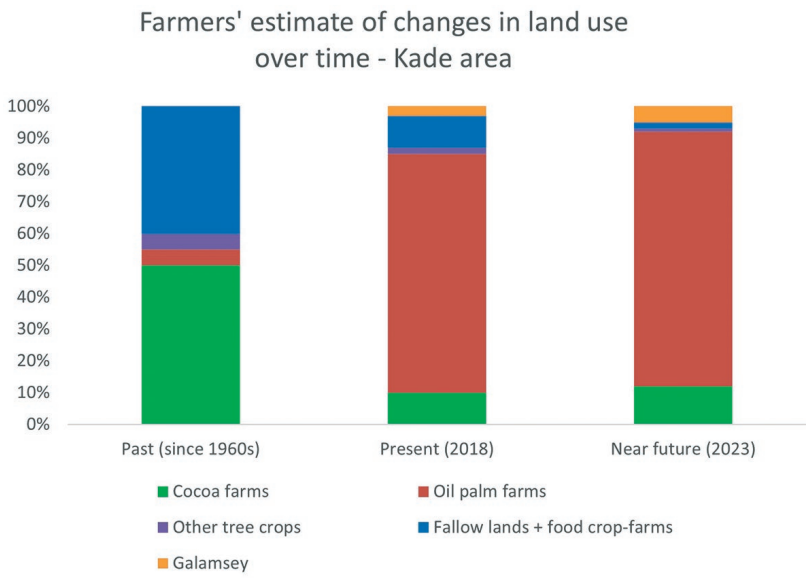
"For us women who prepare the food, during June-July, sometimes you finish preparing the food, and it's so small that you have to give it to your children, and you go to bed hungry" (FGD Kade, September 2018).

Figure 6.1 Perceived changes in land use over time in the Tepa area



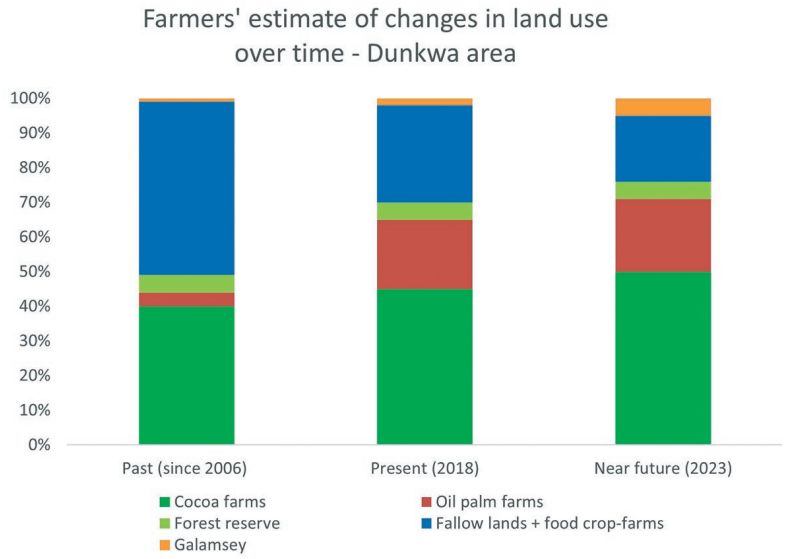
Source: FGD Tepa, August 2018.
NB Farmers are not aware of any demarcated forest reserve

Figure 6.2 Perceived changes in land use over time in the Kade area



Source: FGD Kade, September 2018.
NB Farmers are not aware of any demarcated forest reserve

Figure 6.3 Perceived changes in land use over time in the Dunkwa area



Source: FGD Dunkwa, July 2018.

Changes through time

In addition to seasonal variations in food and nutrition security, farmers also perceived changes through time. First, rice is becoming a staple food. Although it was initially a luxury food, it is increasingly being appreciated for its cost-effectiveness:

> "Rice is on the market because it is imported and not so expensive for some of us to buy when you consider that a small amount can feed a lot of people" (FGD Dunkwa, July 2018).

> "In December, we eat luxury food such as perfume rice with chicken or meat (cow, goat, sheep, fish). That rice is imported, but if you consider that we work on the farm all year round, it is not expensive to buy this rice" (FGD Kade, September 2018).

Rice is also easy to prepare compared to *fufu*:

> "It [rice] is easy to cook, less time-consuming, and can be prepared in many forms. (…) You can eat *awan mmu* (oil rice) without sauce, meat, or fish but with ground pepper and fried egg. You can even omit the egg if you don't have some.") (FGD Dunkwa, July 2018).

Eating rice is also evidence of changing diet patterns:

> "The children also love rice compared to *fufu* that we adults like, and since it will not kill the parent, it makes the children happy" (FGD Dunkwa, July 2018).

> "When some of us were kids, we ate rice only during Christmas, but now some of us eat it throughout the year. The children love it and can eat it every day just like we, the old people, eat our fufu religiously" (FGD Kade, September 2018).

Second, the widespread conversion of fallow and food-crop lands to tree-crop production affects food production. The proportional piling results showed a stark increase in tree-crop areas and an alarming decrease in fallow and food-crop lands in the present (see Figures 6.1-3), especially in the Kade (see Figure 6.2) and Dunkwa areas (see Figure 6.3), where an oil-palm outgrower scheme had been introduced to smallholders. Except for the 1960s, when cocoa was virtually wiped out in the Kade area due to the expansion

of oil palm under a government oil-palm project at that time, farmers noted that many fallow and food-crop lands were replaced with cocoa and oil palm, with cocoa expanding with the influx of migrant sharecroppers, and oil palm expanding due to outgrower schemes and a secure market. Farmers in all areas expect cocoa to rise markedly in the future at the expense of fallow lands and food-crop production:

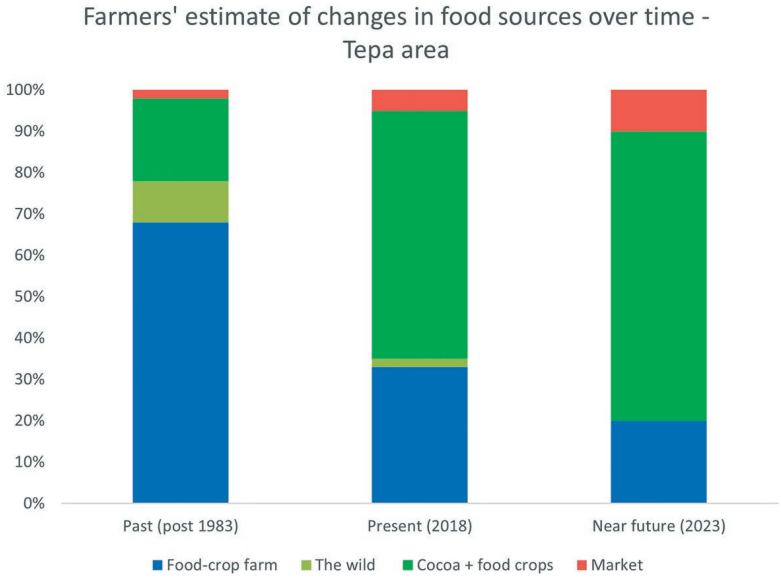
> "A lot of these lands are under cocoa *abunu* now or were converted to oil palm production. On the rest of the land, you might see food-crop farms here and there. This fallow land is not automatically reserved for food crops. If oil palm comes, we will grow it now that those who refused to join the outgrower have seen it to be more lucrative than cocoa" (FGD Dunkwa, July 2018).

Oil palm is expected to expand considerably in the Kade area, where there are guaranteed marketing and outgrower opportunities (see Figure 6.2), and slightly in the Dunkwa area (see Figure 6.3), where farmers are less interested in growing oil palm if they cannot participate in an outgrower scheme. Making an oil palm farm is expensive for farmers, and without initial financial support, it is not attractive. This also became evident in the lack of farmers' interest in the free oil palm seedlings that the Ghana Mineral Commission started offering to reclaim abandoned illegal small-scale mining (*galamsey*) areas in the study area.

The shift from fallow and food-crop land to tree crops has marked consequences for farmers' food production and sources (see Figures 6.4-6). Although tree crops show similar trends of increase in all three study sites, there is a stark difference in current and future food sources. These differences vary across different farmer profiles (see Table 6.14), with reliance on food markets showing an increasing trend with the growing prevalence of oil palm, particularly in the Kade area where multiple tree-crop households dominate:

> "Food is still expensive for us to buy, and we are going to have to buy more in the future than we produce if we don't change. However, a lot of farmers are becoming more interested in buying than planting food crops themselves. Although food is expensive now, it will not be like in Accra. Food crops will become available in the future when old cocoa and oil palm farms are going to be replanted, and food crops will be grown between the seedlings. When you look at the other sides of the district, where there is not too much oil palm, food will also come from there to be sold in our markets here" (FGD Kade, September 2018).

Figure 6.4 Changes in smallholders' food sources, Tepa area



Source: FGD Tepa, August 2018.

The intercropping of cocoa with food crops is a traditional way of farming, and farmers presently are highly dependent on this type of food production. Especially in the cocoa-dominated Tepa area (Figure 6.4) and the Dunkwa area (Figure 6.6), farmers attest that most of their food in the present and future will come from intercropping:

> "We intercropped food crops in the cocoa farm, all types including cassava and vegetables, and it used to last for about eight years. After eight years, you can still find some bananas in your cocoa farm, but also yam (*kokooase bayere*)[82] survives through the life of the farm. You can harvest this yam for many years" (FGD Tepa, August 2018).

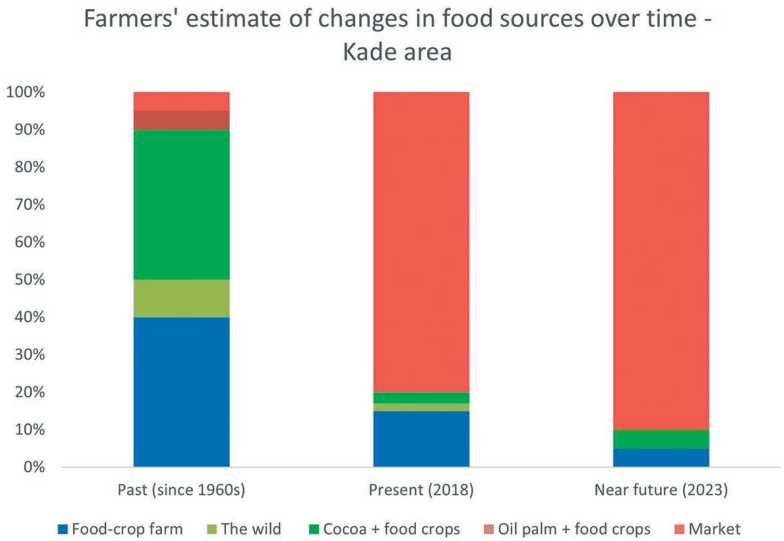
However, farmers made it clear that engaging in oil palm farming affects food-crop production and their diet:

> "Oil palm production affected cassava and other root-crop production because it (…) interferes with the root of oil palm seedlings, so it was not allowed by the project. Other food crops were allowed until there was no space for crops to survive among the palms" (FGD Dunkwa, July 2018).

[82] Dioscorea spp.

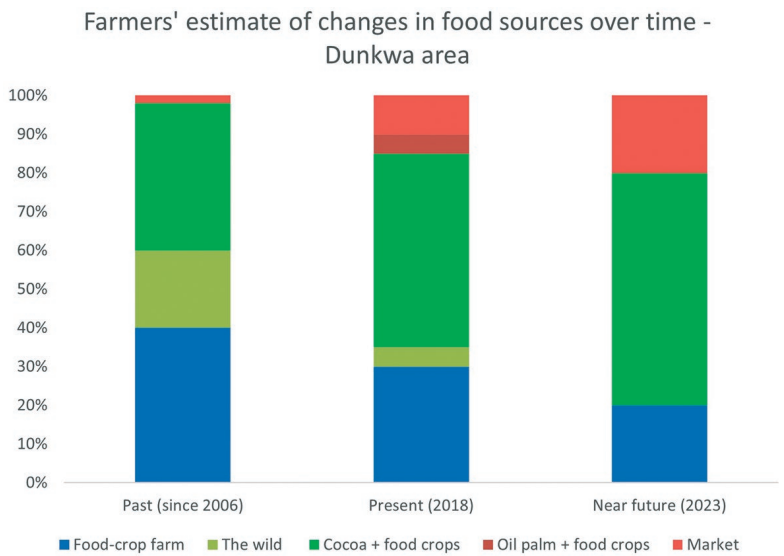
"Cassava is a staple crop and very important to us, and we can say that going into oil palm has affected its production and our diet" (FGD Kade, September 2018).

Figure 6.5 Changes in smallholders' food sources, Kade area



Source: FGD Kade, September 2018.

Figure 6.6 Changes in smallholders' food sources, Dunkwa area



Source: FGD Dunkwa, July 2018.

Table 6.13 Farmers' perceptions of food (in)security across self-identified profiles

Self-identified profile & cluster equivalent / FNS dimension	Caretakers (landless farm HHs)	Emerging tree-crop farmers/ sharecroppers (years 1-2)	Tree-crop farm owners (single tree-crop HHs	Entrepreneurial farmers ('rich farmers') (multiple tree-crop HHs)	Absentee farmers
Availability					
– Food from the wild	x				
– Labour-for-food	x	x	x		
– Food-crop farm	x	x	x	x	x
– Market		x	x	x	x
Access					
– Food from the wild	x	x			
– Labour-for-food	x (~50%)[a]	x	x		
– Food abunu/abusa	x		x		
– Land-for-food abunu/abusa					x
– Food-crop farm			x	x (~20%)	x
– Market[b]	x (~20%)	x (~50%)	x (~20%)	x (~50%)	x (~50%)
Utilization Frequency of meals					
– May not eat three meals a day	x	x			
– Can afford three meals a day			x	x	x
Utilization Dietary diversity					
– May sometimes eat without fish or meat	x	x			
– Eat meat often	x	x			x
– Eat more food from the wild (bushmeat, fish, crabs, mushrooms)	x	x			x
– Limited dietary diversity: focus on maize, local rice, cassava foods, leafy vegetables; fruits only when in season)			x	x	x
– More fruits and vegetables (e.g. including fruits and vegetables from the farm, wild, also from the market)				x	

(table continues on the next page)

Self-identified profile & cluster equivalent / FNS dimension	Caretakers (landless farm HHs)	Emerging tree-crop farmers/ sharecroppers (years 1-2)	Tree-crop farm owners (single tree-crop HHs	Entrepreneurial farmers ('rich farmers') (multiple tree-crop HHs)	Absentee farmers
Preferences					
– May aim for a balanced diet			x		x
– May overlook fruits					
– Eat luxury food often (perfume rice, instant noodles (indomie), meat)				x	x

[a] Percentages are the participants' estimates and have no absolute value.
[b] Mainly for meat, perfume rice, tuna, etc.
Source: Focus groups at Tepa, Kade, and Dunkwa, 2018.

Differences across profiles

Profile-wise (see Table 6.13), farmers mentioned that landless farmers depend mainly on their own food production, labour-for-food arrangements, and harvesting from the wild, and not on food markets. Their limited access to land and limited income capacities force them to find other means of accessing food. The 'entrepreneurial farmers' (commonly the multiple tree-crop households) are able to both produce their own food and buy food on the market due to their higher income capacity. This corresponds with farmers' assertion about markets being the dominant food source in the Kade area, where many tree-crop households exist. While farmers agree that households in this profile can afford whatever they want to eat, they also suggest that this group often relies on processed foods from the market, such as instant noodles and perfume rice, which may not necessarily be more nutritious but are considered high-status foods.

Despite the growing importance of the food market, farmers commonly underestimate the associated food and nutrition security threats as they compare food prices to those in the capital [Accra] and the high incomes from tree crops to those from food crops:

> "When we do food crops only, we do not get enough money to buy food that we don't produce, like fish or meat" (FGD Kade, September 2018).

> "We buy rice and noodles [*indomie*] a lot these days. We have to buy food items we do not produce, such as tin tomatoes, Maggi, salt, milk, drinks, and many others. They are expensive because we do not produce them. We prefer to get more money from cocoa and oil palm and buy the food because [with

> the income from tree crops] we can still afford them. A time will come when we may have to decide not to replant the old oil palm farms with oil palm but with food crops when it becomes too expensive" (FGD Kade, September 2018).

In conclusion, farmers reported significant shifts from fallow lands and food-crop production to tree-crop production, mainly cocoa in the Tepa area and oil palm in the Dunkwa and Kade areas. This transformation significantly impacts food production, shifting food sources from their own land to food markets. Households across all profiles depend on food markets to a certain extent: all households buy salted, fresh or dried fish, salt, sugar, and some buy spices (notably Maggi cubes), but how much they can buy from food markets depends on their income capacity. This growing dependence on food markets signifies emerging food and nutrition security threats, especially for the oil palm-dominated Kade and Dunkwa areas, on top of the widespread seasonal food insecurity experienced from January through July. It is also clear that food utilization among the household profiles with higher income capacity does not necessarily lead to a more diversified diet, confirming the findings on the household dietary diversity scores (see 6.2.3). Households with a higher income capacity spend money on food items that do not increase their household nutrition security.

6.4.2 Autonomy over production, marketing, and consumption

This section analyses household decision-making on production, marketing, and expenditure and the loss of autonomy through engagement in smallholder or outgrower schemes (c.f. Manley & Van Leynseele, 2019).

The household survey and focus groups indicate that farmers in the oil palm areas lose their autonomy over production, marketing, and spending (see Chapter 5). Table 6.14 shows that in the Dunkwa and Kade areas, most household decisions on planting cash and food crops are determined by the VCC in which farmers engage. In contrast, in the Tepa area, such decisions are taken by the head of the household or jointly by the head and spouse. Also, the marketing of produce (in the Kade area) and decisions on household expenditure (in the Dunkwa area) are predominantly conditioned by households' engagement in smallholder or outgrowing schemes.

These findings align with the many risks associated with oil palm outgrower schemes reported by respondents in the individual life history interviews and the focus group discussions (see Chapters 2 and 5). Many respondents indicated that outgrower schemes offer them the opportunity to enter into oil palm production but also pose risks which include the inability to intercrop oil palm with root and tuber crops:

Table 6.14 Decision-making on cash crops, food crops, marketing and expenditure

Study district / Decision-maker	Upper Denkyirah East (Dunkwa area) n = 57		Kwaebibirem Municipal (Kade area) n = 51		Ahafo Ano-North District (Tepa area) n = 60		Total households N = 168		P-value
	n	%	n	%	n	%	N	%	
On cash crops									
– Household head	17	29.8–	21	41.2–	55	91.7+	93	55.4	
– Spouse	3	5.3	2	3.9	0	0.0	5	3.0	
– Head & spouse	5	8.8	3	5.9	3	5.0	11	6.5	0.000*
– Male (not hh)	1	1.8	0	0.0	2	3.3	3	1.8	
– VCC	31	54.4+	25	49.0+	0	0.0	56	33.3	
On food crops									
– Household head	22	38.6–	19	37.3–	47	78.3+	88	52.4	
– Spouse	11	19.3	11	21.6	6	10.0	28	16.7	0.000*
– Head & spouse	2	3.5	1	2.0	1	1.7	4	2.4	
– Male (not hh)	0	0.0	0	0.0	1	1.7	1	0.6	
– VCC	22	38.6+	20	39.2+	5	8.3–	47	28.0	
On marketing									
– Household head	22	38.6–	32	62.7	52	86.7+	106	63.1	
– Spouse	5	8.8	3	5.9	0	0.0–	8	4.8	
– Head & spouse	19	33.3+	1	2.0–	1	1.7–	21	12.5	0.000*
– Male (not hh)	1	1.8	1	2.0	3	5.0	5	3.0	
– VCC	10	17.5	14	27.5+	4	6.7–	28	16.7	
On spending hh income									
– Household head	25	43.9–	37	72.5	51	85+	113	67.3	
– Spouse	1	1.8	0	0.0	0	0.0	1	0.6	0.000*
– Head & spouse	22	38.6+	14	27.5	6	10.0–	42	25.0	
– Male (not hh)	1	1.8	0	0.0	3	5.0	4	2.4	
– VCC	8	14.0+	0	0.0	0	0.0–	8	4.8	

Fisher's exact test. Test significant at $p \leq 0.05$. *: = statistically significant relationship based on a value of the adjusted residue (AR), +: adjusted residue (AR) > 2; –adjusted residue (AR) < –2.

Source: Survey, 2015, 2017.

> "Speculation in the community was that if we do the outgrower project, we would not have firewood, food and other things we got from the farm or landscape anymore because TOPP will take the land from us….. now food is becoming expensive" (Interview with Yaa, Dunkwa, January 2017).

> "When in an outgrower scheme, they may determine what you plant in the farm that is under your contract with them ….for instance, they do not want cassava with oil palm because the cassava roots will interfere with the oil palm roots. When the cassava is ready for harvest, you will surely damage some of the oil palm roots, which will affect its growth" (FGD Dunkwa, July 2018).

There are also restricted market outlets, with the obligation to sell only to the outgrower company, which comes with the inability to fetch higher market prices for palm fruits:

> "We are obliged to sell to TOPP, and farmers who divert are arrested even if other buyers buy at a much higher price. Prices were higher in the community, but TOPP is paying far less to us, so they are making all the profit. Also, they take away your farm with the land when we are unable to maintain the farm. Such a farmer does not receive anything for the farm, and all the money goes to TOPP" (FGD Dunkwa, July 2016).

> "They [GOPDC] also pay us just how much they like. The GOPDC agreement is 25 years, during which you cannot sell to anyone else even if their price is not good, so it is like a monopoly, and that is not good. My oil palm farm is a 26-year-old farm but cannot be felled and replanted because GOPDC has to give permission, and I heard we can do that in the next two years. It is like you are stuck for 25 years" (Interview with Edward, Kade, February 2017).

Deductions made on farmers' harvests result in accumulating debts, as exemplified by these quotes:

> "I sell only to TOPP because they have to deduct the money they spend on the farm. When other people buy at a higher price, what can you do about it? The interest on that loan and the deduction they make mean that I might not get any money when I harvest because TOPP takes 25% of every harvest before inputs and labour costs." (Interview with Kwame, Dunkwa, January 2017)

> "I wish I could sell my palm fruits to another buyer because they pay more than TOPP, but I cannot do that; otherwise, I will be arrested, and TOPP will take over my farm completely. My fear is that we cannot pay all the debt with TOPP before we die, and our children have to continue paying if they inherit the farm" (Interview with Akosua, Dunkwa, January 2017).

Farmers also reported a shift in saving their seeds for planting depending on government and purchases. This shift has affected their local varieties as well as their ability to plant what and when they want:

> "The time when farmers depended solely on their own reserve seeds or collected seeds from colleagues is past (over 30 years now) because of the increasing education by MoFA that our varieties are poor, diseased, and do not yield much. Now we all depend on what MoFA brings; most are also what they call a hybrid, which you have to buy every time you want to plant" (FGD Dunkwa, July 2018).

In summary, smallholders prefer having autonomy over the production, marketing, and consumption decisions that the household head or parents usually take. However, in outgrower schemes, oil palm farmers not only lose their autonomy over decisions on what crops and varieties to grow and to whom to sell for higher prices but sometimes also their land. This loss of land affects the production of staple crops such as cassava and yams. These households depend mainly on their own food production, so smallholders' engagement in outgrower schemes can be detrimental to their households' FNS.

6.4.3 Sustainability of food production[83]

This section focuses on how smallholders produce food and the future of food production. Smallholders showed optimism that some level of own food production would be sustained, mainly through intercropping with tree crops:

> "Our lands, especially those closer to Kade and Kwae, are now finished. Whatever land is to be used in the future are fallow lands, which are very small now. The future of food crops will be through replanting old cocoa and oil palm farms [and interplanting with food crops]" (FGD, Kade, September 2018).

[83] Sustainable tree-crop production is more than the aspects addressed here (see Laven & Boomsma 2012; https://rspo.org/updated-principles-and-criteria-2018-include-the-revised-supply-chain-requirements/).

> "It is like a cycle; every year, people are replanting old cocoa farms under *abunu*, which is why food is always abundant – although you run at a loss if you sell food crops because they are cheap. Here it is not like Accra, where there are no farmers around, and food is expensive. If we do not produce, others will produce, which will be cheap. If we use our land just for food crops, we won't survive, even if we sell all the products" (FGD Dunkwa, July 2018).

Another aspect of sustainability is *how* food is produced. Farmers consider their production unsustainable (focus groups), which they attribute to the widespread use of agrochemicals. In six focus groups, farmers ranked the use of agrochemicals as number one for growing crops, improving soil fertility, and weed, pest, and disease control:

> "Now, because the land is not too fertile [anymore], you need to use a lot of fertilizer to get the cocoa seedlings to grow. Even vegetables need spraying" (FGD Dunkwa, July 2018).

> "Most of us spray weedicides to clear our land and to control the weeds among the crops. This has affected the mushrooms that used to grow here annually. These used to even appear in the farms, but now, we have to comb the fallow areas and forest to harvest. There used to be snails, too, but now they are all gone. It is even affecting cocoyam. It used to regenerate after clearing a fallow land for the farm, but it doesn't come [anymore] because we spray now. Most of us have to buy the corms to plant" (FGD Dunkwa, July 2018).

> "With the excessive and negligent use of agrochemicals, you harvest crops, and if you don't use them all the same day, it gets rotting. The food we produce now is not safe anymore. The soil is dead because of continuous use of weedicides" (FGD Kade, September 2018).

Despite these concerns, farmers find that the use of agrochemicals has come to stay:

> "Applying weedicides requires money, but buying and paying for its application is cheaper than hiring labour to weed the farm. We can't do without it" (FGD Tepa, August 2018).

> "We didn't use fertilizer to cocoa or oil palm, but now, after some years, if you do not apply fertilizer to cocoa, it will yield nothing. How to continue to buy fertilizer is a problem for many of us" (FGD Dunkwa, July 2018).

Regarding tree crops, practical sustainability practices are taught and enforced in advanced VCCs, to which a premium is paid to farmers or used for community development activities under corporate social responsibilities. However, even with these incentives, farmers find these practices too rigid:

> "How can they [TOPP] tell us not to kill snakes, rats, and squirrels that come to eat my oil palm fruits? I fell from a palm tree during harvest because I saw a snake on the tree, but I got nothing for not killing it. Organic fertilizers are also expensive, small bottles for so much, so I buy inorganic fertilizer" (FDG Dunkwa, July 2018).

In conclusion, farmers still believe intercropping food crops can sustain food production with tree crops, but food-crop production alone cannot sustain their livelihoods and food and nutrition security. Sustainable production practices are mainly prioritized in advanced VCCs, from which many are excluded. While agrochemicals have been introduced to improve farming, farmers consider their use a threat to sustainable farming and FNS by affecting the land, wild foods, and food safety.

6.5 Discussion

This chapter combines food and nutrition security and food sovereignty concepts to assess the FNS of tree-crop farming households effectively. Using this approach, I demonstrated that smallholder tree-crop households are both food producers and consumers: they prefer to grow their basic food but also depend on the market for particular food needs. The income from tree crops and households' food production ensure total household FNS, with the quantity and diversity of own production and income capacity playing significant roles (c.f. Ecker et al. 2012; Kowornu et al. 2013). The analysis further revealed that FNS is a multi-dimensional phenomenon (Noack & Pouw 2015; Reincke et al. 2018): not only do production and consumption determine FNS, but culture, autonomy, and sustainability of production and consumption are also crucial. Other critical factors that influence a household's FNS include access to land, farm diversification, the type of tree crop, and the development stage of the tree-crop farm, with the latter determining the potential to interplant food crops. In terms of consumption, affordability and quality are also crucial determinants. Some of these factors have also been identified and recognized by other scholars (e.g., Bymolt et al., 2018; Ickowitz et al. 2019).

A surprising finding was that almost all households meet part of their food needs through their own production. This proportion was larger than expected as information from the focus groups and literature (e.g., Asubonteng et al. 2018) revealed that the area of fallow and food-crop lands has decreased due to the expansion of cocoa and oil palm.

Despite respondents' optimism about the availability of food from intercropping in cocoa farms, the expansion of tree crops may pose a risk to households' food production, particularly in the Kade area (Asubonteng et al. 2018). Tree-crop expansion also threatens a household's FNS by depleting wild food sources.

This chapter showed that the type of farming household, land ownership, type of tree crop, and growth stage of the farm determine the nature of the trade-off between tree crop expansion and food-crop production. For shareholders with no land of their own, single tree-crop households with mature farms where intercropping is no longer feasible, and oil palm farmers in outgrower schemes who are not allowed to interplant food crops, the trade-off between tree-crop expansion and food-crop production may adversely affect FNS (Anderman et al. 2014). Such households may resort to land-for-food production arrangements, with limited autonomy to decide what crops to grow and how crop benefits are shared (see Chapter 5). In critical cases, landless households resort to labour-for-food arrangements, which have limited prospects for the whole FNS, especially during scarcity periods when most farming households have no food to exchange for labour.

Production diversification among tree-crop farming households can positively impact their FNS (Aneani et al. 2011; Bymolt et al. 2018). Many households diversified into animal rearing and food crops using intercropping or separate lands. The latter mainly occurs among cocoa farmers, as also reported in other studies (Aneani et al. 2011, Bymolt et al. 2018). Crop diversification is often a livelihood choice (Mortimore & Adams 2001) and widespread in West African tree-crop farming (Steenhuijsen Piters et al. 2021) and essential for a household's FNS now and in the future (Waha et al. 2018), particularly where households have limited income to satisfy their consumption needs. This implies that oil palm households under an outgrower agreement, who lose autonomy over their crop choice, experience the worst forms of food insecurity and instability, as they cannot produce the staple crops that form the key ingredients in their diet. The Ministry of Food and Agriculture recognizes that inhibiting staple crop production adversely affects oil palm households' FNS (MoFA 2011a).

This chapter also clarified that a household's income capacity is critical for its FNS, enabling it to supplement its production. The higher income capacity of multiple tree-crop households appears to boost and stabilize their household FNS compared to other households. It allows them to access food markets, which is critical in seasonal periods of food insecurity. Despite an all-year-round income, oil palm households in outgrower schemes are disadvantaged in this respect due to growing debts from their involvement in these schemes (see Chapter 5). However, the chapter's findings showed that high incomes do not necessarily lead to a more diversified diet as households spend their income more often on luxury food items that do not increase the nutritional value of their diet. Similar

findings were found by Ickowitz et al. (2019) and Betge et al. (2020). Furthermore, it should be noted that if women play a significant role in generating household income – as is the case among palm-oil processors in the Kade area (Vos 2017) – household FNS may be threatened as these women no longer engage in the production of food crops.

Finally, employing the food sovereignty concept revealed the cultural and social importance of 'traditional' food farming and diets. Food and nutrition security goes beyond having access to food to include food preferences. This chapter revealed differences across generations in this respect. For the older generation, food means *fufu*, so where the production of its main ingredients – cassava, cocoyam, yam, and plantain – is hampered due to the production of tree crops, food and nutrition security in the sense of having access to culturally appropriate food is endangered as nothing can replace it. In contrast, children in tree-crop farming households transition from *fufu* to rice, which they prefer over traditional food. However, given that most tree-farming households do not produce rice, some income is required to meet the dietary preferences of the younger generation, which is facilitated by incomes from tree crops rather than food-crop incomes. This gives weight to households' involvement in tree-crop production to complement their FNS, contrary to food sovereignty paradigms that argue against smallholders' involvement in international value chains (Altieri 2009; Giménez & Altieri 2013). However, farmers lamented the dependence on agrochemicals and hybrid seeds to engage in such production. The potential effects of this dependence on their FNS require further research.

Regarding the limitations of the study, it should be acknowledged, first, that the survey was carried out in different periods of the year; hence seasonal biases may have occurred. Second, the FNS data is based on farmers' experienced FNS, whereby the HFIAS was limited to only four domain questions instead of the nine questions developed by FAO (Coates et al. 2007). Although this was justified and found to be consistent and reliable (see Chapter 2), this must be recognized by anybody wishing to apply the method. Third, the findings regarding the FNS of oil-palm farming households need further research because of the low number of households in the sample that grow oil palm only. Lastly, the food sovereignty concept involves dimensions other than autonomy, culture, and sustainability addressed in this chapter. A full analysis of food sovereignty should go beyond this selective application of the food sovereignty concept and additionally require attention to food quality, affordability, and recognition and respect of cultural diversity and local knowledge.

6.6 Conclusion

This chapter analysed how FNS differs among tree-crop farming household profiles and between cocoa and oil palm farming households, farmers' perceptions of changes in food production and FNS, and the importance of autonomy and sustainability dimensions of food sovereignty in achieving FNS. It revealed that food availability and utilization did not differ across household profiles. However, the higher income capacity of multiple tree-crop farming households increases their access to food and stabilizes their FNS during seasonal periods of food and nutrition insecurity. Oil palm farming households involved in outgrower schemes seem to be worse off regarding FNS due to restrictions on growing staple crops and their existing debts. The chapter further showed the importance of diversification in tree-crop farms and the importance of tree-crop incomes and access to land for FNS, particularly to cope with trade-offs between tree-crop expansion and food production due to decreasing availability of food-crop and fallow land. Finally, the chapter showed that addressing cultural aspects, autonomy, and sustainability is important for a holistic analysis of tree-crop farming households' FNS. This confirms the multi-dimensional nature of the FNS concept, which can be addressed more effectively by integrating aspects of the food sovereignty concept. Such an integrated analysis contributes to discussions and strategies that could help avoid and overcome trade-offs between expanding market-oriented production and food production, sustainable agricultural production, and farmers' autonomy.