Photo credit: Nestlé, Cocoa farmer and his family, Côte d'Ivoire

12 Household income, poverty and wealth

Bymolt, R., Laven, A., Tyszler, M. (2018). Demystifying the cocoa sector in Ghana and Côte d'Ivoire. Chapter 12, Household income, poverty and wealth. The Royal Tropical Institute (KIT).

Despite decades of investment in West Africa, cocoa is still often referred to as a 'poor man's crop'.[1] Many stakeholders believe the poverty situation of cocoa households is untenable and must improve. Furthermore, some perceive poverty itself to be a threat to the future of the cocoa industry. If households are unable to earn sufficient income, they will not be able to make the necessary investments to maintain and improve their cocoa farms. Households will then be trapped in a low input-low output cycle and unable to contribute enough to the expected future demand for cocoa. In some cases, if farmers are unable to sufficiently support their families, they may leave cocoa for other crop options, further risking future supply.

Previous research[2,3,4] has identified a variety of issues pertaining to the poverty status of cocoa households, both on the supply and demand side. Additionally, it has been observed that the enabling environment (including institutions and physical infrastructure) is sub-optimal for supporting the cocoa value chain (Table 12.1).

Table 12.1 Summary of potential issues affecting the poverty status of cocoa households

Supply side	Demand side	Enabling environment
Land tenure is not sufficiently secure	Low prices, fluctuating prices	Insufficient physical infrastructure (roads, hospitals, schools, transport costs)
Position of farmers without land	Limited access to market information	Lack of access to credit
Small size of farms	Lack of collective bargaining	Gender inequality
Aging cocoa trees, many beyond their most fertile age	Speculation on the futures markets	Lack of healthcare
Low yields (productivity per unit of land)		Lack of farmer associations and collective bargaining, and farmer organisation
Low use and investment in inputs such as fertilisers and pesticides		Food security and nutrition risks
Low knowledge and training		Unsafe working conditions with spray pesticides and fertilisers
Low quality cocoa beans		Corruption
Human rights, child labour		Environmental impact of fertilisers and pesticides
Monoculture		Rising costs of living/inflation
Deforestation, decreasing biodiversity		Lack of transparency and accountability
Cocoa tree diseases such as stem borer, cocoa swollen shoots virus (CSSV)		Unstable political environment

As researchers, we agree that, in the context of West Africa, the issues presented in Table 12.1 are often present, and that the cocoa sector is not performing optimally at many levels. However, identifying the underlying causes of sub-optimal performance is simpler than assessing the prevalence or magnitude of each issue, let alone formulating and implementing solutions at scale.

[1] v.d. Kooij, S. (2015). De McDonaldisatie van de cacaosector. Vice Versa. Available at http://hetnieuwe.viceversaonline.nl/blog/de-mcdonaldisatie-van-de-cacaosector/

[2] Fountain, A.C. and Hütz-Adams, F. (2015). Cocoa Barometer 2015-USA Edition. Available at http://www.cocoabarometer.org/International_files/Cocoa%20Barometer%202015%20USA.pdf

[3] Fountain, A.C. and Hütz-Adams (2018) Cacao Barometer 2018. Available at http://www.cocoabarometer.org/Cocoa_Barometer/Download_files/2018%20Cocoa%20Barometer.pdf

[4] Balineau, B., Bernath, S., Pahuatini, V. (2016). Cocoa farmers' agricultural practices and livelihoods in Côte d'Ivoire. Insights from cocoa farmers and community baseline surveys conducted by Barry Callebaut between 2013 and 2015. AFD and Barry Callebaut. Available at https://www.afd.fr/fr/cocoa-farmers-agricultural-practices-and-livelihoods-cote-divoire

As noted in a recent Agence française de développement (AFD) and Barry Callebaut report,[5] good data and statistics on farmers' well-being, yields, access to finance, diseases and agricultural practices are scarce, which is a serious constraint to the efficient design and implementation of programmes and policy. The lack of quality data and data availability has made it difficult for researchers to reliably estimate income, wealth and poverty levels in cocoa growing regions. What adds to the challenge is that there are different approaches to measuring poverty, and each approach has its drawbacks.

Despite these difficulties, there have been a number of attempts to estimate cocoa farmer incomes. For example, in 2015, the Cocoa Barometer estimated, based on a variety of secondary data for its calculations, that cocoa farmers were earning USD 0.84 per person per day in Ghana and USD 0.50 per person per day in Côte d'Ivoire.[6] In their calculations, the authors estimated 78% of household income in Ghana comes from cocoa and 90% in Côte d'Ivoire. To calculate the income per household member, they used the figure of 10 members per household in Côte d'Ivoire. The researchers divided a calculation of household income by the total number of people in the household to arrive at a 'per person, per day' income. The Barometer did not include the 'in-kind' value of household's agricultural production (typically production consumed by the household).

In AFD and Barry Callebaut report, the researchers involved provide a 'rough estimate' of a per capita daily cocoa income of USD 1.17 for farmers in Côte d'Ivoire.[7] The key survey question to respondents was "How much did you earn from cash crops last year/last month/over the last seven days?". The study reported that "all in all, 25% of households have another source of cash income than cocoa, mainly from sales of food crop surpluses." The study appears to have insufficiently accounted for income received by all household members from all crops and other non-farm income sources.

Before we present data from our study on the household income, poverty and wealth of cocoa farmers we first elaborate on the different approaches to measuring poverty (income, expenditure and wealth), including some methodological pitfalls, followed by an explanation of how this was measured in this study. In separate boxes, we make reference to what poverty lines are, how they are calculated, and their relevance for this analysis.

[5] Balineau, B., Bernath, S., Pahuatini, V. (2016). Cocoa farmers' agricultural practices and livelihoods in Côte d'Ivoire. Insights from cocoa farmers and community baseline surveys conducted by Barry Callebaut between 2013 and 2015. AFD and Barry Callebaut. Available at https://www.afd.fr/fr/cocoa-farmers-agricultural-practices-and-livelihoods-cote-divoire

[6] Fountain, A.C. and Hütz-Adams, F. (2015). Cocoa Barometer 2015-USA Edition. Available at http://www.cocoabarometer.org/International_files/Cocoa%20Barometer%202015%20USA.pdf.

[7] Balineau, B., Bernath, S., Pahuatini, V. (2016). Cocoa farmers' agricultural practices and livelihoods in Côte d'Ivoire. Insights from cocoa farmers and community baseline surveys conducted by Barry Callebaut between 2013 and 2015. AFD and Barry Callebaut. Available at https://www.afd.fr/fr/cocoa-farmers-agricultural-practices-and-livelihoods-cote-divoire

12.1 Approaches to measuring poverty – income, expenditure or wealth?

12.1.1 Expenditure

Most rich countries measure poverty using income because it is comparatively easy to measure, with much of it coming from wages and salaries. However, most poorer countries use expenditure to measure poverty because measuring income at a national scale is hard to measure (much of it comes from self-employment). Expenditure is also the basis from which national (and hence international) poverty lines are calculated; specialised surveys with a detailed focus on expenditure are important in this regard.[8]

However, when embedded in household surveys with a broader focus, we have previously found that collecting expenditure data is at least as difficult as collecting income data for the following reasons:

- Expenditure lists are long and take considerable time for respondents to answer;
- Recall periods are typically short (often the past week or month) and therefore misleading when expenditure amounts may vary greatly throughout the year;
- Respondents have difficulty recalling the value of many items; and,
- Expenditure data typically fails to account for value derived from one's own production (in-kind).

For these reasons, we followed most other cocoa researchers and chose not to collect detailed expenditure data in our household survey, as much as we would have liked to.

12.1.2 Income

For large agricultural or self-employed populations, income tends to be seriously understated for several reasons:[9]

- People forget, particularly when asked in a single interview, about items they may have sold, or money they may have received, up to a year before;
- People may genuinely not know how much income they have earned throughout the year due to poor record keeping;

[8] Examples include the Living Standard Measurement Survey (LSMS) supported by the World Bank, Household Budget Surveys (HBS), Income and Expenditure Surveys (IES) and Socio-economic Surveys (SES).

[9] Many of these reasons are included in the following: World Bank. (2009). Handbook on Poverty and Inequality - ISBN: 9780821376133. Chapter 2, p.23. Available at http://documents.worldbank.org/curated/en/488081468157174849/Handbook-on-poverty-and-inequality

- Different household members may earn income from different sources and the respondent may not be sufficiently informed of income derived from these other sources and by each other person in the household;
- People may be reluctant to disclose the full extent of their income lest the tax collector or a neighbour learns the details;
- People may be reluctant to report income earned illegally, for instance, from smuggling, corruption, or prostitution;
- Some income is typically not calculated, such as the extent to which livestock has risen in value or the in-kind value of food produced and consumed by the household.

Much of the previous cocoa research that has tried to analyse poverty has taken an income approach. However, we note that respondents should not be asked, "How much income did you earn from X source", as this is too inaccurate and vulnerable to bias. Rather, the respondents need to be asked a series of questions to ascertain the income derived from each source. For cocoa, this would require a calculation based on all relevant labour costs, inputs costs, production volume for both seasons, and the farm-gate price. Since it is practically impossible to accurately calculate household income received from every sources, and from every household member, the estimation of cocoa income needs to be accompanied by an estimate of the share of household income derived from cocoa in relation to all other sources.

12.1.3 Wealth and assets

Calculating wealth through the value of durable goods can also be very difficult. For example, if a respondent owns their own house or apartment, a satisfactory way to gauge the value is to ask how much you would have to pay if they had to rent it. In practice, the valuing of household assets is seldom done because it can take a long time and responses can be rather inaccurate. However, since the possession of assets is an indicator of wealth, an asset-based approach to measuring household socioeconomic position is an alternative to income and consumption expenditure.

Demographic and Health Surveys (DHS) wealth index

This approach is based on the Demographic and Health Surveys (DHS),[10] which collect information on ownership of a range of durable assets (e.g. car, refrigerator, television), housing characteristics (e.g. material of dwelling floor and roof, toilet facilities), and access to basic services (e.g. electricity supply, source of drinking water). These items were all originally included in surveys within the scope of their influence on health but researchers decided to use the assets to develop living standards indicators and have sought to construct wealth indices for that purpose.

[10] The Demographic and Health Surveys (DHS) Program has become one of the principal sources of international data on fertility, family planning, maternal and child health, nutrition, mortality, and HIV/AIDS. The relationship between these indicators and economic status is of utmost importance to researchers and policymakers worldwide. See https://dhsprogram.com/

The Filmer-Pritchett principal component methodology[11] was used to determine the relative weights of items used in the index.

The main advantage of the DHS approach to measuring wealth is that it can be more reliable than income or consumption expenditure, since it uses simple questions or direct observation by the interviewer and should therefore suffer from less respondent recall or social desirability bias. However, some studies have challenged this claim.[12]

Assets are also more stable than income across time and change more slowly. Depending on the application or goal of the analysis, this can be an advantage or a disadvantage.

The main disadvantage is that the DHS Wealth Index is constructed as a relative index within each country. Each wealth index has a mean value of zero and a standard deviation of one. Thus, specific scores cannot be directly compared across countries or over time. In this research, this means that we cannot compare Ghana and Côte d'Ivoire. Nevertheless, to measure relative wealth within each country from data collected in our survey, we have used the DHS Wealth Index.

Poverty Probability Index (PPI)

The Poverty Probability Index[13] (formally the Progress out of Poverty Index) is another index that builds on the logic of indices such as the DHS. The PPI's main advantage is its simplicity as survey questions are reduced to a set of 10 easy-to-answer multiple choice questions such as "What material is your roof made out of?", "How many of your children are in school?". This simplicity saves time and money in poverty data collection. The PPI also claims similar targeting accuracy to that of alternative approaches.[14]

Each answer is given a value, and the total value of all answers is the survey respondent's PPI score. The researcher then uses a PPI look-up table to convert the PPI score to a likelihood that the respondent's household is living below a poverty line. The look-up table allows the researcher to determine the household's likelihood of living below multiple national and international poverty lines.

The disadvantages of the PPI are that it is a likelihood model and is, therefore, a less precise estimation than the DHS Wealth Index. Another problem is that, for some

[11] Filmer, D. and Pritchett, L. (2001). Estimating Wealth Effects Without Expenditure Data—Or Tears: An Application To Educational Enrolments In States Of India. Demography, Volume 38-Number 1, Available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.581.7223&rep=rep1&type=pdf

[12] Howe, L., Hargreaves, J., Huttly. S. (2008). Issues in the construction of wealth indices for the measurement of socioeconomic position in low income countries. Emerg Themes Epidemiol. 2008; 5:3. Available at https://doi.org/10.1186/1742-7622-5-3

[13] Poverty Probability Index. (2017). About the PPI: A Poverty Measurement Tool. Available at https://www.povertyindex.org/about-ppi

[14] Poverty Probability Index. (2012). Ghana 2012 Poverty Probability Index (PPI): Design Memo. Available at https://www.povertyindex.org/node/5668/download

countries, the scorecards (and data on which they are based) are in need of updating.[15] Finally, older households tend to obtain higher scores. We have used the PPI Index to measure poverty likelihood from our survey data.

12.2 How income, poverty and wealth was measured in this study

We have attempted to take multiple approaches to measuring income, poverty and wealth in this study. We are aware of how sensitive these issues are and, therefore, we feel that triangulating our findings from different approaches is important for the robustness of conclusions. We were also aware of the limitations of each individual approach.

To mitigate potential data collection errors, the household surveys were programmed in XLSForm and deployed on digital tablets running Open Data Kit. This allowed us to generate live error and warning messages on screen when enumerators entered unexpected values. Certain detailed survey questions were prefaced with 'do you know' questions. Skip logic programming then allowed us to skip asking certain detailed questions to insufficiently informed respondents, thereby enhancing data quality (See Chapter 2, Methodology).

With regards to the calculation of income data, respondents were asked to identify all income sources from each individual household member of working age, grouped in general categories.[16] On the next screen, the programmed survey presented respondents with only those income sources identified as being present among household members. The respondent was then asked to estimate the proportion of income derived from each source. In practice, this meant respondents typically had to estimate the proportion of income derived from only a few income sources.[17]

There are a few limitations here: first, respondents typically gave estimates to the nearest five or ten percent. Second, it is difficult to judge whether or not the respondent is able to make a highly accurate judgement of the share of household income derived from different sources, and if they were able to differentiate between gross and net income and combination thereof. Third, respondents were considering cash income and therefore in-kind income or value of own production was not

[15] While the Ghana PPI was created in 2015 using data from the 2012/2013 Living Standards Survey, the Côte d'Ivoire scorecard was published in 2013 using data from 2008.

[16] These were: sale of cocoa; sale of other crops; own small business or trading; remittances from friends and family living away from the household; sale of livestock or livestock products; salary employment in government job; salary employment with a company; labouring for other people on their farms; sale of fish; labouring for other people non-agriculture; sale of bush products; (bush meat, charcoal, wood etc.); sale or lease of land; other.

[17] For example, they might estimate cocoa 60%, other crops 30%, small business 10%

accounted for. Fourth, we know it matters how questions are asked. In hindsight, we wish we had used a set of closed yes/no questions to identify the presence or absence of different sources of income among household members.[18] We are particularly concerned that we have not sufficiently captured income from remittances, which was reported at quite low rates.[19] These limitations mean that the reported share of household income derived from different sources should be seen more as a useful indication than a firm figure. It is likely, in our view, that we have an over-estimation of the share of household income derived from cocoa (most frequently identified as the largest household income source). If so, it follows that we will have an under-estimation of other non-cocoa household income, resulting in an under-estimation of total household income.

To calculate actual household income, we collected detailed information for each household's two most important crops. In most cases, cocoa was one of the two most important crops in both countries. Detailed questions were asked about production volumes for each season, input use and costs, labour use and costs, and prices. From this data, crop models were developed, which give us a good picture of cocoa revenues and profitability. Since the sale of cocoa is the major income source for most cocoa households, we base our estimation of total household annual income on cocoa income.

More specifically, our technical approach to compute total household annual income was as follows:

- We considered only the households which reported knowing their own production figures. (91% of cocoa producing households in Ghana and 56% in Côte d'Ivoire).
- We calculated the total cocoa production (kg/year) per household.
- We calculated the total value of production (Local Currency Unit (LCU)/year) per household by applying a fixed price of 6.64 GHS/kg and 1,000 CFA/kg.
- We calculated the annual input cash expenses (LCU/year) per household for granular fertiliser, liquid fertiliser, herbicides, pesticides and fungicides.
  - For households who reported not doing the activity related to the inputs above, an expense of 0 LCU/year was assumed.
  - For households who reported doing the activity related to the inputs above, but for whom the value was missing, the median expenses per ha per household of the male- or female-headed households in each country was used to estimate the annual input cash expenses.

[18] The actual question for each household adult was "Last year, did this household member also receive any income from anywhere?" which was followed by a list that the enumerator could tick.

[19] Remittances was near the bottom on the list of income sources, so we are concerned that it was not sufficiently probed by enumerators. This is an issue because, in previous studies, we have noted that respondents often do not consider remittances to be income as such. We note a recent CGAP study in Côte d'Ivoire, which reports that remittances are the second largest source of household income, whereas, in our study, remittances were reported at very low rates. CGAP. (2016). Côte d'Ivoire - CGAP Smallholder Household Survey 2016, Building the Evidence Base on the Agricultural and Financial Lives of Smallholder Households. Report available at http://www.cgap.org/sites/default/files/Working-Paper-Survey-and-Segmentation-Smallholders-Coted%27Ivoire-Jul-2017.pdf

- We calculated the annual hired labour expenses (LCU/year) per household for land clearing, land preparation, planting, granular fertiliser application, liquid fertiliser application, manure/compost application, herbicide application, fungicide application, weeding, pruning, harvesting, pod breaking and transporting.
  - For households who reported not doing an activity above, or only doing with household or communal labour, a hired labour expense of 0 LCU/year was assumed.
  - For households who reported doing a cocoa production activity, but for whom the hired labour expenditure was missing (i.e. unknown), the median expenses per ha per household male- or female-headed households in each country was used to estimate the annual hired labour expenses.
- Net income from cocoa per household was calculated as the value of annual production, minus annual expenses in inputs, minus annual expenses in hired labour.
- Total household income was extrapolated using the estimated contribution of cocoa sales to the total household income.
- Conversions to USD were made using the exchange rate of USD 0.26116 per GHS and USD 0.00166 per CFA, as in January 2016.
- Conversions to 2016 International dollars[20] (2016 PPP) were made using the exchange rate of $ 0.71225 PPP (2016) per GHS and $ 0.00425 PPP (2016) per CFA.

The calculation of total household income aims at estimating total net cash income earned by the household. This therefore excludes the in-kind value of household production (agriculture and livestock) consumed at home. First of all, we did not collect enough data on livestock edible production. Secondly, we were not able to produce reliable crop models for crops other than cocoa, because our sample size was too small, or because respondents frequently had difficulty estimating yields for produce not sold in bags or kg units (e.g. cassava, plantain, yam, rubber, palm). One alternative option would be to assign a proxy value to other crops planted on the household's cultivated land, assuming that it yields some intrinsic value, but less so than cocoa (e.g. 50% of the value). The other option we considered was using rough calculations for maize as a proxy value for other crops (as maize is typically one of the lowest value crops produced by the household). We are reluctant to include calculations that we are not confident about and so have chosen not to incorporate in-kind values in our income calculations.

[20] International dollar is a currency conversion rate that is adjusted to reflect the purchasing power parity (PPP) and average relative commodity prices within each country. The PPP conversion factors were obtained from https://data.worldbank.org/indicator/PA.NUS.PRVT.PP?locations=GH-CI

Box 12.1 Purchasing power parity (PPP)

Due to large differences in price levels across economies, market exchange rate-converted GDP does not accurately measure the relative size of economies and the levels of material well-being. PPPs make it possible to compare the output of economies and the welfare of their inhabitants in 'real' terms, thus controlling for price level differences across countries. PPPs measure the total amount of goods and services that a single unit of a country's currency can buy in another country. The PPP between countries A and B measures the amount of country A's currency required to purchase a basket of goods and services in country A compared to the amount of country B's currency to purchase a similar basket of goods and services in country B. PPPs can thus be used to convert the cost of a basket of goods and service into a common currency while eliminating price level differences across countries. In other words, PPPs equalise the purchasing power of currencies. A PPP could also be thought of as an alternative currency exchange rate, but based on actual prices.[21]

The PPP exchange rate will typically be different to market exchange rates. For example, in relation to our study, while the market exchange rate is USD 0.26116 per GHS, the International dollar exchange rate is $ 0.71225 PPP (2016) per GHS. This means that while 1 GHS can only be exchanged to USD 0.26, it has a relative purchasing power of USD 0.71, which is almost 3 times stronger.

Further, by applying an equivalence scale to household members, we are then able to calculate a 'per person, per day' income.

To analyse poverty and wealth from other angles, we also included the DHS Wealth Index questions in our survey and calculated DHS Wealth Index scores. We also included PPI questions to estimate the likelihood that households fall under different national and World Bank poverty lines.

Box 12.2

Poverty lines

National poverty lines typically reflect the line below which a person's minimum nutritional, clothing, and shelter needs cannot be met in that country. National poverty lines are typically lower in poorer countries and higher in richer countries. The World Bank advises that, if you are interested in a particular country, you should use national poverty lines which are defined according to each country's specific economic and social circumstances. However, if you are

[21] World Bank (n.d.). Fundamentals of Purchasing Power Parities. The International Comparison Program (ICP). Available at http://pubdocs.worldbank.org/en/332341517441011666/PPP-brochure-2017-webformat-rev.pdf

interested in comparing poverty measures across countries, you could use international poverty lines. The World Bank international poverty lines attempt to hold the real value of the poverty lines consistent across countries and over time by accounting for differences in purchasing power across countries.

How are international poverty lines calculated?

The World Bank poverty lines aim to be a poverty line 'yardstick'. In 1990, a group of independent researchers and the World Bank examined national poverty lines from some of the poorest countries in the world, and converted the lines to a common currency by using purchasing power parity (PPP) exchange rates. The PPP exchange rates are constructed to ensure that the same quantity of goods and services are priced equivalently across countries. Once converted into a common currency, they found that, in six of these very poor countries, the value of the national poverty line was about $1 per day per person, and this formed the basis for the first dollar-a-day international poverty line. After a new round and larger volume of internationally comparable prices were collected in 2005, the international poverty line was revised based on 15 national poverty lines from some of the poorest countries in the World. The average of these 15 lines was $1.25 per person per day (again in PPP terms), and this became the revised international poverty line. In 2015, the World Bank again used the poverty lines of those same 15 poorest countries from 2005 to determine the new global poverty line of $1.90 in 2011 PPP.[22]

A common pitfall in poverty calculations is to not correct the value of money over time or use only market exchange rates. A comparison of more recent data to a poverty line requires either the updating of the PPP poverty threshold or the correction of the recent data to 2011 PPP. Using the United States Consumer Price Index,[23] the value of $1.90 in 2011 is equivalent to $2.03 in 2016. Any comparison to an international poverty line is more accurate if the local currency is converted using PPP exchange rates instead of market exchange rates.

Equivalence scales

It is important to note that some of the national poverty lines and, therefore indirectly, the World Bank poverty lines use the concept of a 'male adult equivalent'. This means that $1.90 PPP (2011) per person per day actually means $1.90 PPP (2011) per male adult equivalent per day. When one is interested in per capita income (or consumption/expenditure), equivalence scales are needed to adjust household income (or expenditure) for the composition of the household. An equivalence scale typically measures the number of adult males to which that household is deemed to be equivalent. Each household member counts as some fraction of an adult male. Effectively, household size is the sum of these fractions and is not measured in numbers of persons but in numbers of adult equivalents. There are two main assumptions underlying equivalence scales.

[22] World Bank. (2018). How is the global poverty line derived? How is it different from national poverty lines? Available at https://datahelpdesk.worldbank.org/knowledgebase/articles/193310-how-is-the-global-poverty-line-derived-how-is-it

[23] https://data.worldbank.org/indicator/FP.CPI.TOTL?locations=US

First, children tend to consume less than adults. Therefore, lower weights are assigned for children residing in a household. Second, larger households can benefit from economies of scale.

Another common pitfall is to divide a calculation of household income by the total number of people in the household, rather than by their 'adult equivalent'. This inaccurately gives a higher proportion of households below the poverty lines.

Unfortunately, there is no universal consensus on the right equivalence scale to use. Often the equivalence scales are based on the different calorie needs of individuals of different ages. OECD equivalence scales are among the most well-known.[24]

OECD equivalence scale (old): This assigns a value of 1 to the first household member, 0.7 to each additional adult and 0.5 to each child. This scale (also called the "Oxford scale") was mentioned by OECD (1982) for possible use in "countries which have not established their own equivalence scale". For this reason, this scale is sometimes labelled "(old) OECD scale".

OECD-modified scale: The Statistical Office of the European Union (EUROSTAT) adopted in the late 1990s the so-called "OECD-modified equivalence scale". This scale, first proposed by Hagenaars et al. (1994)[25], assigns a value of 1 to the household head, 0.5 to each additional adult member and 0.3 to each child.

Square root scale: Recent OECD publications comparing income inequality and poverty across countries use a scale which divides household income by the square root of household size. This implies that, for instance, a household of four persons has needs twice as large as one composed of a single person.

Table 12.2 OECD equivalence scales

Household size	Per capita income	OECD scale (old)	OECD modified scale	Square root scale	Household income
1 adult	1	1	1	1	1
2 adults	2	1.7	1.5	1.4	1
2 adults, 1 child	3	2.2	1.8	1.7	1
2 adults, 2 children	4	2.7	2.1	2	1
2 adults, 3 children	5	3.2	2.4	2.2	1
Elasticity[1]	1	0.73	0.53	0.5	0

[1] Using household size as the determinant, equivalence scales can be expressed through an 'equivalence elasticity', i.e. the power by which economic needs change with household size. The equivalence elasticity can range from 0 (when unadjusted household disposable income is taken as the income measure) to 1 (when per capita household income is used). The smaller the value for this elasticity, the higher the economies of scale in consumption.

[24] OECD. (2009). What are equivalence scales? OECD Project on Income Distribution and Poverty. Available at http://www.oecd.org/eco/growth/OECD-Note-EquivalenceScales.pdf

[25] Hagenaars, A., Vos, K. de, M.A. Zaidi (1994), Poverty Statistics in the Late 1980s: Research Based on Micro-data, Office for Official Publications of the European Communities. Luxembourg.

12.3 Results of poverty and wealth analysis

12.3.1 Household income

In our household survey, respondents were asked to identify all household income sources from all household members. Nearly all households have multiple income sources, and multiple household members typically engage in income generating activities to support the household (Table 12.3). We have split 'sale of cocoa' and 'sale of other crops' into distinct categories to contrast the two. Income from cocoa and other crops are the most frequently cited sources of household income. It should be recalled from Chapter 5 on Crop choices and diversification that, on average, households sell on average 3.33 different crops per year in Ghana and 2.81 different crops in Côte d'Ivoire.

Around half of all respondents in Ghana reported that someone in the household earns income from a small business or trading. In Côte d'Ivoire, a lower proportion of respondent households reported additional income from a small business or trading, but the relatively high percent of 'other' income suggests to us that this may also be income from trading activities. The main takeaway from Table 12.3 is that multiple income sources from multiple members needs to be accounted for when considering household income.

Table 12.3 Income sources from all household members, by cocoa and non-cocoa households

Income source	Ghana cocoa	Ghana non-cocoa	pvalue	sig	Côte d'Ivoire cocoa	Côte d'Ivoire non-cocoa	pvalue	sig
Sale of cocoa	99%	31%	0.00	***	98%	16%	0.00	***
Sale of other crops	83%	90%	0.00	***	77%	93%	0.00	***
Own small business or trading	50%	56%	0.06	*	21%	28%	0.00	***
Sale of livestock or livestock products	21%	13%	0.01	***	2%	2%	0.58	
Remittances	16%	14%	0.53		4%	8%	0.00	***
Salary employment in government job	9%	11%	0.36		2%	1%	0.21	
Salary employment with a company	5%	3%	0.22		1%	3%	0.07	*
Other	4%	8%	0.01	***	16%	19%	0.14	
Sale of fish	2%	3%	0.23		3%	3%	0.91	
Labouring for other people on their farms	2%	11%	0.00	***	2%	2%	0.26	
Labouring for other people non-agriculture	1%	2%	0.5		2%	3%	0.66	
Sale of bush products (bush meat, charcoal, wood etc.)	0%	0%	0.94		2%	2%	0.89	
Sale or lease of land	0%	0%			1%	1%	0.43	
N	1,318	242			910	575		

Table 12.4 shows the mean proportion of income that households derive from cocoa sales and other categories. In Ghana, cocoa households[26] derive, on average, 61% of their income from cocoa, with a further 20% coming from the sale of other crops. Non-cocoa households in Ghana reported a fractionally higher proportion of other non-farm income sources than cocoa households. In Côte d'Ivoire, the data shows a similar pattern. Cocoa households report obtaining 66% of their income from cocoa and a further 24% from the sale of other crops. As in Ghana, non-cocoa households reported obtaining a slightly higher share of income from various other sources, including 'small business', than cocoa households.

Table 12.4 Percent of household income from difference sources (average), by cocoa vs non-cocoa households

	Ghana cocoa	Ghana non-cocoa	Côte d'Ivoire cocoa	Côte d'Ivoire non-cocoa
Sale of cocoa	61%	10%	66%	5%
Sale of other crops	20%	56%	24%	69%
Own small business or trading	10%	16%	4%	10%
Remittances from friends and family living away from the household	2%	3%	1%	3%
Sale of livestock or livestock products	2%	3%	0%	0%
Salary employment in government job (teacher, nurse, police)	2%	4%	1%	1%
Other	1%	3%	4%	8%
Salary employment with a company	1%	1%	0%	1%
Labouring for other people on their farms	0%	1%	0%	1%
Sale of fish	0%	3%	0%	0%
Labouring for other people non-agriculture	0%	1%	0%	1%
Sale of bush products (bush meat, charcoal, wood etc.)	0%	0%	0%	0%
Sale or lease of land	0%	0%	0%	0%

Using our method described earlier, we find that, on average, a cocoa household in Ghana generates cocoa revenues of USD 1,885 per year. After accounting for input and hired labour costs, an average cocoa household earns a net income of USD 1,510 from cocoa alone. In Côte d'Ivoire, an average cocoa household income generates cocoa revenues of USD 2,029 and net cocoa income of USD 1,908 (Table 12.5).

[26] As discussed in the Chpater 2 (Methodology), 'cocoa households' are those who reported cocoa to be either their most important or second most important crop. Some 'non-cocoa households' may still produce a small amount of cocoa, even though it is not their most important or second most important crop. This distinction allows us to think of 'cocoa households' as typical cocoa producing households.

Table 12.5 Average household income from cocoa only, by country (USD, 2016)

	Ghana	Côte d'Ivoire
Yield (kg/ha) [Total production / Productive farm]	398 kg	349 kg
Productive farm (ha)	2.7 ha	3.5 ha
Total production (kg/farm)	1,087 kg	1,222 kg
Producer price (USD/kg)	$1.73	$1.66
Value of production (USD/farm)	$1,885	$2,029
Input costs (USD/ha)	$41	$23
Hired labour costs (USD/ha)	$97	$12
Total costs (USD/farm)	$376	$121
Net cocoa income (USD/farm)	$1,510	$1,908

Note: The above table has been calculated with data from cocoa households only

We then calculate cocoa households' average income based on the income percentage they estimated was derived from cocoa. In Ghana, we find that an average cocoa household earns USD 2,487 per annum from all income sources, which is the equivalent to $ 6,784 PPP (2016). In Côte d'Ivoire, we calculate an average household income of USD 2,900, which is the equivalent to $ 7,429 PPP (2016). (Table 12.6).

Table 12.6 Average household income from all sources

	Ghana	Côte d'Ivoire
Percentage of household income from cocoa	61%	66%
Total income (2016 USD/household)	$2,487	$2,900
Total income (2016 PPP/household)	$6,784	$7,429

Note: The above table has been calculated with data from cocoa households only

Our next step is to calculate average household size equivalencies (Table 12.7). We have used all of the OECD equivalence scales to show how the choice of scale affects the effective 'number of persons' in the household by which we will divide to get a per person daily income. Currently, the OECD uses the square root scale.

Table 12.7 Average household size equivalencies (number of persons)

	Ghana	Côte d'Ivoire
Mean household size in our sample	5.9	7.0
OECD (old) equivalence scale	3.9	4.6
OECD modified scale	3.0	3.4
Square root scale (currently used by OECD)	2.4	2.6

Finally, we divide total household income by each of the OECD equivalence scale coefficients, and then by 365 days. This gives us a daily per person income estimate, either in 2016 USD (Table 12.8) or 2016 PPP (Table 12.9). Using market exchange

rates, when no equivalence scale is applied, we estimate a per person per day income of USD 1.16 in Ghana, compared with USD 1.14 in Côte d'Ivoire. Calculations using the square root equivalence scale, provide an estimate of USD 2.89 per person per day in Ghana and USD 3.11 per person per day in Côte d'Ivoire. This does not include in-kind income (i.e. the value of crops produced and consumed by the household).

Table 12.8 Average daily income per person equivalent (2016 USD/day)

	Ghana	Côte d'Ivoire
No equivalence scale	$1.16	$1.14
OECD (old) equivalence scale	$1.73	$1.73
OECD modified scale	$2.39	$2.35
Square root scale	$2.89	$3.11

Note: The above table has been calculated with data from cocoa households only

These values are calculated by converting local currency into 2016 USD using the exchange rate. To correctly compare to the World Bank poverty line, we must convert these values into 2016 PPP. As indicated in this chapter previously, the $ 1.90 PPP (2011) person-per-day poverty line is equivalent to the value of $2.03 PPP (2016).

Using the PPP conversion rates, when no equivalence scale is applied, we estimate a per person per day income of $3.18 PPP (2016) in Ghana, compared with $2.92 PPP (2016) in Côte d'Ivoire. Using the square root equivalence scale, we estimate $7.89 PPP (2016) per person per day in Ghana and $7.97 PPP (2016) per person per day in Côte d'Ivoire (Table 12.9).

Table 12.9 Average daily income per person equivalent (2016 PPP/day)

	Ghana	Côte d'Ivoire
No equivalence scale	$ 3.18	$ 2.92
OECD (old) equivalence scale	$ 4.71	$ 4.44
OECD modified scale	$ 6.25	$ 6.02
Square root scale	$ 7.89	$ 7.97

Note: The above table has been calculated with data from cocoa households only

By presenting calculations with/without PPP conversion and with/without equivalence scales we have demonstrated that results, and the interpretations on which they are based, are subject to methodological choices. Researchers must always take care to make clear which conversions have been used and which benchmark they are comparing against. We also strongly suggest that researchers clearly describe the process by which the calculations were made so that others can attempt to replicate these. Furthermore, to simplify matters somewhat, we believe that it is better for income to be calculated at the household level , rather than the individual level (per person).

12.3.2 Poverty Probability Index (PPI)

The Poverty Probability Index (PPI) is a simple, yet statistically, sound poverty measurement tool. The answers to 10 questions about a household's characteristics and asset ownership are assigned scores. The scores are then added up and converted to a percent likelihood that individuals of a given household are under certain poverty lines. The average likelihood indicates the estimated share of the sample (and population) that are actually below each poverty line.[27]

According to the PPI documentation, PPI-calculated poverty rates can be compared between countries, but not perfectly so. Unfortunately, the PPI indices for Ghana and Côte d'Ivoire were developed a few years apart. The Ghana PPI uses 2011 purchasing power parity (PPP) and references the World Bank $1.90 PPP and $3.10 PPP poverty lines, whereas the Côte d'Ivoire PPI uses the 2005 PPP, and the $1.25 PPP, $2.00 PPP and $2.50 PPP. For these reasons, we have presented the two countries in separate tables and we advise caution in making cross country comparisons.

In Ghana, we find that, on average, the likelihood of individuals in cocoa households are below the $1.90 poverty line is 7.5% (2011 PPP), with no statistical difference with non-cocoa households. We find the likelihood of 24.5% of cocoa households to be below the $3.10 poverty line, again with no statistically significant differences with non-cocoa households (Table 12.10). This suggests that the poverty situation among cocoa growing households is less severe than is sometimes presented.[28]

Furthermore, we find no statistically significant difference between cocoa and non-cocoa households, which suggests poverty that does exist is a 'rural smallholder' phenomenon, rather than a 'cocoa farmer' phenomenon.

In Ghana, we found no statistically significant differences in PPI poverty likelihood between male and female-headed households. This is consistent with the Ghana Living Standard Survey Round 6 (GLSS6), which found that, "Poverty incidence among male-headed households is higher (25.9%) than female-headed households (19.1%). This follows the same pattern found in 2005/06."[29]

We also looked at whether significant differences in poverty likelihood could be found between other sub-groups of the sample. In Ghana we find no statistical differences between youth (household head under 35 years) and non-youth households. We do find that migrant households (where the head is born in another region) have

[27] Poverty Probability Index. (2017). About the PPI: A Poverty Measurement Tool. Available at https://www.povertyindex.org/about-ppi

[28] E.g. Fountain, A.C. and Hütz-Adams, F. (2015). Cocoa Barometer 2015-USA Edition. Available at http://www.cocoabarometer.org/International_files/Cocoa%20Barometer%202015%20USA.pdf; Balineau, B., Bernath, s., Pahuatini, V. (2016). Cocoa farmers' agricultural practices and livelihoods in Côte d'Ivoire. Insights from cocoa farmers and community baseline surveys conducted by Barry Callebaut between 2013 and 2015. AFD and Barry Callebaut. Available at https://www.afd.fr/fr/cocoa-farmers-agricultural-practices-and-livelihoods-cote-divoire

[29] Ghana Statistical Service. (2014). Ghana Living Standard Survey Round 6 (GLSS6). Available at http://www.statsghana.gov.gh/docfiles/glss6/GLSS6_Poverty%20Profile%20in%20Ghana.pdf

a slightly higher poverty rate (10.5%) than non-migrant households (6.5%) *(highly significant for $1.90/day PPP 2011)*. Regionally, the Eastern region has a slightly lower extreme poverty rate than other regions, however, care must be taken in this interpretation because poverty rates for all regions in our Ghana sample are quite low and the effect size is only a few percentage points.

Table 12.10 PPI Ghana, likelihood of individuals in cocoa and non-cocoa households being under $1.90 PPP (2011) and $3.10 international poverty lines (PPP, 2011)

	Ghana cocoa	Ghana non-cocoa	pvalue	sig
$1.90/day PPP 2011	7.55%	7.51%	0.95	
std.error	0.28%	0.61%		
$3.10/day PPP 2011	24.44%	24.95%	0.73	
std.error	0.58%	1.30%		
N	1,306	239		

Note: p-value from a one-way ANOVA test

Table 12.11 PPI Ghana, likelihood of male and female-headed households being under $1.90 PPP (2011) and $3.10 international poverty lines (PPP, 2011)

	Ghana female head	Ghana male head	pvalue	sig
$1.90/day PPP 2011	8.22%	7.40%	0.21	
std.error	0.62%	0.27%		
$3.10/day PPP 2011	26.31%	24.14%	0.11	
std.error	1.24%	0.59%		
N	285%	1,258%		

Note: p-value from a one-way ANOVA test

In Côte d'Ivoire, we find that the likelihood of cocoa households to be below the $1.25 (2005 PPP) poverty line is 26%. This is directly comparable with the $1.90 2011 PPP poverty line, since this an update by the World Bank of the $1.25 PPP (2015). The likelihood to be below the $2.50 2005 PPP is 68.5% of cocoa households, which roughly equates to the $3.10 2011 PPP. As in Ghana, we find no statistically significant differences between cocoa and non-cocoa households.

Table 12.12 PPI Côte d'Ivoire, likelihood of individuals in cocoa and non-cocoa households being under $1.25, $2.00 and $2.50 (2005 PPP)

	Côte d'Ivoire cocoa	Côte d'Ivoire non-cocoa	pvalue	sig
$1.25 PPP 2005 (~$1.90 PPP 2011)	26.44%	27.73%	0.15	
std.error	0.54%	0.73%		
$2.00 PPP 2005	54.46%	55.43%	0.42	
std.error	0.74%	0.98%		
$2.50 PPP 2005	68.50%	69.04%	0.64	
std.error	0.70%	0.91%		
N	884	563		

Note: p-value from a one-way ANOVA test

As in Ghana, we found no statistically significant differences between male and female-headed households in Côte d'Ivoire. We do find a very small difference in poverty rates between youth (24%) and non-youth headed households (27%) *(highly significant for $1.90/day PPP 2011)*. Also, as in Ghana, we find a slightly higher poverty incidence among migrants (30%) and non-migrants (26%) in Côte d'Ivoire *(highly significant for $1.90/day PPP 2011)*. Only small differences in extreme poverty rates were found between Côte d'Ivoire's administrative districts; the small sample size per district prevents a more detailed analysis.

Table 12.13 PPI Côte d'Ivoire, likelihood of male and female-headed households being under $1.25, $2.00 and $2.50 (PPP 2005)

	Côte d'Ivoire female head	Côte d'Ivoire male head	pvalue	sig
$1.25/day PPP 2005 (~$1.90 PPP 2011)	25.93%	27.11%	0.41	
std.error	1.55%	0.45%		
$2.00/day PPP 2005	52.08%	55.23%	0.10	
std.error	2.07%	0.61%		
$2.50/day PPP 2005	65.68%	69.14%	0.06	*
std.error	1.96%	0.58%		
N	151	1291		

12.3.3 DHS wealth index

DHS wealth index is an asset-based approach to measuring household socioeconomic status and uses information on ownership of a range of household assets. In our survey, this comprised eight questions on household ownership, size and materials, 32 questions on household assets, and 11 questions on livestock assets.

The index is constructed as a relative index within each country and specific scores cannot be directly compared across countries or over time. For this reason, we have presented Ghana and Côte d'Ivoire data in separate tables. Each wealth index has a mean value of zero and a standard deviation of one. The details on how the DHS methodology was applied can be found in the following footnote.[30]

We applied DHS wealth index weights for rural areas to compute the base indicator. This indicator is then converted into a national wealth index using the regression equation provided by the DHS program between rural and national values. With the national wealth index values, we can classify each household within a national wealth quintile.

[30] DHS. (2004). The DHS Wealth Index, DHS Comparative Reports 6. Available at https://dhsprogram.com/pubs/pdf/cr6/cr6.pdf

In Ghana, we find that around half of all households in our sample are in the 2nd quintile, implying that they are reasonably poor on a national level. 25% are in the bottom quintile, and 21% are in the third quintile (Table 12.14). There was found to be no statistically significant differences between cocoa and non-cocoa households, between male and female-headed households, nor between youth and non-youth heads when performing a Chi-squared test.

In all regions in Ghana, around half of all households fall into the second wealth quintile nationally. We do find some statistically significant differences between regions. The Central and Eastern regions appear to be the wealthiest in our sample, each with nearly a third of households falling into the middle quintile. The Central and Eastern regions also have the smallest percent of households falling into the bottom (poorest) quintile. Brong Ahafo appears to be the least wealthy region in our sample, with nearly half of households falling into the bottom (poorest quintile). We have only described these regional differences broadly because our sample size per region is not large enough to make detailed claims about each region.

Finally, in Ghana, we find statistically significant differences between migrant and non-migrant households, consistent with our PPI findings. Just over half of migrant and non-migrant households fall into the second wealth quintile nationally. However, a much higher proportion of migrants (37%) fall into the bottom quintile than non-migrants (21%). It follows from this, that a much higher proportion of non-migrants (24%) fall into the middle wealth quintile than migrants who were born in other regions (11%).

Table 12.14 Wealth quintile, according to DHS wealth index, Ghana

Quintile	Ghana cocoa	Ghana non-cocoa	pvalue	sig
1st quintile (bottom)	25%	26%	0.80	
2nd quintile	52%	54%		
3rd quintile	21%	19%		
4th quintile	2%	2%		
5th quintile (top)	0%	0%		
N	1,150	200		
dhs_quintile				

Note: p-value from a Chi-squared test

In Côte d'Ivoire, we also find that 43% of households are in the 2nd quintile, implying that many are reasonably poor at a national level. However, in contrast to Ghana, a higher proportion of cocoa households are in the third and fourth quintiles than in the bottom quintile. This reflects their relative wealth position within the wider country (Table 12.15).

In Côte d'Ivoire, we found no statistically significant differences between cocoa and non-cocoa households, nor between male and female-headed households.

Furthermore, we found no statistical differences between youth and non-youth heads, nor between migrants and non-migrants when performing a Chi-squared test.

We do find significant differences between administrative districts but, as the sample size is quite low per district, it is difficult to draw firm conclusions. We do find, however, that around one-third of households in Bas-Sassandra fall into the bottom quintile – easily the highest proportion of any administrative district. On the other hand, Comoe district, which lies between Abidjan and Ghana was found to have virtually no households in the bottom quintile and more than half in the fourth and top quintiles combined. District Autonome De Yamoussoukro, Goh-Djiboua, and Lacs also stand out with a relatively high proportion of households in the middle and fourth quintiles.

Table 12.15 Wealth quintile, according to DHS wealth index, Côte d'Ivoire

Quintile	Côte d'Ivoire cocoa	Côte d'Ivoire non-cocoa	pvalue	sig
1st quintile (bottom)	14%	15%	0.21	
2nd quintile	43%	48%		
3rd quintile	24%	19%		
4th quintile	15%	13%		
5th quintile (top)	4%	5%		
N	716	367		
dhs_quintile				

Note: p-value from a Chi-squared test

12.4 Summary

Poverty and wealth calculations are challenging for both methodological and data availability reasons. Methodologically, all main approaches to measuring wealth and poverty (expenditure, income and wealth/assets approaches) have their drawbacks. Furthermore, it is rare for high quality datasets based around cocoa households to be publically available online. Most studies that collect primary data are relatively small and lack the required statistical power to make reasonable estimates of wealth and poverty.

When calculating household income, multiple income sources from multiple household members needs to be accounted for. However, calculating incomes for cocoa households is challenging, as complete data is often not available. The net income from cocoa is challenging to estimate because of bad record-keeping, particularly in what relates to production costs. Total annual incomes were estimated by extrapolating the calculated net income from cocoa production using the reported share of total income coming from cocoa sales. Moreover, the estimations of annual income do not include the value of crops consumed at home, or any other in-kind

income, since these are very challenging to estimate, although we do provide some estimates about the value of crops consumed at home in the report.

Our household income model estimates that, on average, Ghanaian cocoa households earn USD 2,487 per annum from all income sources, which is equivalent to $6,784 PPP (2016). Applying the current OECD equivalence scale, we calculate an income of USD 2.89 per person per day (in 2016 USD), equivalent to $7.89 PPP (2016) This does not include in-kind income.

Our household income model estimates that, on average, Ivorian households earn an average of $2,900 per annum, which is equivalent to $7,429 PPP (2016). This equates to $3.11 per person per day (in 2016 USD), or equivalent to $7.97 PPP (2016) when applying the current OECD equivalence scale. This does not include in-kind income.

We believe our income model can be considered a good estimate of average income in 2015-2016. However, it cannot definitively measure income with high precision, and we would argue that it is virtually impossible to do so due to data limitations at myriad data points. Small changes in values for cocoa yield, cocoa price, input and labour costs, and estimations of the proportion of income derived from cocoa will naturally alter estimations of household income across years and across different studies.

We think we have still under-estimated income in our model. We know, for example, that when estimating income shares from different income sources, respondents only considered cash income. If in-kind income was to be included (e.g. the value of own production consumed by the household), this would result in higher estimated income. This is particularly important when making a comparison with a national or international poverty line. Unfortunately, it would be practically impossible for a respondent to estimate in-kind income with moderate accuracy. We are also concerned that we have insufficiently captured income from remittances. Finally, we were not able to produce models for crops other than cocoa, either because our sample size was too small for other crops, or because respondents had difficulty estimating yields for produce not sold in bags or Kg units (e.g. cassava, plantain, yam, rubber, palm).

We suggest that total annual household income per annum is a more appropriate unit of aggregation than any other. A per person per day income calculation prohibits reasonable estimates and can lead to erroneous conclusions due to choices in equivalence scales and exchange rates. Therefore, we are strongly in favour of calculating incomes per households instead of 'per person a day'.

Using the Poverty Probability Index (PPI), we estimate 7.5% of Ghanaian cocoa households are under the $1.90 PPP (2011) poverty line. In Côte d'Ivoire, we estimate 26% of households are under the equivalent poverty line.

Our PPI analysis shows that cocoa households do not suffer from a higher incidence of poverty than non-cocoa farmers. We found no statistically significant differences in poverty rates between these groups in either Ghana or in Côte d'Ivoire. This suggests that poverty is more a 'rural smallholder' phenomenon, rather than a 'cocoa farmer' phenomenon, contrary to the narratives of cocoa being a poor man's crop.

Our PPI analysis shows that female-headed households do not suffer from higher poverty incidence than male-headed households. We found no statistically significant differences in poverty rates between these groups in either Ghana or in Côte d'Ivoire. While this finding may challenge certain gender narratives, it should not be surprising. For example, several recent Ghana Living Standard Surveys find that poverty incidence is, in fact, slightly higher for male-headed households than female-headed households.

Using the DHS wealth index, we find that 25% of Ghanaian households are in the 1st (poorest) quintile nationally, 52% fall into the 2nd quintile, and 21% fall into the third (middle) quintile. In Ghana, our DHS analysis generally agrees with our PPI analysis. Cocoa households are not poorer than non-cocoa households, and female-headed households are not poorer than male-headed households.

Using the DHS wealth index, we find that 14% of Ivorian cocoa households fall into the 1st (bottom) quintile nationally, 43% fall into the 2nd quintile, 24% fall into the middle quintile and even 15% fall into the 4th quintile. This means that cocoa households are relatively wealthier than many households in the country. In Côte d'Ivoire, we also find that our DHS analysis agrees with our PPI analysis. Cocoa households are not poorer than non-cocoa households, and female-headed households are not poorer than male-headed households.

In Ghana and in Côte d'Ivoire, we find some significant regional differences. In Ghana, households in the Central and Eastern regions are wealthier, on average, than those in other regions. Brong Ahafo has the highest proportion of households in the bottom quintile. In Côte d'Ivoire, Bas-Sassandra is the least wealthy administrative district. Comoe district, District Autonome De Yamoussoukro, Goh-Djiboua, and Lacs are among the wealthiest in our sample.

The different approaches used in this chapter to calculate income, poverty and wealth point in the same direction: cocoa households are, like other rural households, fairly poor. However, we find that poverty levels among cocoa households are less severe than projected by other researchers. The difference can be explained, at least partly, by different estimates of household size and the share of cocoa contributing to total household income. Our slightly more positive estimations correspond with the findings we presented in Chapter 7, The Importance of Cocoa, illustrating that cocoa is perceived to be the most important crop for the majority of households in cocoa growing households in Ghana and Côte d'Ivoire.