Analysis of the income gap of cocoa producing households in Ghana

Comparison of actual incomes with the Living Income Benchmark

Prepared for the Living Income Community of Practice

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The Living Income Community of Practice coordinated both the Living Income Benchmark studies and this study to analyze the gap between the benchmarks and actual incomes. A consortium of actors in the cocoa sector provided the financial support. Generous thanks to the funders of this study: *Cargill, Fairtrade International, GIZ, Lindt Cocoa Foundation, Mars and Rainforest Alliance UTZ Sector Partnerships Programme.*

Executive summary

The Living Income Community of Practice, co-hosted by GIZ, ISEAL and the Sustainable Food Lab and the GIZ Programme "Sustainable Supply Chains and Standards" are currently calculating 'Living Income' Benchmarks for the cocoa producing regions in Ghana and Côte d'Ivoire. The Living Income Benchmark studies estimate the net income required for a decent standard of living for a typical family in these regions.

The study estimates a Living Income Benchmark in rural cocoa growing areas of Ghana to be GHS 21,100 (USD 4,742) per year for a typical male-headed household (up to 4 ha of productive land) of 3.5 adults and 2.5 children. Female-headed households of 3 adults and 2 children have a Benchmark of GHS 17,806 (USD 4,001) per year. Finally, male-headed households with large land size (more than 4 ha of productive land) composed of 3.5 adults and 3 children have a Benchmark of GHS 22,799 (USD 5,123) per year.

KIT Royal Tropical Institute collected robust quantitative and qualitative data between November 2016 and March 2017 on current income diversification strategies and crop production activities involving 3,045 farming households in cocoa growing areas in Ghana and Côte d'Ivoire. The study estimates that in Ghana, on average, typical male-headed households earn GHS 10,180 (USD 2,288) per year; female-headed households earn GHS 7,794 (USD 1,752) per year; and male-headed households with large land size earn GHS 22,714 (USD 5,104) per year.

The estimated income gap in comparison to the Living Income Benchmark is thus USD 2,455 per year for the typical male-headed household, which is about 52% of the Benchmark value. Only 9.4% of typical male-headed households achieve the Living Income Benchmark. Female-headed household have similar figures, while male-headed households with large land size have an estimated gap of close to zero, with 44% of households in this group achieving the Benchmark.

However, this calculation of the income gap is not without its conceptual and methodological difficulties. Since calculating net incomes from multiples sources from rural households is highly inaccurate and complete data is not available, 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. The net income from cocoa is also challenging to estimate because of bad record-keeping, particularly in what relates to production costs. Moreover, these 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.

In order to advance the Living Income Community of Practice, it is important to define clear methodological guidelines on how to measure and report against the Living Income Benchmark, as well as how to understand the cost elements which comprise the Living Income Benchmark in order to understand which elements are most critical for households below the Benchmark. These methodological discussions are also included in the report.

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1 Introduction

The Living Income Community of Practice[1], co-hosted by GIZ, ISEAL and the Sustainable Food Lab and the GIZ Programme "Sustainable Supply Chains and Standards" are currently calculating 'Living Income' Benchmarks for the cocoa producing regions in Ghana and Côte d'Ivoire. The Living Income Benchmark studies estimate the net income required for a decent standard of living for a typical family in these regions.

In order to understand the gap between the actual incomes and the Living Income Benchmark, a gap analysis needed to be carried out based on the most recent data. KIT Royal Tropical Institute collected data between November 2016 and March 2017 on current income diversification strategies and crop production activities involving 3,045 farming households in cocoa growing areas in Ghana and Côte d'Ivoire. This data is the starting point for the gap analysis.

This report has been simultaneously developed by the same authors as the *Analysis of the income gap of cocoa producing households in Côte d'Ivoire* and uses the same methodological approach. Since each report is a standalone piece, repetitions will be found for completeness of each report.

This report starts with providing a background on the Living Income Benchmark study for Ghana and the KIT study, which is followed by the definition of the analytical groups and a description of their characteristics. We then present the calculations of total annual household income for each group and then compare these with their Living Income Benchmarks.

This report is also aimed at identifying methodological barriers and potential solutions to move forward in designing policy for improving the livelihoods of the households in these areas. These are presented in the final section of this report.

[1] www.living-income.com

2 Background

2.1 Living Income Benchmark study

The *Living Income Report, Rural Ghana, Cocoa growing areas of Ashanti, Central, Eastern, and Western Regions*[2] has been released in draft form under the authorship of research consultant Sally Smith, with Dr. Daniel Sarpong from the University of Ghana. The study was coordinated by the Sustainable Food Lab with financial supported from Cargill, Fairtrade International, GIZ, Lindt Cocoa Foundation, Mars and Rainforest Alliance (UTZ), with logistical support also provided by the World Cocoa Foundation.

The Living Income Benchmark is the net income required for a basic, but decent, standard of living in cocoa producing areas in Ghana. The Benchmark is based on the costs of living in March 2018. In line with other Living Wage studies and Living Income Benchmark studies being carried out, this study's approach is based on the methodology of Martha and Richard Anker, initially developed for waged workers.[3]

The study estimates a Living Income Benchmark in rural cocoa growing areas of Ghana to be GHS 17,573 (USD 3,949) per year for a typical family of 2 adults and 3 children. This income should cover costs of food (52%), housing (14%), non-food and non-housing (30%) and include a provision for sustainability and emergencies (5%).

2.2 KIT study

KIT Royal Tropical Institute collected robust quantitative and qualitative data between November 2016 and March 2017 on current income diversification strategies and crop production activities involving 3,045 farming households in cocoa growing areas in Ghana and Côte d'Ivoire.[4] Figure 1 shows the map of surveyed locations. The research received financial support from the International Trade Initiative (IDH), the Jacobs Foundation, the Lindt Cocoa Foundation and UTZ. Agriculture and Lifecycle was the local partner in Ghana, while Agricole Local Partner supported the field work in Côte d'Ivoire. The research received methodological and analytical support from Südwind Institute and CIRAD. The study can be accessed via https://www.kit.nl/sed/project/demystifying-cocoa-sector

[2] Smith & Sarpong (2018). Living Income Report, Rural Ghana, Cocoa growing areas of Ashanti, Central, Eastern, and Western Regions. Living Income Community of Practice, Series 1.

[3] For information about the Living Wage coalition please check https://www.globallivingwage.org/

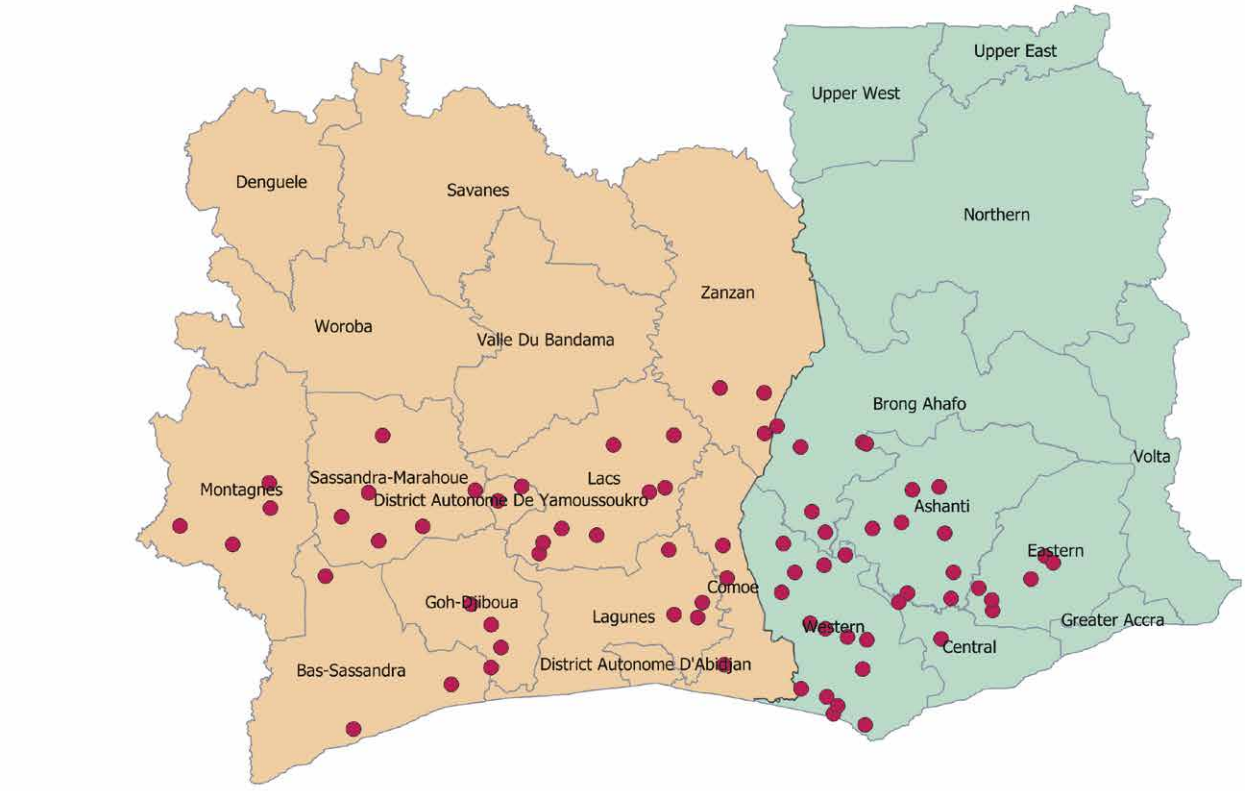
[4] Bymolt, R. Laven, A., Tyszler, M. (2018) Demystifying the cocoa sector in Ghana and Côte d'Ivoire. Royal Tropical Institute (KIT), Amsterdam

The survey covered social-economic characteristics and income sources of the farming households, nutrition and food security questions and detailed questions on the production and sales of two major crops per household. The survey also contained questions covering the Dietary Diversity Score (DDS), Poverty Probability Index (PPI) and the DHS Wealth Index.

Focus group discussions (37 in each country) covered a variety of different exercises aimed at supporting the survey questions and understanding the 'why, how, and for whom?'. The participatory exercises covered topics such as the importance of different income sources, variation of income and expenses throughout the year, availability and affordability of food, intra-household relations and the control and use of resources.

The study estimates an average income of GHS 12,429[5] (USD 2,794) per year for a comparable average family of 3.5 adults and 2.5 children.[6] This includes GHS 7,282 (USD 1,636) (about 60%) net income from cocoa production and sales.

Figure 1 Map of surveyed locations



[5] Values corrected by Consumer Price Index in order to be comparable with the Living Income Benchmark study.

[6] The adjusted Living Income Benchmark for this family composition is GHS 21,100 (USD 4,742) per year.

3 Grouping of households

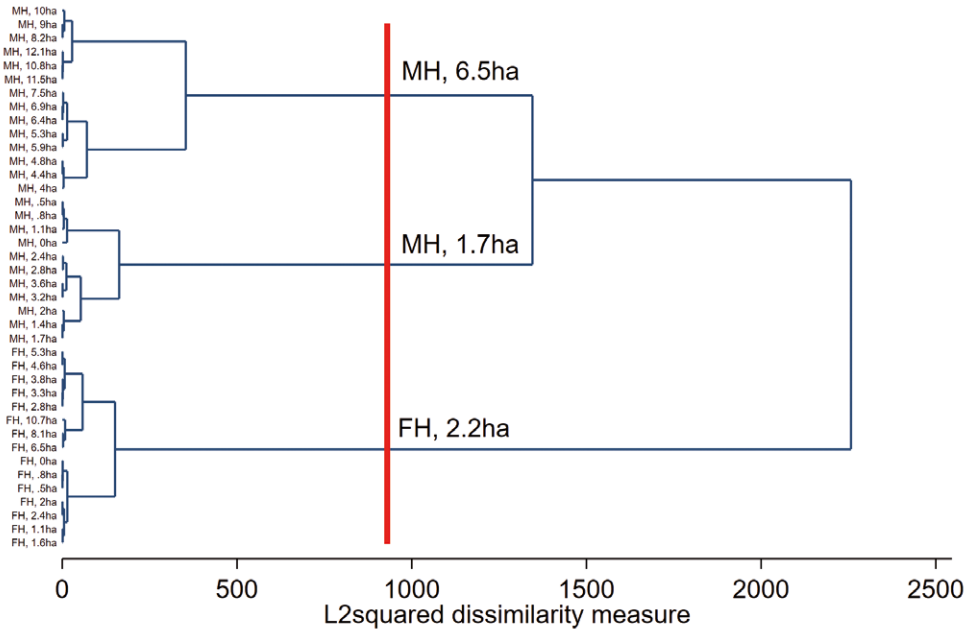
In order to better compare income of farming households with the Living Income Benchmark and reflect the variability of household compositions and livelihood strategies within KIT's sample, a grouping of households is appropriate. This methodological choice was made to derive these groupings using a data-driven approach, a cluster analysis.

3.1 Cluster analysis

Cluster analysis is a technique used to group observations. The goal is to create clusters which are as distinct as possible from each other, whilst cluster members are as similar as possible to each other. For this analysis, we clustered observations on the basis of the sex of the household head[7] and productive cocoa land.[8,9]

In a hierarchical cluster analysis, each observation is initially set to be its own cluster and, in each round, clusters are progressively merged based on how similar they are to each other until there is only one single cluster with all observations. An output of this exercise is a dendogram, which is illustrated in Figure 2.

Figure 2: Dendogram



Note: FH = Female-headed; MH = Male-headed; X ha indicates the average productive cocoa land size of that cluster

[7] In the KIT Study the head of the household was self-determined by respondents.

[8] Productive cocoa land is defined, in this study, as land used to cultivate cocoa where trees are at least 5 years old.

[9] Other variables were also considered, but the strong grouping variables were sex of the household head and productive land. For details, please consult the KIT study website or contact the authors.

In the dendogram, the horizontal axis indicates the threshold to merge clusters. Very similar clusters will be merged with a low threshold (e.g. female-headed households with 1 ha and female-headed households with 1.1 ha), while distinct clusters will require a high threshold to be merged (e.g. female-headed households with 1 ha and male-headed households with 10 ha), The more the threshold has to be raised to merge clusters, the more distinct the clusters are. This is indicated by long horizontal strikes in the dendogram.

Figure 2 suggests three clusters from the data set, with one cluster having all female-headed households, another cluster with male-headed households with average productive cocoa land size of 1.74 ha and a third cluster with male-headed households with average productive cocoa land size of 6.45 ha, as shown in Table 1.

Table 1 Cluster characteristics

	All	Cluster 1	Cluster 2	Cluster 3
Observations	1,181	194	744	243
	(100%)	(21%)	(63%)	(16%)
Sex of the household head				
Female	16%	100%	0%	0%
Male	84%	0%	100%	100%
Productive cocoa land (ha)				
Min	0	0	0	3.77
1st quartile	1.21	1.01	1.01	4.41
Median	2.03	1.62	1.62	5.39
Mean	2.73	2.21	1.74	6.45
3rd quartile	3.65	2.83	2.43	7.35
Max	12.14	11.3	3.65	12.14

3.2 Analytical groups

Based on the cluster analysis, we defined three analytical groups to be used to further the comparison to the Living Income Benchmark:

- *Female-headed:* all female-headed cocoa households;
- *Male-headed, typical:* all male-headed households with up to 4 ha of productive cocoa land;
- *Male-headed, large:* all male-headed household with more than 4 ha of productive cocoa land.

The analytical groups differ only slightly from the cluster groups, but have a definition which is easier to identify and implement on the field. Most importantly, the *male-headed, typical* is the biggest group, which is most likely to represent the typical household in the sample.

3.3 Characteristics of the groups[10]

3.3.1 Grouping characteristics

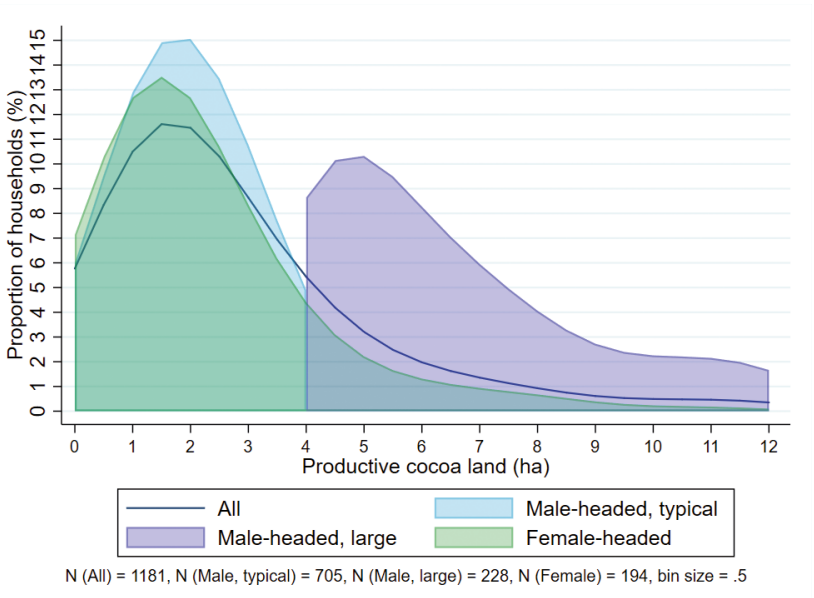
Table 2 shows the grouping characteristics of the three analytical groups. Male-headed, typical households have an average of 1.9 ha and a median of 1.8 ha of productive cocoa land. Female-headed households have a slightly higher average, 2.2 ha, but a lower median, 1.6 ha. Male-headed, large households start at 4 ha, with an average of 6.3 ha and a median of 5.7 ha of productive cocoa land.

Table 2 Household grouping characteristics

	Female-headed	Male-headed, typical	Male-headed, large
Observations	288	705	228
	(24%)	(58%)	(18%)
Sex of the household head			
Female	100%	0%	0%
Male	0%	100%	100%
Productive cocoa land (ha)			
Min	0	0.20	4.05
1st quartile	1.01	1.21	4.45
Median	1.62	1.82	5.66
Mean	2.22	1.91	6.34
3rd quartile	2.83	2.45	7.46
Max	11.33	3.97	12.15

Figure 3 shows the detailed distribution of productive cocoa land of each analytical group.

Figure 3 Distribution of productive cocoa land of the analytical groups (Gaussian kernel smoothed)



[10] In this section, we include characteristics which directly feed into the analysis of the Living Income gap. For further data and/or analysis, please consult the KIT study website or contact the authors.

3.3.2 Household composition

To analyze these groups with a view to comparing with the Living Income Benchmark, a key characteristic is household composition, since this has direct implications for household cost of living.

To ensure that we gathered good estimates we asked about the household size as a two-stage question. We first asked "*What is the total number of members in your household?*" followed up by the question "*Of those, how many members usually live in your compound/house?*". In Ghana, cocoa households had an average of 8.60 persons for the first question but 5.87 for the second question. Detailed questions about household members and the calculations presented in this report are based on the answer to the second question.

Table 3 shows household composition of the analytical groups. Female-headed households have approximately one adult male less than male-headed, typical households. Male-headed, large households have about 0.5 person more than male-headed, typical households.

Table 3 Household composition

	All	Female-headed	Male-headed, typical	Male-headed, large
Average household size (number of persons)	5.87	5.13	5.91	6.42
Detailed composition (number of persons)				
Males, children 0 to 17 years old	1.38	1.13	1.45	1.36
Females, children 0 to 17 years old	1.23	0.97	1.28	1.46
Males, 18 to 29 years old	0.55	0.56	0.53	0.62
Females, 18 to 29 years old	0.52	0.53	0.49	0.58
Males, 30 to 60 years old	0.85	0.47	0.90	1.04
Females, 30 to 60 years old	0.91	0.96	0.87	0.97
Males, over 60 years old	0.25	0.07	0.27	0.29
Females, over 60 years old	0.18	0.44	0.11	0.09

3.3.3 Income earners

It is also important to understand the number of income earners and income sources within the household. Table 4 shows the average number of income earners per household. Female-headed households have approximately 0.5 adult male less income earners than male-headed, typical households. Male-headed, large households have only slightly more income earners than the male-headed, typical households.

Table 4 Income earners per household

	All	Female-headed	Male-headed, typical	Male-headed, large
Average number of income earners (number of persons)	2.64	2.33	2.59	2.94
Detailed composition (number of persons)				
Males, children 0 to 17 years old	0.02	0.01	0.02	0.02
Females, children 0 to 17 years old	0.02	0.01	0.02	0.02
Males, 18 to 29 years old	0.27	0.28	0.27	0.31
Females, 18 to 29 years old	0.24	0.22	0.23	0.26
Males, 30 to 60 years old	0.82	0.41	0.87	1.02
Females, 30 to 60 years old	0.86	0.92	0.82	0.94
Males, over 60 years old	0.25	0.06	0.27	0.29
Females, over 60 years old	0.16	0.41	0.10	0.08

3.3.4 Income sources

Table 5 shows the income sources of the cocoa households. As expected, cocoa sales is the leading income source; according to respondents, cocoa sales contribute about 60% of total income, followed by sales of other crops. This is also the same ranking order for the number of income earners per income source, with an average of just over 2.1 persons in a household earning income from cocoa sales, followed by sales of other crops. Income from small businesses is the third most important income source involving on average 0.7 persons. Income from small businesses provides about 10% of total household income; the largest group within the household earning income from this source are females between 30 and 60 years old.

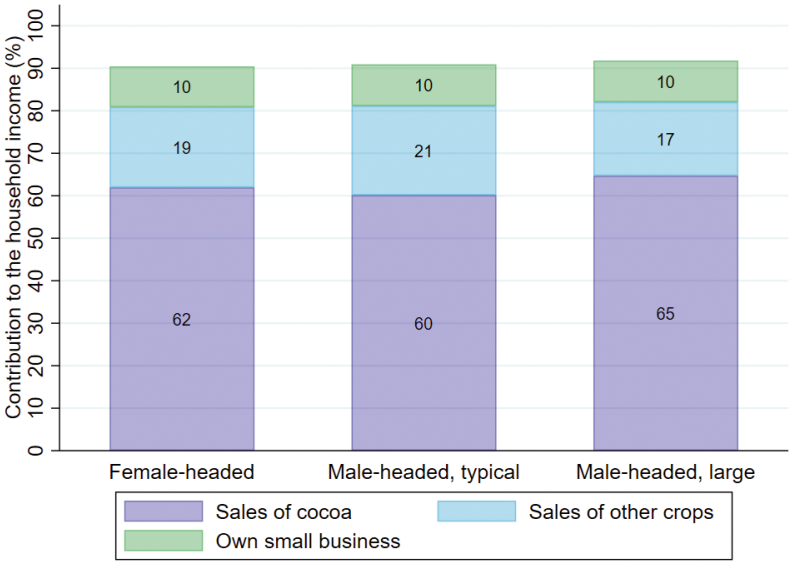
Table 5 Income sources

	Sale of cocoa	Sale of other crops	Sale of livestock or livestock products	Own small business or trading
Estimated contribution to total household income*	61%	20%	2%	10%
Average number of income earners (number of persons)	2.13	1.70	0.36	0.73
Detailed composition (number of persons)				
Males, children 15 to 17 years old	0.01	0.01	0.00	0.00
Females, children 15 to 17 years old	0.01	0.01	0.00	0.00
Males, 18 to 29 years old	0.18	0.15	0.02	0.05
Females, 18 to 29 years old	0.06	0.05	0.01	0.03
Males, 30 to 60 years old	0.73	0.59	0.15	0.20
Females, 30 to 60 years old	0.67	0.56	0.10	0.33
Males, over 60 years old	0.24	0.18	0.05	0.03
Females, over 60 years old	0.14	0.10	0.02	0.03

* Based on perception of respondents
Note: each person may have multiple income sources

Figure 4 shows the main income contributors for each analytical group, which shows that the three groups have similar patterns. Further details about the net income from cocoa is presented in the section 4.2 *Net cocoa income*.

Figure 4 Main income sources of cocoa households



4 Household annual income

4.1 Technical notes

Since cocoa sales provides the major income source for cocoa households, we base our estimation of total household annual income on the cocoa production, revenues and costs data. We only collected 'perceived contribution' to total household income from other agricultural and livestock activities, laboring and off-farm income, but not the estimation of those values. Our data would only allow us to obtain some estimation of income generated by a selection of crops, but not the complete income generated. Most importantly, in estimation of annual income, we did not include the value of crops consumed at home, or any other in-kind income, since these are very challenging to estimate. A discussion about this point can be found in section 6.5 *Value of crops consumed at home and value of other in-kind income.*

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);
- We computed the total cocoa production (kg/year) per household;
- We computed the total value of production (GHS/year) per household by applying a fixed price of 6.64 GHS/kg;[11]
- We computed the annual input cash expenses (GHS/year) per household for granular fertilizer, liquid fertilizer, herbicides, pesticides and fungicides.
  - For households who reported not doing the activity related to the inputs above, an expense of 0 GHS/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 analytical group[12] was used to estimate the annual input cash expenses.
- We computed the annual hired labor expenses (GHS/year) per household for land clearing, land preparation, planting, granular fertilizer application, liquid fertilizer 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 labor, a hired labor expense of 0 GHS/year was assumed.
  - For households who reported doing an activity above, but for whom the hired labor expenditure was missing, the median expenses per ha per household of the analytical group[12] was used to estimate the annual hired labor expenses.

[11] This is derived from the reported price of GHS 425 per 64 kg bag

[12] Female-headed household, male-headed, typical household or male-headed, large household

- Net income from cocoa per household was computed as the value of annual production, minus annual expenses in inputs, minus annual expenses in hired labor.
- Total household income was extrapolated using the estimated contribution of cocoa sales to the total household income.
- To be comparable with the Living Income Benchmark data, all values above were corrected using the variation in the Consumer Price Index (CPI)[13] and converted to USD using the same exchange rate as the Living Income Benchmark report.[14]

4.2 Net cocoa income

The study estimates an average net income from cocoa of GHS 7,282 (USD 1,636) per year per household. Table 6 shows the details of the averages for each analytical group.

Table 6 Calculation of household income from cocoa*

	All	Female-headed	Male-headed, typical	Male-headed, large
Revenues				
Productive land (ha/household)	2.7	2.2	1.9	6.3
Total production (kg/year/household)	1,087	748	840	2,096
Land productivity (kg/ha)	398	338	438	331
Price (USD/kg)	$1.86	$1.86	$1.86	$1.86
Value of production (USD/year/household)	$2,027	$1,394	$1,566	$3,907
Costs				
Input costs (USD/year/household)	$104	$68	$86	$215
Hired labor costs (USD/year/household)	$250	$351	$160	$501
Total costs (USD/year/household)	$351	$419	$243	$709
Net income				
USD/year/household	$1,636	$1,032	$1,317	$3,089
GHS/year/household	7,282	4,593	5,861	13,744

* Each item (row) is calculated per household and the group average is presented in the table. Therefore, differences can occur from calculating totals based on the averages. This is because of a slight difference in number of observations per item, due to removing outliers or missing values that could not be inputted. The net income per year per household is the most relevant and complete number, while other numbers help in the build up to understand the differences between groups.

[13] Data obtained from IMF, http://data.imf.org/regular.aspx?key=61545849. The CPI for Ghana in the reference period of the KIT study, (first quarter of 2016) was 197.77. The CPI for the first quarter of 2018, period of the Living Income Benchmark data collection was 247.06. This implies an increase in almost 25% of the cost of living.

[14] The rate used was 1 USD per 4.45 GHS.

From the table, it can be noted that female-headed households have about 20% less annual income on average, while the income from the male-headed, large group is about 2.5 times as large as the male-headed, typical household. Figure 5 suggests that the net cocoa income differences are not due to differences in household productivity nor value of production. While the male-headed, large group will have a higher net income because of their larger land size, Figure 6 suggests that the lower net income from cocoa within female-headed households is explained by the higher expenses that result from hiring labor.

Figure 5 Distribution of coca production and revenues of the analytical groups (Gaussian kernel smoothed)

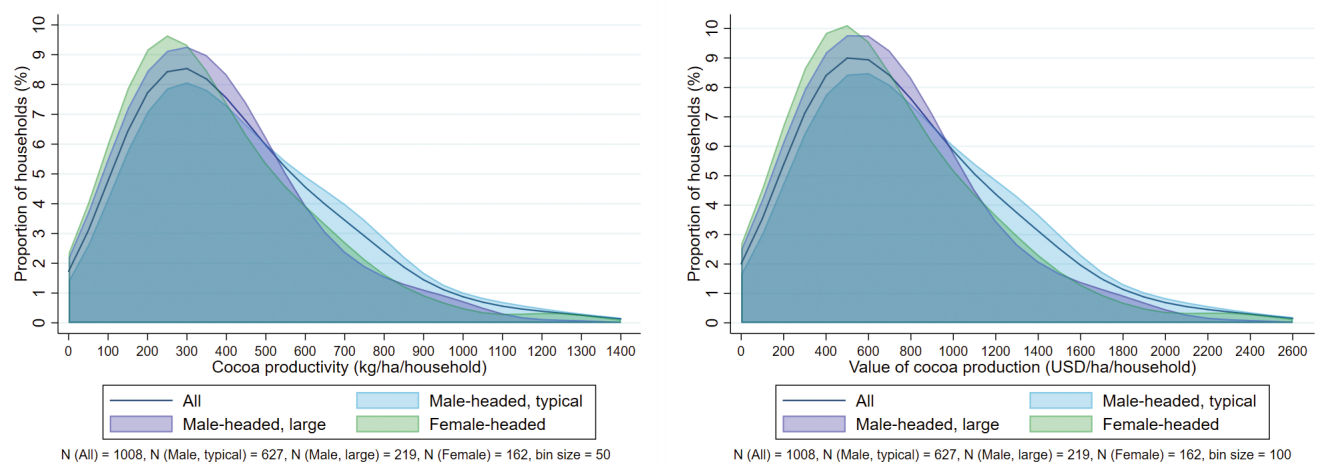
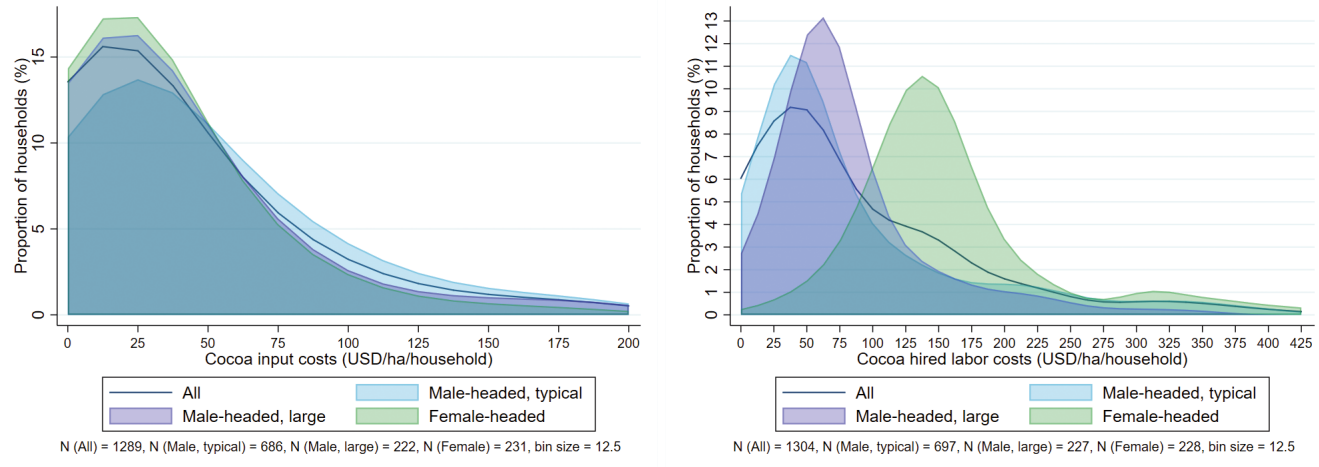
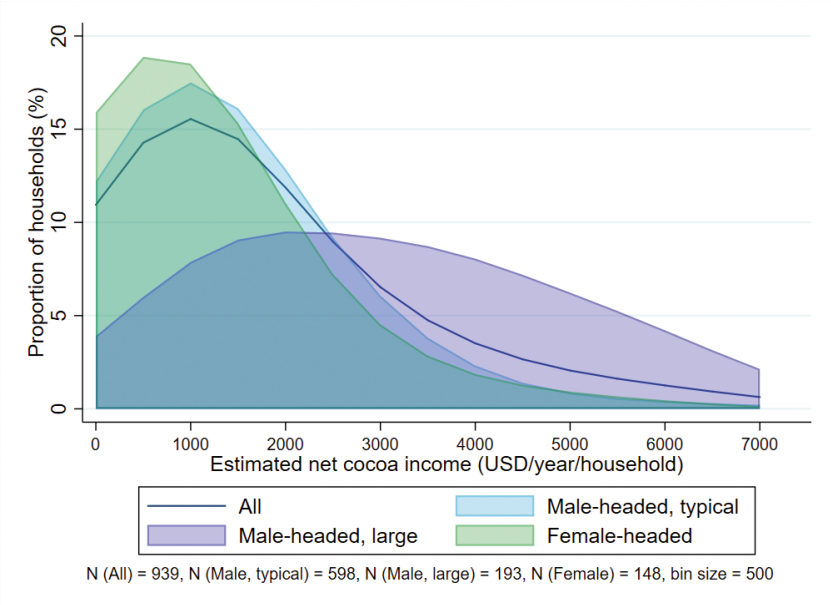


Figure 6 Distribution of cocoa costs of the analytical groups (Gaussian kernel smoothed)



Finally, Figure 7 shows the distribution of the estimated net annual cocoa income per household. We see that female-headed households are very similar to the male household, typical with lower income due to higher hired labor costs. The male-headed, large households have higher income but also higher income variability.

Figure 7 Distribution of net cocoa income (Gaussian kernel smoothed)



4.3 Total annual income estimation

We estimated the total annual household income by using the contribution of cocoa income to the total household income. This is the best proxy to cover for other income sources, such as sales of other crops, laboring and ownership of small businesses. As mentioned before, in the estimation of annual income, we did not include the value of crops consumed at home, or any other in-kind income, since these are very challenging to estimate. A discussion about this point can be found section 6.5 *Value of crops consumed at home and value of other in-kind income*.

The study estimates that, on average, typical male-headed households earn GHS 10,180 (USD 2,288) per year; female-headed households earn GHS 7,794 (USD 1,752) per year and male-headed households with large land size earn GHS 22,714 (USD 5,104) per year.

Figure 8 shows the distribution of the estimated total annual household income while Table 7 shows details of the distribution. From these, we see a similar pattern to the cocoa annual income, where female-headed households show similar results to the male-headed, typical households with lower income, and the male-headed, large households have a higher income but also a higher variability.

Figure 8 Distribution of annual household income (Gaussian kernel smoothed)

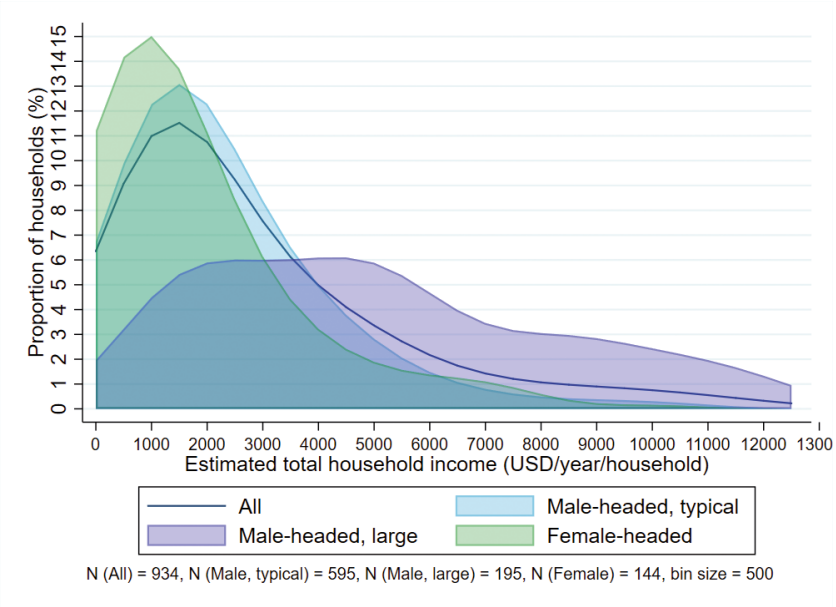


Table 7 Annual household income

	All	Female-headed	Male-headed, typical	Male-headed, large
Annual household income				
Income from cocoa (USD//year/household)	$1,636	$1,032	$1,317	$3,089
Contribution of cocoa income to total income	61%	62%	60%	65%
Total income (USD/ year/household)	$2,793	$1,752	$2,288	$5,104
Total income (GHS/ year/household)	12,429	7,794	10,180	22,714
Total income (USD/year/household)				
Min	$ 25	$ 25	$ 90	$ 290
1st quartile	$ 1,063	$ 538	$ 1,057	$ 2,528
Median	$ 1,922	$ 1,153	$ 1,740	$ 4,727
Mean	$ 2,793	$ 1,752	$ 2,288	$ 5,104
3rd quartile	$ 3,784	$ 2,172	$ 3,000	$ 7,588
Max	$ 12,618	$ 9,996	$ 10,815	$ 12,618

5 Comparison of Living Income Benchmark with actual income

5.1 Adjusted Benchmarks

Since the household compositions found in the KIT study differs from the typical household modeled for the Living Income Benchmark study, a direct comparison with the Benchmark is not possible; Table 8 shows the approximate household composition used to derive the adjusted Living Income Benchmark values.

Table 8 Living income Benchmark approximation[15]

Adjusted household composition	All	Female-headed	Male-headed, typical	Male-headed, large
Household size (number of persons)	6.0	5.0	6.0	6.5
Detailed composition (number of persons)				
Children, 0 to 17 years old	2.5	2.0	2.5	3.0
Adults, 18 to 29 years old	1.0	1.0	1.0	1.0
Adults, 30 to 60 years old	2.0	1.5	2.0	2.0
Adults, over 60 years old	0.5	0.5	0.5	0.5
Living income Benchmark				
USD/year/household	$4,742	$4,001	$4,742	$5,123
GHS/year/household	21,100	17,806	21,100	22,799

5.2 Comparison of estimated incomes to the Benchmark

Figure 9 shows the distribution of annual household incomes of each group compared to their group Benchmarks. Figure 10, Figure 11 and Figure 12 show the distribution of the estimated annual incomes for each analytical group compared to the Benchmark, mean and median values. They also highlight the percentage of households that are above the Benchmark.

The graphs show that 9.7% of female-headed households achieve the Benchmark, which is a similar to the share of male-headed, typical households (9.4%). 43.6% of the male-headed, large households achieve the Benchmark. Across the whole sample, only 17% of the households achieve the Benchmark.

[15] Smith & Sarpong (2018). Living Income Report, Rural Ghana, Cocoa growing areas of Ashanti, Central, Eastern, and Western Regions. Living Income Community of Practice, Series 1.

Figure 9 Comparison of households annual income to the Benchmark (Gaussian kernel smoothed)

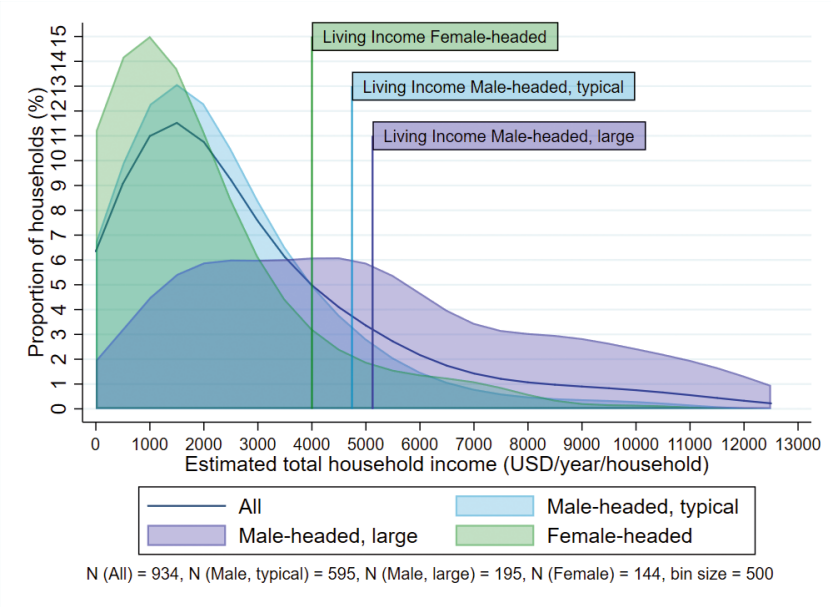


Figure 10 Comparison of female-headed households to the Benchmark (Gaussian kernel smoothed)

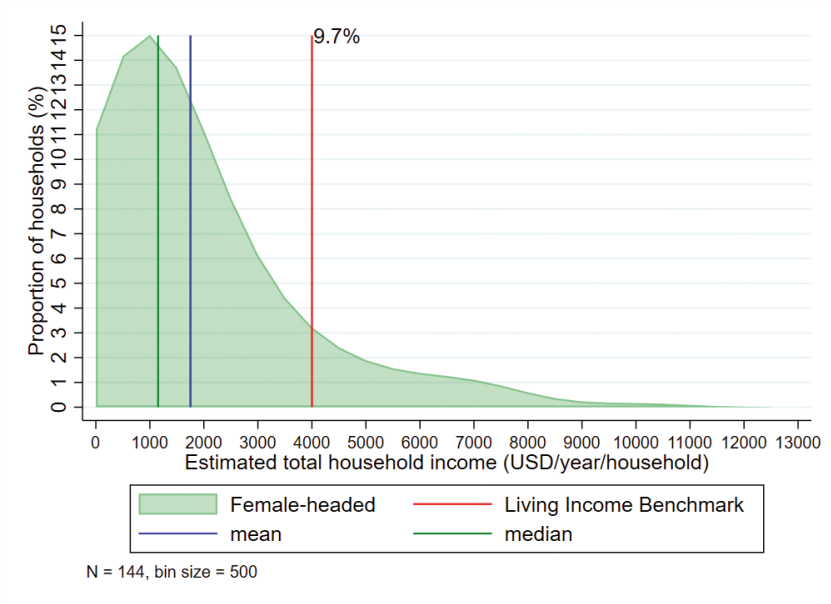


Figure 11 Comparison of male-headed, typical households to the Benchmark (Gaussian kernel smoothed)

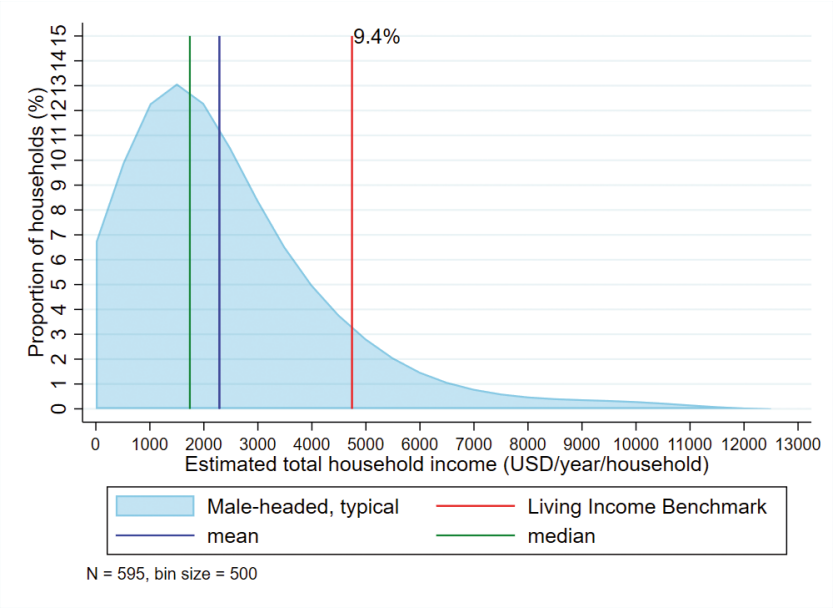
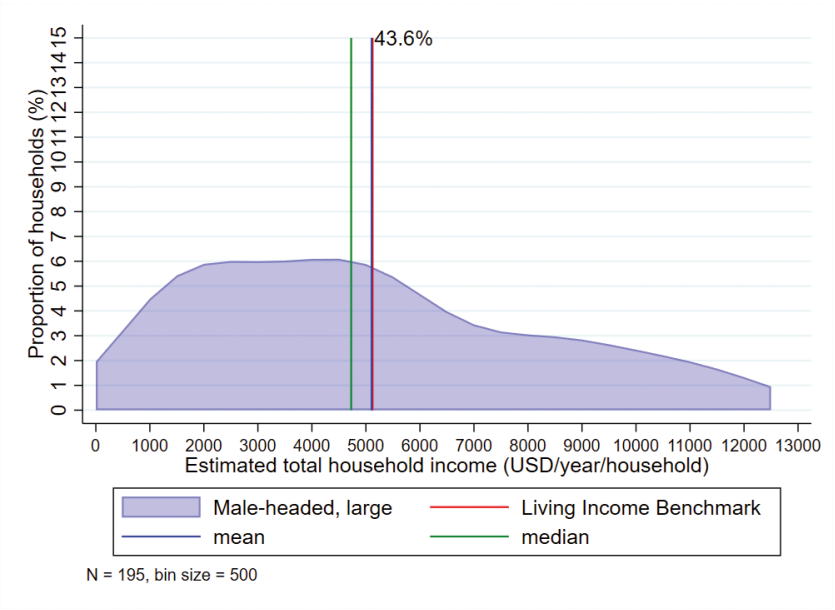


Figure 12 Comparison of male-headed, large households to the Benchmark (Gaussian kernel smoothed)

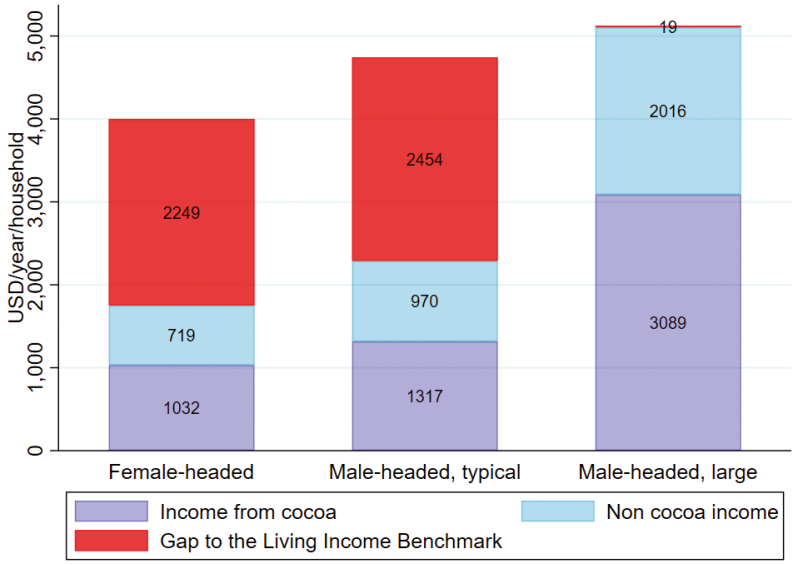


5.3 Gap to the Living Income Benchmark

Figure 13 shows the gap of the average annual incomes to the Living Income Benchmark. Male-headed, large have an average annual income which is very close to the Benchmark value. Female-headed households have a lower income than male-headed, typical households, but the gap is also smaller. Nevertheless, in both cases, the gap is relatively large, representing about 56% of the Benchmark value for female-headed households and 52% of the Benchmark value for male-headed, typical households. The estimated income gap to the Living Income Benchmark is USD

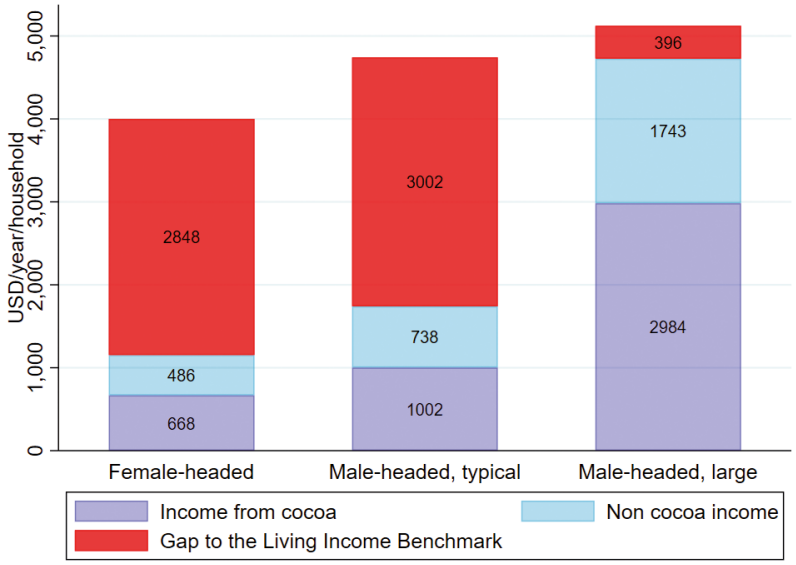
2,455 per year for the typical male-headed household. Even doubling the net income generated from cocoa would not be enough to fully close the gap.

Figure 13 Gap to the Living Income Benchmark per analytical group (using average values)



In order to have a more accurate estimation of the typical farming household in each group, Figure 14 shows the gap of the median annual incomes to the Living Income Benchmark. Since the median incomes are smaller than the average incomes, the gap is larger. The analysis is similar as above. Male-headed, large have a median annual income which is about USD 400 per year below the Benchmark value.

Figure 14 Gap to the Living Income Benchmark per analytical group (using median values)



6 Methodological discussions

In this section, we present a series of methodological discussions which are relevant when measuring incomes against a set Benchmark and how to close the gap to the Benchmark. This discussion is not exhaustive and is meant to provide an input to the Living Income Community of Practice and debate on how to advance data collection, analysis, and program/policy advice.

6.1 Living wage vs Living Income

Living income studies are inspired by Living Wage studies and are based on the same conceptual and methodological framework. Both studies start with calculating the costs of a simple but decent standard of living for a typical family in a region. The Living Wage calculations then proceed with assuming wage earnings are the sole income source for the family; the full time equivalent wage earners in this family are then calculated followed by determining the wage per month per person that would be necessary to afford the costs of living.

Once the Living Wage Benchmark is set, measuring the wage gap can be done, for example, by analyzing national laws, sector practices, auditing company payroll data or asking employees to report their salaries.

The Living Income Benchmark stops at the calculation of the costs of living, since this should be the income earned by the typical household. Measuring the income gap to the Living Income Benchmark is conceptually similar to measuring the Living Wage gap but it is, in practice, much more complicated. The core reasons for this are the multitude of income sources, each with its own data inaccuracies, and the seasonality typically faced by rural households. We provide more detail on these points below.

6.2 Household income data

First of all, rural households have a variety of income sources from different household members and from multiple sources, including sales of crops and livestock, small businesses, laboring on other farms, salaried employment and remittances.

Estimating total household income requires estimating the contribution of each household member to the total household income. This is difficult data to collect since it would either require interviewing every household member or assuming the respondent has accurate information about all household members.

Similarly, estimating total household income would require understanding the contribution of each income source to the total household income – data that is also challenging to collect. In addition, respondents might underreport because of different privacy concerns and certain sources, like government cash programs, may not be seen as income, or simply incomes might be wrongly estimated.

Since it is common for rural households, particularly in the cocoa growing areas of Ghana and Côte d'Ivoire, to earn the majority of their income via sales of crop, calculating net income from crop production is crucial. This calculation is also not trivial, since it requires, at a minimum, data on earnings from sales and costs of production.

Typically, because of poor record-keeping, recall data will be the primary source of data on estimation of production, land cultivated, prices, loses, etc. Recall data is known to be of poor quality. The quality of this data will also vary per crop. Table 9 shows the level of record keeping by cocoa households in the KIT study. On average, only 32% of the cocoa households kept records, and if they did, they kept record of production figures.

Table 9 Record keeping by cocoa households

	All	Female-headed	Male-headed, typical	Male-headed, large
Households that kept written cocoa records	32%	14%	37%	39%
Type of record kept (if records were kept)				
Expenditure on inputs	46%	39%	47%	48%
Expenditure on hired labor	24%	18%	25%	24%
Number of household labor days	16%	18%	18%	13%
Production volumes	35%	24%	36%	38%
Volumes sold, price and money received	91%	91%	90%	93%

Data on production costs are therefore even more difficult to estimate since it also spans different activities, which are paid differently and happen in different periods during the season. Another complication is that production inputs or services from cooperatives are often acquired on credit, which might be already discounted from payments, creating another layer of noise in the available data.

When measuring against the Living Income Benchmark, a few alternatives and additions are possible. If the goal is to estimate total net income of a household, specific direct questions need to be made about values received from different sources, agricultural expenses and shares of the total household income for triangulation. Enough probing needs to take place to make sure underreporting is minimized and nothing is

forgotten. A focused effort needs to be made to understand differences between gross and net income flows, and flows where discounts are already being made.

Any kind of major records would be useful to estimate incomes. For example, if farmers are members of a producer organization that records farmer production for payment, this can be an important source of data. If farmers received inputs or loans based on their production or land size, the data supporting the inputs distribution or loan allowance is also of value.

Since income is expected to a pathway to improving the standard of living of households, analyzing the actual incomes can be complemented by the analysis of other wealth indicators. The advantage is that wealth indicators, particularly asset-based wealth indicators, can be easier to measure and the Living Income Community of Practice could more easily benefit from other larger studies. Therefore understanding the correlation between achieving the Living Income Benchmark and the levels of asset-based wealth index can be a complementary tool. We present more details about this approach in section 6.6 *Asset-based wealth measure vs income measures*.

Another addition would be measuring actual expenses. The Living Income Benchmark is based on the costs of a modeled standard of living. It would be very informative to understand from households where they actually spend their incomes. For households with expenditure levels around the Living Income Benchmark, the composition of their expenses would be very important to refine and validate the Benchmark. For households with expenditures below the Benchmark, measuring actual expenses would be crucial to understand the choices made and where critical interventions need to be made. In sections 6.7 and 6.8 we present some thoughts on food and housing, respectively.

The Living Income Community of Practice would benefit from defining clear guidelines on options and valid approaches to measuring against the Benchmark in order to have comparability across multiple actors, understand the progress towards Living Income, refine the Benchmark and improve potential policy advice.

6.3 Unit of analysis for Living Income Benchmark and gap

The Living Wage Benchmark is reported in 'per worker per month'. For a Living Income Benchmark, we strongly advise that reporting is in 'per family per year'. The reason for this is that, to measure against the Benchmark, it is necessary to combine income from multiple persons and multiple sources. These sources are also seasonal and payments can also be concentrated in different periods during the year. The total annual household income is a more reasonable unit of aggregation than any other.

We also strongly advise against converting to 'per person per day'. The reason is that poverty lines, which are typically reported in per person per day, are embedded in a series of technicalities that are surprisingly complex. First of all, poverty lines are set in international dollars of a specific year, which require conversion of these values over time, which is often not (correctly) done. Moreover, the international poverty lines are the aggregation of national poverty lines. National poverty lines are not all consistently calculated. Some are expressed in terms of adult-equivalents,[16] which would also require understanding the household composition of the average family used as reference. Therefore, bringing the debate to a 'per person per day' level only creates more confusion instead of analyzing at the level of 'per family per year', which is a much clearer level of aggregation.

6.4 Value of money over time

The Living Income Benchmark is calculated at a specific moment in time. Any comparison to the Benchmark will require a comparable purchasing power. When the data collected for measuring actual incomes is from a different moment in time than the data collected to estimate the Benchmark, a conversion needs to be made.

We recommend using the country variation in the Consumer Price Index in local currency. We strongly advise the Living Income Community of Practice to make a clear methodological choice on this to allow for comparability and progress.

6.5 Value of crops consumed at home and value of other in-kind income

An important component of the Living Income Benchmark is the cost of food, which accounts for 52% of the Living Income Benchmark value in Ghana.

Households in cocoa growing areas in Ghana generally grow a number of different food crops, which are used for consumption and for sale. Table 10 shows the types of crop households grow in Ghana, according to the KIT study.

[16] See http://documents.worldbank.org/curated/en/837051468184454513/pdf/WPS7606.pdf

Table 10 Type of food crops households grown in Ghana

	Percentage of households
Cassava	84%
Plantain	80%
Maize	46%
Cocoyam	45%
Peppers/Chili	29%
Yam	24%
Tomatoes	21%
Palm	14%
Okra	14%
Eggplant	10%
Rice	6%
Bananas	6%
Coconut	4%
Oranges	3%
Cashews	3%
Pineapple	3%

Note: only includes food crops for which at least 2% of respondents reported producing

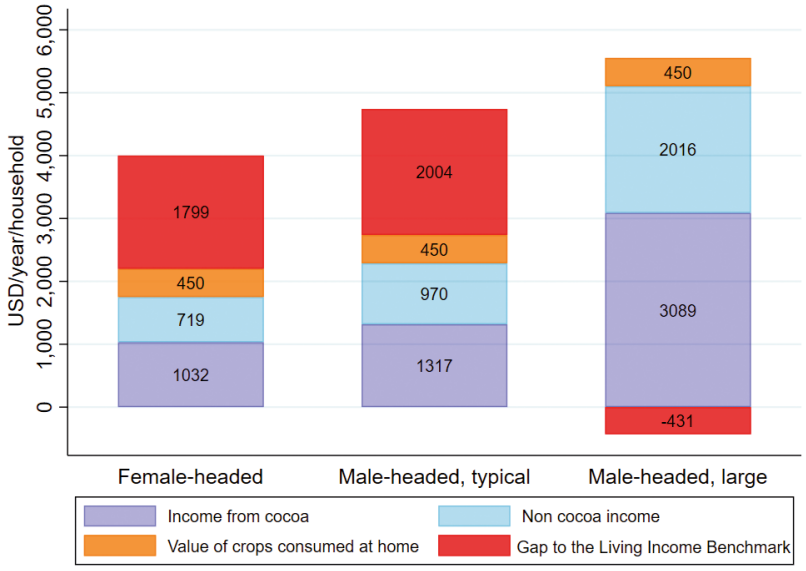
Since a meaningful part of the crop production of rural households is consumed at home, they should be valued at the same rate as they are valued for the calculation of the Living Income Benchmark, i.e., their market prices.

This calculation is also not trivial and has not been included in the main text. Calculations can be done, for example, using the reported share of food crops consumed at home. In the KIT study, cocoa households report an average of 20% of maize production being consumed at home. If we would assume that all their non-cocoa land (1.22 ha) is used for maize production (1070 kg/ha), at a price of GHS 1.53/kg, a household would have a value of USD 90 per year from maize consumed at home. A similar calculation where all non-cocoa land is assumed to produce crops which are 100% consumed at home (as a proxy), at a price of GHS 1.53/kg a household, would have a value of USD 450 per year from crops consumed at home.

The focus groups discussion data from Living Income Benchmark study, suggests a rough estimation of the value of crops produced at home to be within the range of USD 300 to 500 per year. This also does not include the value of livestock products consumed at home.

Figure 15 presents the Living Income gap if crops consumed at home are valued at USD 450 per year. In this case, the gap to the Living Income Benchmark is USD 2,004 per year for the typical male-headed household instead of USD 2,455. Still, even doubling the net income generated from cocoa, i.e. adding another USD 1,317 per year, would not be sufficient to fully close the gap.

Figure 15 Gap to the Living Income Benchmark per analytical group if crops consumed at home are valued (using average values)



Finally there are other potential sources that would reduce the need for income, such as in-kind payments and barter exchange. These are also challenging to properly measure but are also key to have a complete estimation of the total household net income. In the KIT data, there is only minimal information about barter exchange.

6.6 Asset-based wealth measure vs income measures

Alternatives, and as a complement to measuring income, are asset-based wealth measures, such as the DHS wealth index[17] and Poverty Probability index (PPI)[18]. Asset-based wealth measures are established wealth indicators and prominent in the literature.

In comparison to income-based wealth measures, these asset-based wealth measures are based on relatively easier to collect data, since indicators are based on possession of physical assets, such as machinery, or the quality of infrastructure, such as housing. On the other hand, asset-based wealth measures do not change over time as quickly as income-based wealth measures. The reason is that while household income can meaningfully vary from year to year, acquisition or selling of equipment or changes in housing quality may not happen every year.

[17] The DHS wealth index is a composite measure of a household's cumulative living standard. The DHS wealth index is calculated using data on a household's ownership of selected assets; materials used for housing construction; and types of water access and sanitation facilities. See https://www.dhsprogram.com/topics/wealth-index/

[18] The Poverty Probability Index is a statistically-sound, yet simple, poverty measurement tool . The PPI to uses 10 questions about a household's characteristics and asset ownership to compute the likelihood that the household is living below a series of poverty lines. See https://www.povertyindex.org/

Nevertheless, both approaches should move in the same direction. To investigate that, we apply statistical testing by comparing the DHS wealth index and PPI on the national poverty line of those reaching the Living Income Benchmark to those not reaching it, within each analytical group.

Table 11 Comparison of the wealth indices in relation to earning the Living Income Benchmark

	All	Female-headed	Male-headed, typical	Male-headed, large
DHS wealth index*				
Below Living Income Benchmark	-0.32	-0.36	-0.31	-0.35
Above Living Income Benchmark	-0.21	-0.35	-0.18	-0.21
p-value of a t-test	0.00	0.95	0.01	0.03
PPI, National poverty line**				
Below Living Income Benchmark	21.7	22.2	21.5	22.01
Above Living Income Benchmark	14.7	16.5	13.2	15.35
p-value of a t-test	0.00	0.30	0.00	0.01

* The DHS wealth index is a dimensionless metric varying from about -1.5 to +1.5. A higher number indicates a higher wealth level. Households with an index value in the range of -0.55 to -0.05 will be in be the 2nd quintile of national wealth.
** The PPI indicates the probability of falling under a poverty line, between 0 and 100. A higher number indicates a lower wealth level.

The results shown in Table 11 indicate, as would be expected, that there is a statistically significant relationship between earning more than the Living Income Benchmark and having a higher wealth level. A better understanding of the correlations would allow the Living Income Community of Practice to monitor progress using larger studies, such as the recurrent DHS panels.

6.7 Components of Living Income Benchmark: Food

If 83% of the households in the KIT study are not achieving the Living Income Benchmark, the next question is which components of the Benchmark are lacking. Since the costs of food accounts for 52% of the Living Income Benchmark value in Ghana, we investigate the details about food availability and affordability.

In Ghana, the availability and affordability of different food groups were discussed in the scope of the KIT study in 13 focus group discussions, involving around 650 farmers (34% women). Table 12 shows the number of focus groups (approx. 50 participants per group) in Ghana that agreed that each food group was 'generally available', 'sometimes available' or 'poorly available'. Table 13 shows the number of focus groups in Ghana that agreed that each food group was 'generally affordable', 'sometimes affordable' or 'poorly affordable'.[19]

[19] The table represents general agreement by the majority of focus group participants, even though some individual participants may have a dissenting view.

Table 12 Food group availability in Ghana

	Poor availability	Sometimes available	Generally available
Dairy	1		12
Eggs			13
Fish and seafood		1	12
Grains	1		12
Ingredients used in small quantities		1	12
Leafy vegetables		6	7
Meat and poultry	2		11
Nuts and seeds		1	12
Organ meat	4	2	7
Other fruits		4	9
Other vegetables		3	10
Pulses	1		12
Root vegetables	2	7	4
Roots and tubers			13
Tea and coffee		1	12
Vitamin A-rich foods		9	4

Table 13 Food group affordability in Ghana

	Poor affordability	Sometimes affordable	Generally affordable
Dairy	11	1	1
Eggs	3		10
Fish and seafood	8	1	4
Grains	2	9	2
Ingredients used in small quantities	4		9
Leafy vegetables		2	5
Meat and poultry	12	1	
Nuts and seeds	6	4	3
Organ meat	9	2	
Other fruits		3	8
Other vegetables		8	5
Pulses	4	7	2
Root vegetables	8		3
Roots and tubers		6	7
Tea and coffee	8		5
Vitamin A-rich foods		2	10

Table 12 suggests that, in Ghana, most food groups are 'generally available', although some food groups are more available than others. The affordability of food groups is widely perceived to be more problematic than availability.

Availability and affordability of perishable food is highly dependent on the season. In the dry season the availability of food crops is generally poor, resulting in lower consumption. When food is largely available, prices also tend to adjust, becoming more affordable.

During the cocoa main season, late September to early January, farmers have more cash available and can afford to buy more luxury food products, such as meat and milk. Just before the start of main cocoa season is the period when farmers are most food insecure.

The average Dietary Diversity Score for Women of 15 to 49 years of age (DDS-W)[20] in the KIT sample is 5, indicating that, on average, women ate 5 out of 10 food groups. About 62% of the women ate 5 or more food groups, which is considered satisfactory. We do not have enough observations of respondents achieving and not achieving the Living Income Benchmark to make a valid statistical testing, since this information was collected only from female respondents between 15 and 49 years old.

6.8 Components of Living Income Benchmark: Housing

Another major component of the Living Income Benchmark for which the KIT study can provide some data is housing, which comprises 14% of the total Living Income Benchmark. The Living Income Benchmark study presents (in Table 6), a definition of minimum standards of housing.

Figure 16 presents the percentage of households in the KIT study that achieve these minimal standards. Figure 16 shows that almost all households have acceptable roofs, where the more problematic issue is private toilet (about 38% of the sample). Table 14 shows the number of acceptable items per analytical group. There is an average of 4.6 items, with no meaningful differences between groups.

[20] The DDS-W varies from 0 to 10, which indicates how many unique food groups have been eaten in a 24 hour recall. See https://www.fantaproject.org/monitoring-and-evaluation/minimum-dietary-diversity-women-indicator-mddw.

Figure 16 Percentage of households with acceptable housing items, by analytical group

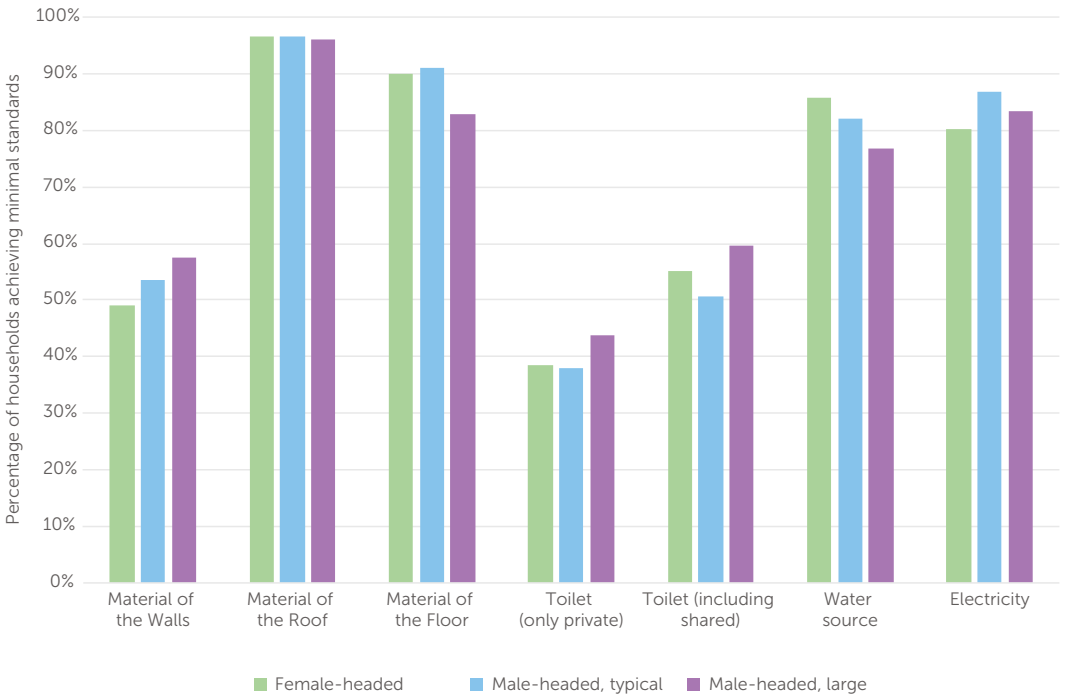


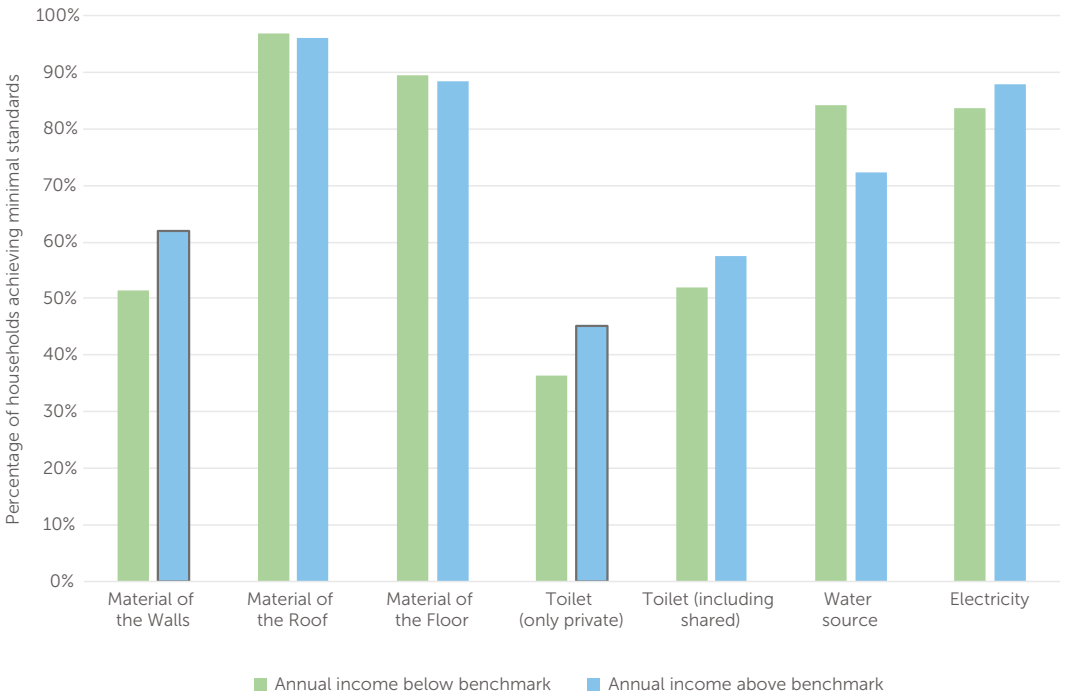
Table 14 Number of acceptable housing items

	All	Female-headed	Male-headed, typical	Male-headed, large
Number of acceptable items*				
No items	0%	0%	0%	0%
1 item	2%	1%	2%	3%
2 items	4%	4%	3%	5%
3 items	11%	13%	10%	11%
4 items	22%	22%	23%	20%
5 items	39%	37%	40%	37%
6 items	23%	23%	22%	24%
Average number of acceptable items*	4.6	4.6	4.6	4.6

*counting acceptable toilet as a single item, shared or private

Figure 17 compares those below with those above the Living Income Benchmark. The improvements in walls and private toilet are statistically significant. The KIT data also suggests that a higher number of sleeping rooms is (statistically) related to achieving the Benchmark. The average number of sleeping rooms is 4.75 for those with annual income below the Benchmark and 5.58 for those with annual income above the Benchmark.

Figure 17: Percentage of households with acceptable housing items, by Benchmark achievement



Note: thicker outline indicates a statistically significant difference at the 5% level

The analysis is limited since the KIT study does not include all items mentioned by the Living Income Benchmark report for acceptable housing and has only limited data on the actual quality of these items and the sizes of the dwellings. With these caveats, the above analysis suggests that some housing items above, such as roofing or flooring, are not limiting factors and are already at an acceptable level. On the other hand, walls and private toilet are often below minimal standards and are exactly the items where we see differences between households below and above the Living Income Benchmark, alongside the number of rooms, suggesting where investments are made.

6.9 Household labor commitment

In designing approaches to closing the income gap, it is important to understand how much household labor is already committed to the major crop. Table 15 shows the number of household labor days used in cocoa production and the share of the household labor supply already committed to cocoa production.

Table 15 Household labor committed to cocoa production activities

	All	Female-headed	Male-headed, typical	Male-headed, large
Average total person-days/year/household	68.9	36.8	67.9	111.8
Detailed composition *Average person-days/year/household*				
Land clearing	1.5	0.7	1.8	1.5
Land preparation	1.0	0.4	1.2	1.2
Planting	3.5	2.6	3.7	3.8
Granular fertilizer application	1.3	0.8	1.3	2.1
Liquid fertilizer application	2.5	0.8	2.5	4.5
Manure/compost application	0.1	0.1	0.2	0.1
Herbicides application	3.9	1.4	4.5	5.3
Pesticides application	5.8	2.3	5.3	11.6
Fungicides application	4.6	1.2	4.9	7.8
Weeding	12.2	5.8	11.8	19.7
Pruning	5.4	1.1	5.1	12.0
Harvesting	16.9	12.1	14.8	31.2
Pod breaking	6.4	4.6	6.6	7.9
Transporting	3.7	2.9	4.2	3.1
Commitment				
Potential labor supply*	659	580	646	732
Share of household labor committed to cocoa production	10%	6%	11%	15%

* based on the number of income earners and 250 working days per year

Table 15 shows that, on average, male-headed, typical households commit about 11% of their potential labor supply to cocoa production activities, in approximately 68 person-days per household per year. Female-headed household commit slightly less (6%), with an average of about 37 person-days per household per year. This finding is in line with the higher hired labor costs faced by female-headed households. Male-headed, large households use slightly more, 15%, of their labor supply.

We cannot say, however, how much of the remaining labor supply is committed to other on-farm, off-farm work or household work. It is also not possible to say how flexible the work burden allocation would be if other activities were taken up, or if the cocoa production household labor demand was increased.

We also advise caution on the use of these numbers. This is because the seasonality of agricultural activities is not straight-forward to understand the elasticity in household labor supply. Moreover, reporting on household labor supply to agricultural activities can be subject to much noise and underreporting, particularly when young members of the household are involved in agricultural work.

6.10 Standardized guidance

A final overall recommendation is that the Living Income Community of Practice develops standardized guidance on how to measure against the Benchmark. It is crucial that such a guide is made to allow for comparability of different analysis and to indicate what the Living Income Community of Practice believes to be helpful in advancing the knowledge and the debate. Without a proper guidance, each researcher will make its own choices. These choices are not better or worse, but different, which prevents a proper harmonization.