Cocoa Farmer Income

The household income of cocoa farmers in Côte d'Ivoire and strategies for improvement

April 2018

True Price™

FAIRTRADE INTERNATIONAL

Introduction

1

Executive summary: The household income of cocoa farmers in Côte d'Ivoire and strategies for improvement

- Fairtrade works together with cocoa farmers and cocoa cooperatives in Cote d'Ivoire.

- Fairtrade's mission is to empower these producers to combat poverty, strengthen their position and take more control over their lives.

- Fairtrade wanted to have more information on the actual household incomes of cocoa farmers in Côte d'Ivoire. To assess this, household income data was collected in 2016 in collaboration with COSA and GeoTraceability. This covers 3202 Fairtrade smallholder cocoa farmers from 23 cooperatives in Côte d'Ivoire. This report presents the results of analysis of the data set. The method for analysis was co-developed by Fairtrade and True Price, which was previously applied for coffee.

- The average household income is $2707/year. This is significantly below the living income of $7318/year, but above the extreme poverty line of $2276/year. 7% of all farmers currently earn a living income. Within the sample, smaller households are better off than large households.

- Contributions of Fairtrade are positive. The trainings provided by SPOs (and supported by Fairtrade) correlate significantly with higher yields. In addition, pesticides and fertilizers are often provided at low prices by SPOs. These are also positively correlated to yields.

- Lifting the poorest farmers out of poverty is particularly challenging. A holistic approach is needed to increase their earnings.

About this report

This report consists of 6 chapters. The introduction gives an executive summary of the study and navigation of this report.

The second chapter describes the model used, the way the data was processed, and the main descriptive statistics.

In the third chapter, the results of the study are given. This includes the average household income, the living income methodology and results, the distribution of household income, a zoom-in on the cost-of-production, an analysis of income from other goods, and some insight on household size distribution and the Fairtrade premium.

The subsequent chapters provide analyses of the results, including the role of the Fairtrade Premium and Fairtrade Minimum Price is assessed.

The fourth chapter gives an insight into the value added of the cocoa farming: the profit plus the labour costs.

In the fifth chapter investigates under what conditions farmers' circumstances can be improved. It begins with the aim of this analysis, then shows its methods and results, and concludes with insights from the analysis and possible applications.

The sixth chapter concludes and the appendix provide an overview of the variables in the model and the methodological choices and key assumptions used for data processing.

About True Price

Authors and acknowledgements

Andrea Rusman (True Price)

Reinier de Adelhart Toorop (True Price)

Jelmer de Boer (True Price)

Adrian de Groot Ruiz (True Price)

About True Price

True Price is a social enterprise that aims to contribute to a circular and inclusive economy that creates value for all people by providing the information needed for such an economy. True Price helps organizations – multinationals, SMEs, NGOs, governments – quantify value and improve their economic, environmental and social impacts. True Price works directly with organizations by providing research services. In addition, True Price enables organizations to measure their impact by developing open source methods for impact measurement that are relevant, sound and inclusive.
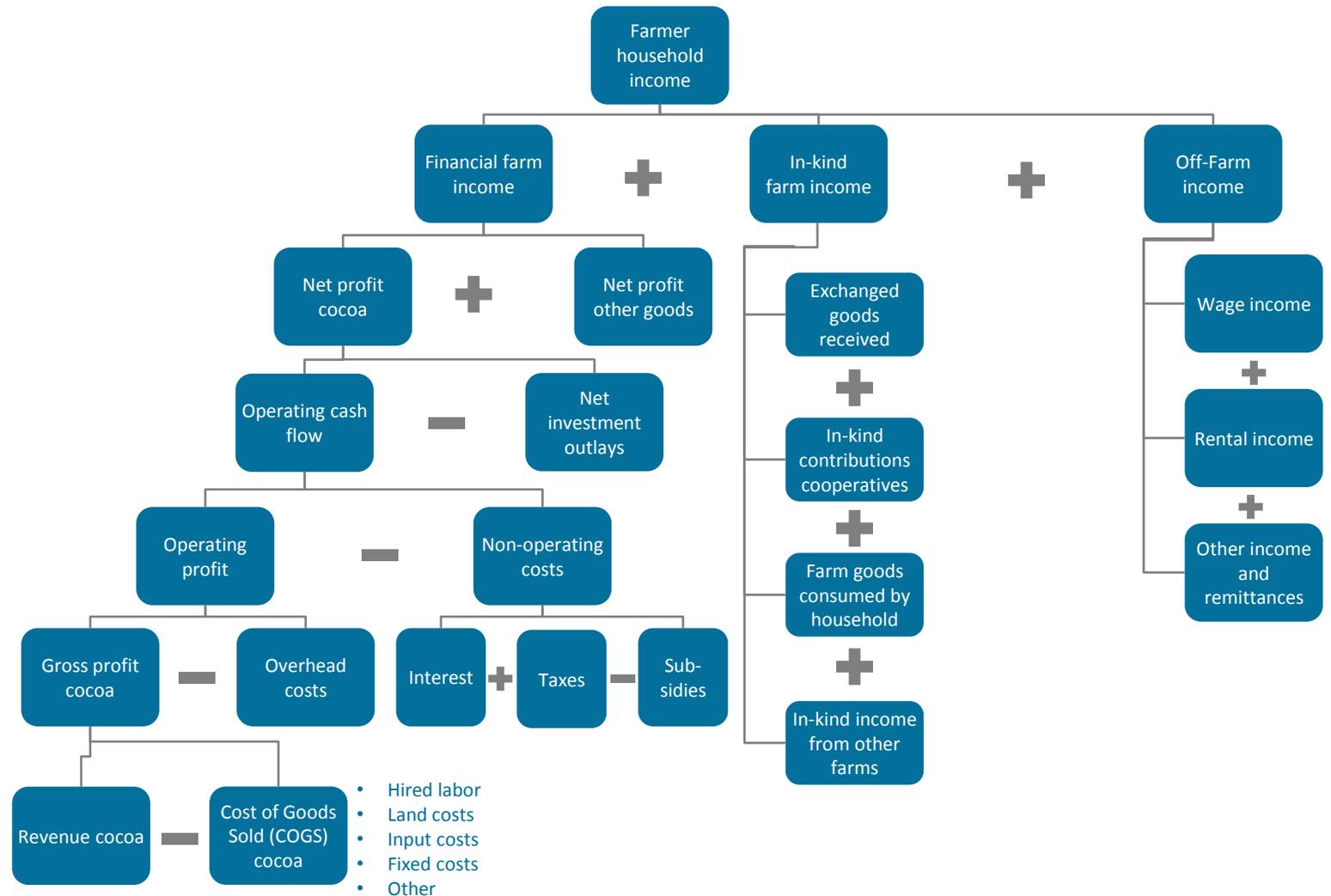
www.trueprice.org

Methodology and descriptive statistics

2

Overview farmer income model[1]

- The perspective of the model is farmer wealth (current and future income) not economic profit; therefore, opportunity costs[2] are excluded
- The standard comprehensive income model was adapted to a farm with a focus on cash available to the farmer
- Financial farm income was extended with in-kind farm and off-farm income

Farmer household income

Financial farm income **+** In-kind farm income **+** Off-Farm income

Net profit cocoa **+** Net profit other goods

Operating cash flow **−** Net investment outlays

Operating profit **−** Non-operating costs

Gross profit cocoa **−** Overhead costs

Interest **+** Taxes **−** Sub-sidies

Revenue cocoa **−** Cost of Goods Sold (COGS) cocoa
- Hired labor
- Land costs
- Input costs
- Fixed costs
- Other

Exchanged goods received **+** In-kind contributions cooperatives **+** Farm goods consumed by household **+** In-kind income from other farms

Wage income **+** Rental income **+** Other income and remittances

[1] An explanatory list of the variables is provided in the appendix.

[2] Opportunity costs refer to a benefit that a person could have received, but gave up, to take another course of action.

Data

- Most data points are (derived from) primary data from the field study Fairtrade commissioned.

- Various elements of farmer income were not collected in the field study but are not deemed material.

- A few elements of farmer income cannot be assessed from the collected data and are deemed potentially material: Interest costs (of loans taken), subsidies and in-kind contributions from cooperatives. These items are estimated at respectively 2.4%, 0.1% and 1.1% of cocoa revenue. This is based on secondary literature on cocoa and an earlier farm income study of Fairtrade on coffee.

- Membership fees for the cooperatives are not included, as these are typically paid once at registration. An analysis is included in the appendix.

- Water costs have not been collected and are assumed to be zero.

- Fixed costs include items such as ropes, axes and tarpaulins. The costs are used on an expense basis and not a depreciation basis.
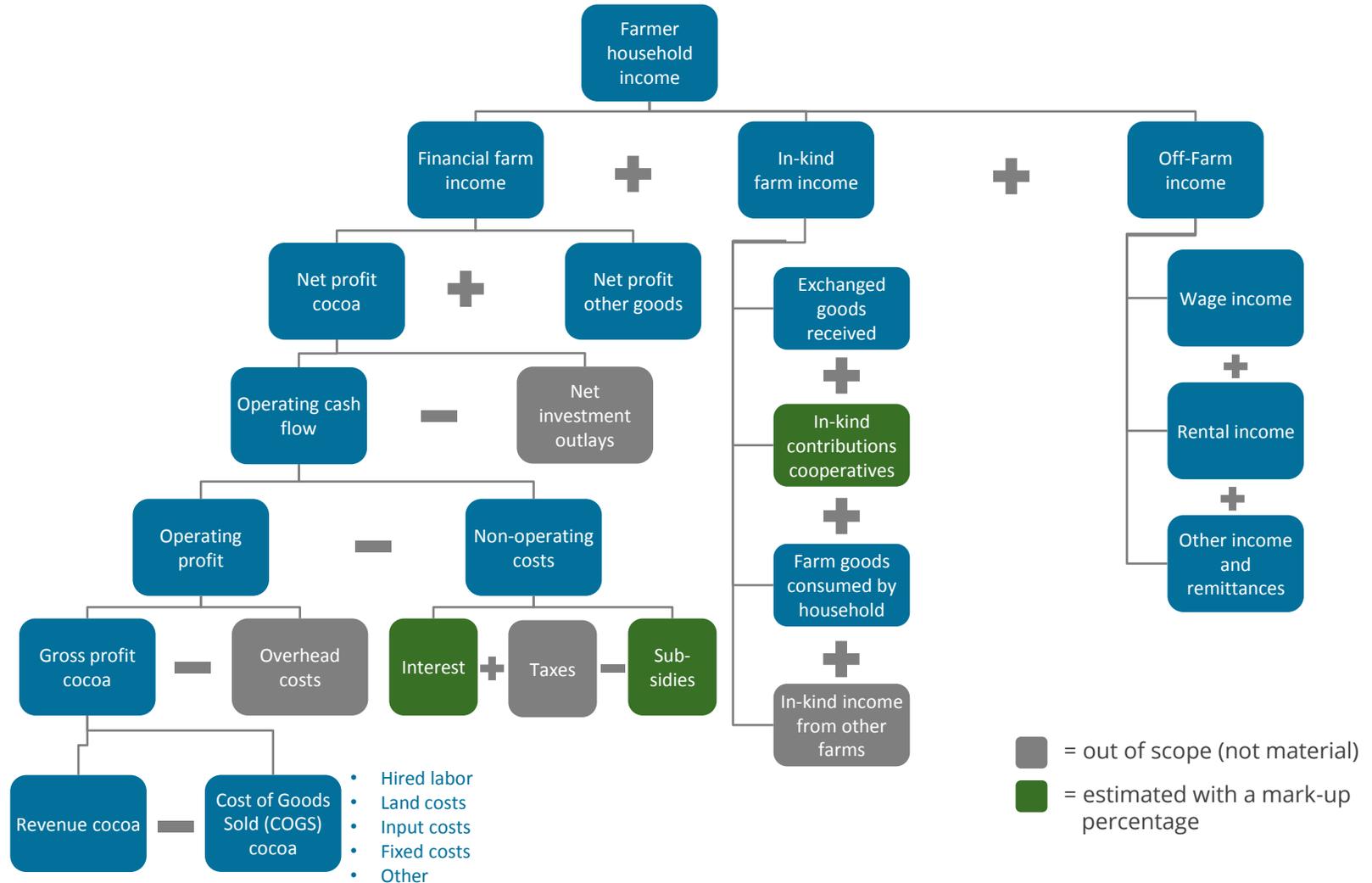
Our approach to data processing: fill data gaps with relevant median values and remove unrealistic outliers

- The study is based on two questionnaires conducted in 2016, covering 3235 farmers and 23 cooperatives.

- Farmer household income, as well as other relevant outcomes, are calculated based on the responses of the farmers.

- Where farmer input was missing, unclear or likely to be incorrect, we have 'cleaned' the data as well as possible. We used the following 'rules':

  - Empty cells and cells containing "Not Applicable" or "NA" were replaced by 0.

  - Cells containing "Does not know" or "Refuse to answer" were put to the median of the non-zero values for that category. A justification is provided in the appendix.

  - A numerical value was inserted for text in order to be able to do calculations (e.g.: a pay rate that is "Monthly" was changed to "12").

- Some categories contain 'outliers' or inconsistent data points that are processed. An extended list of assumptions on the handling of these points is provided in the appendix.

- Some farmers did not provide enough data to process. Those 33 farmers are omitted from the calculations. The remaining 3202 farmers are included in the analysis that is described in the remainder of this report

- Some delivered data leaves room for multiple interpretations. A list of ambiguities and respective choices of interpretation is given in the appendix.

Descriptive statistics

- The descriptive statistics below are unweighted medians and averages.
- These statistics are based on a sample size of 3202 farmers who are distributed over 23 different cooperatives in Côte d'Ivoire.
- These statistics are obtained after the procedures on filtering of the data, described globally on previous slides and extensively in the appendix, have been applied.
- The cooperatives are located in the regions Agneby-Tiassa (1), Bas-Sassandra (10 & 27), Cavally (7), Goh (11), Indenie-Djuablin (18), La Me (20), Loh-Djiboua (21), Marahoue (22), Nawa (24) and Sud-Comoe (28).

Indicator	Unit	Median	Average
Total farm area	ha	5.0	6.7
Area of cocoa production	ha	4.0	4.9
Amount of cocoa trees	#	5000	6352
Trees per hectare	#/ha	1320	1348
Kilos of cocoa produced	kg	1500	1999
Profit per kilo cocoa	USD/kg	1.1	0.9
Yield	kg/ha	400	437
Hired FTE	#FTE	0.1	0.8
Wages (of hired labour)	USD/FTE	$343	$530
Quality of life	scale[2] of 1-5	4.0	4.1
Household size	# people	8.0	9.0
Model household[1]	# adults and children	4.3 adults, 3.7 children	4.9 adults, 4.1 children
FTE in model household	#FTE	2.7 FTE	3.0 FTE
Percentage of trees below 5 years	%	2%	13%
Percentage of trees between 5 and 25 years	%	55%	51%
Percentage of trees over 25 years	%	5%	35%
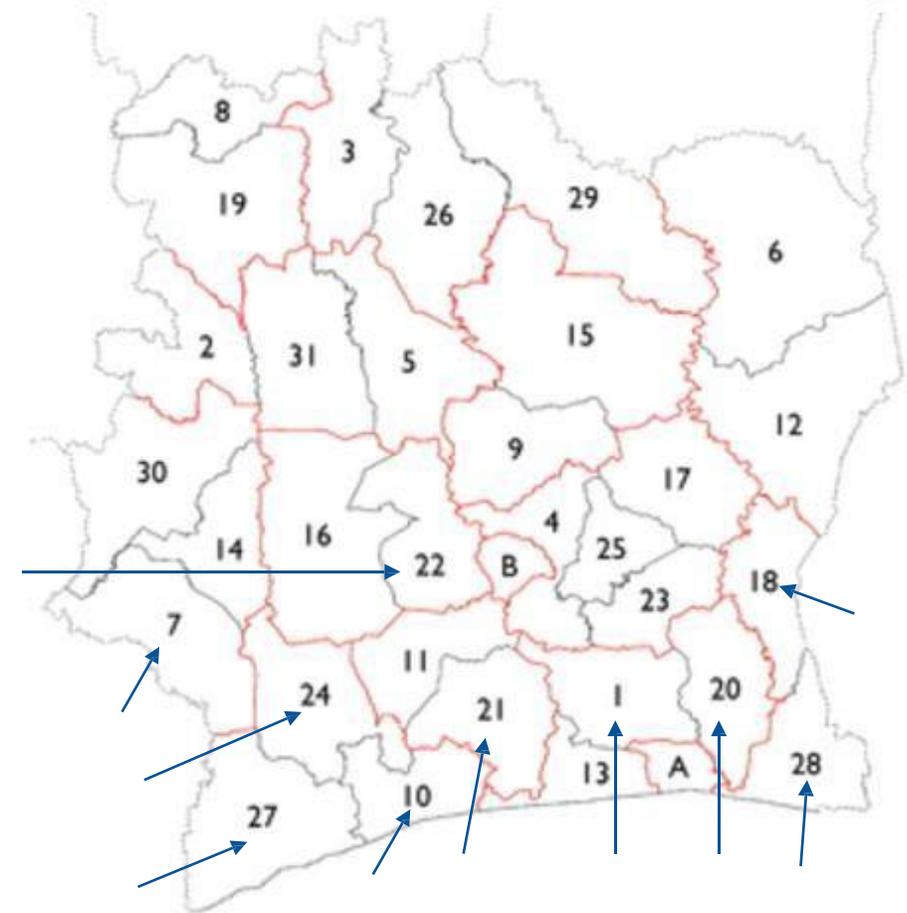
[1] The median number of adults and children are respectively 4 (of which 2 FTE working) and 3. These numbers do not add up to the median number of people in the household, which is 8, because medians cannot be added. Therefore, the model household is constructed using the ratio of adults to children of the full sample.

[2] This scale goes from "very bad", 1, to "very good", 5. This quality is assigned by the farmers themselves on how they perceived the quality of life of the household last year.
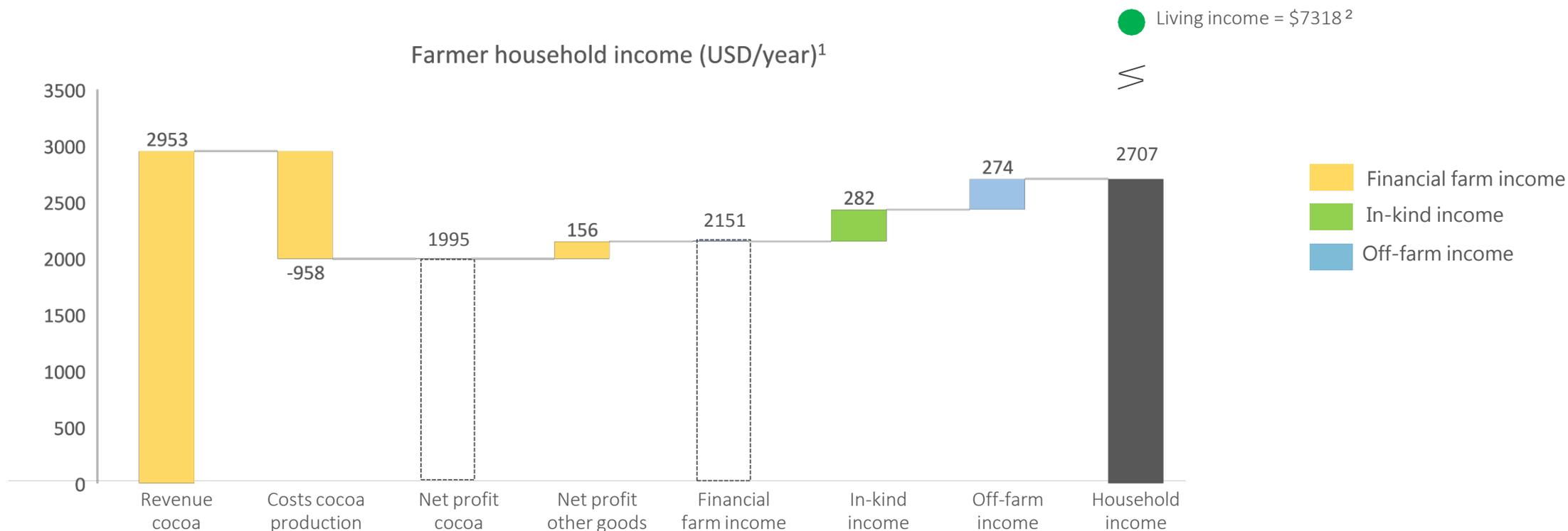
Results

3

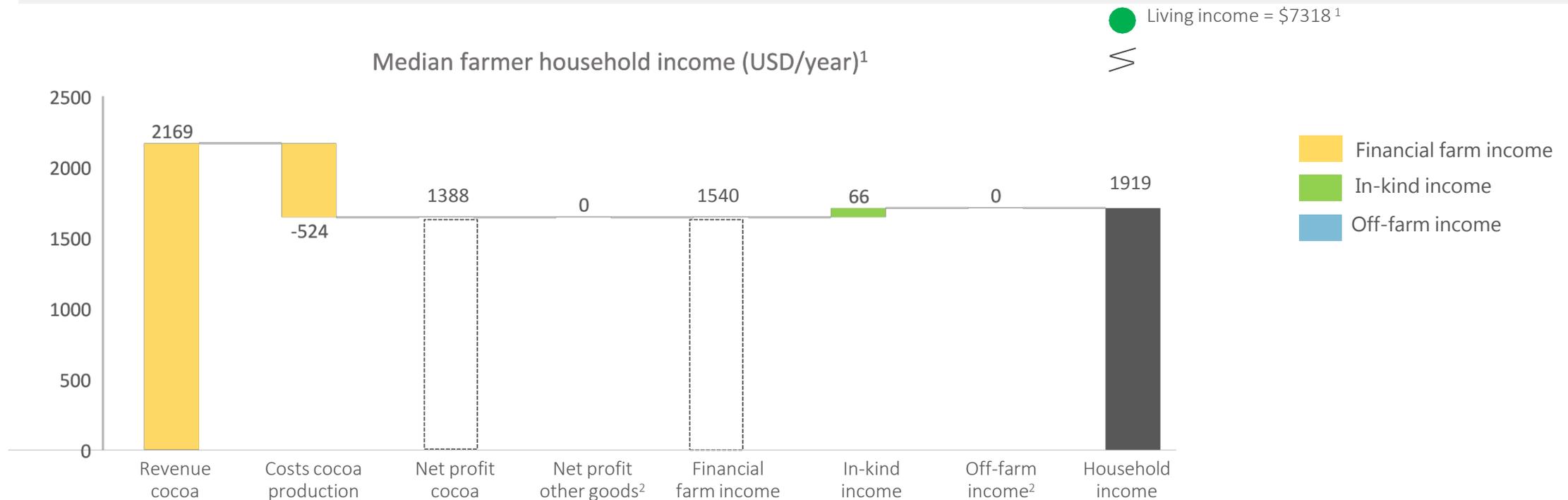# The average farmer household income is $2707 per year

Key insights
- The household income is not sufficient to make the living income. On average, cocoa farmer households earn only 37% of a living income in rural Côte d'Ivoire.
- Cocoa is the main source of income: 74% percent of the farmer household income stems from the profit on cocoa.
- The households make 6% of their income from selling other goods, whereas off-farm income and in-kind income account for 10% and 10% of the total household income respectively.

Living income = $7318 [2]

Farmer household income (USD/year)[1]

Legend:
- Financial farm income
- In-kind income
- Off-farm income

Chart values:
- Revenue cocoa: 2953
- Costs cocoa production: -958
- Net profit cocoa: 1995
- Net profit other goods: 156
- Financial farm income: 2151
- In-kind income: 282
- Off-farm income: 274
- Household income: 2707

[1]This calculation is based on the average household.
[2]This calculation is based on a median household size of 8, since medians are less susceptible to the values of outliers.

The median farmer household income is $1919 per year

● Living income = $7318 [1]

Median farmer household income (USD/year)[1]

Legend:
- Financial farm income (yellow)
- In-kind income (green)
- Off-farm income (blue)

Values: Revenue cocoa 2169; Costs cocoa production -524; Net profit cocoa 1388; Net profit other goods[2] 0; Financial farm income 1540; In-kind income 66; Off-farm income[2] 0; Household income 1919

[1]This calculation is based on the median household, which has a household size of 8 members.
[2]A median household has no income from other sources than the cocoa and the in-kind benefits of other crops and cattle.

A living income for a typical 8-member household in Côte d'Ivoire is estimated at USD 7,318 per year

Methodology

The living income calculation is based on the method of Anker & Anker[1] for calculating the cost of a decent standard of living, and on the average household composition as in the primary data from the sample.

We use the median number of family members (8) in our calculations. Based on the average ratios in the sample, 4.3 family members are adults (of which the equivalent of 2.7 working full time) and 3.7 are children. The argument for using the median is that this is less sensitive to the fact that some farmers reported *very* large family sizes (>25 people, see also the appendix).

A living income covers the cost of food, housing, clothing, healthcare and transportation. It includes a limited budget for telecommunications and savings for adults and the costs of education for children.

In addition, working adults need to pay taxes[2] and insurance costs for working adults are included in order to guarantee an income in case of illness or unemployment.[3]

The estimated Living income is USD 7,318 per year for the average cocoa household, which is significantly higher than the World Bank's poverty line at USD 3,713 for an 8-member household.

Results

| Household composition			Work-related costs per FTE		
Number of adults	4.3		Unemployment insurance	$	51
Of which working adults (FTE)	2.7		Sick leave insurance	$	48
Number of children	3.7		Taxes	$	434
			Total additional per FTE	$	532
Costs per child			*Costs per adult*		
Food	$	250	Food	$	375
Housing	$	241	Housing	$	241
Clothing	$	36	Clothing	$	36
Healthcare	$	18	Healthcare	$	18
Education	$	13	ICT	$	29
Transport	$	65	Transport	$	65
			Savings/unforeseen expenses	$	64
Total per child	$	624	Total per adult	$	828

Total household living income $7,318

1) Anker, R. and Anker, M. (2017). Living wages around the world. Manual for measurement.

2) We understand that cocoa farmers are small enterprises that are in theory obliged to pay profit taxes, although in practice they rarely do so. In the living income, this is included to comply with the strict interpretation of the tax law. If evidence can be found that cocoa farmers are not due to pay this tax, it could be omitted from the calculation, reducing the living income.

3) The method assumes that elderly people are supported by their working relatives. Alternatively, the living income can include a 'retirement insurance' of ~ $ 131 per FTE or ~$ 354 per household

Distribution of the household income: most farmers earn below the poverty line

Household income (USD/year)
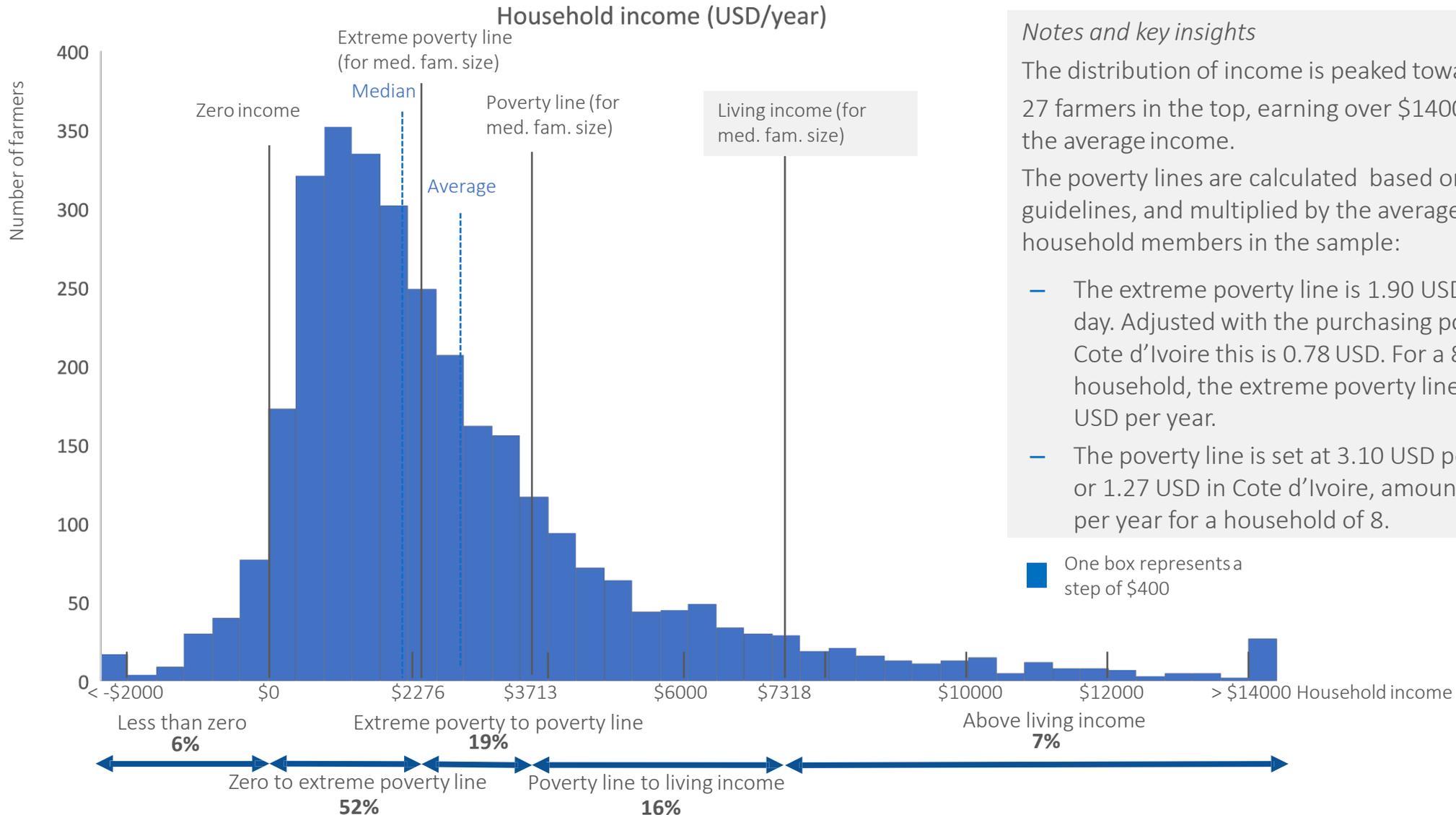
Notes and key insights

The distribution of income is peaked towards low incomes.

27 farmers in the top, earning over $14000 per year, drive up the average income.

The poverty lines are calculated based on World Bank guidelines, and multiplied by the average number of household members in the sample:

- The extreme poverty line is 1.90 USD per person per day. Adjusted with the purchasing power parity rate for Cote d'Ivoire this is 0.78 USD. For a 8 member household, the extreme poverty line would be 2276 USD per year.

- The poverty line is set at 3.10 USD per person per day, or 1.27 USD in Cote d'Ivoire, amounting to 3713 USD per year for a household of 8.

One box represents a step of $400

The income distribution per person per day also peaks at low incomes

Average income per person in household per day
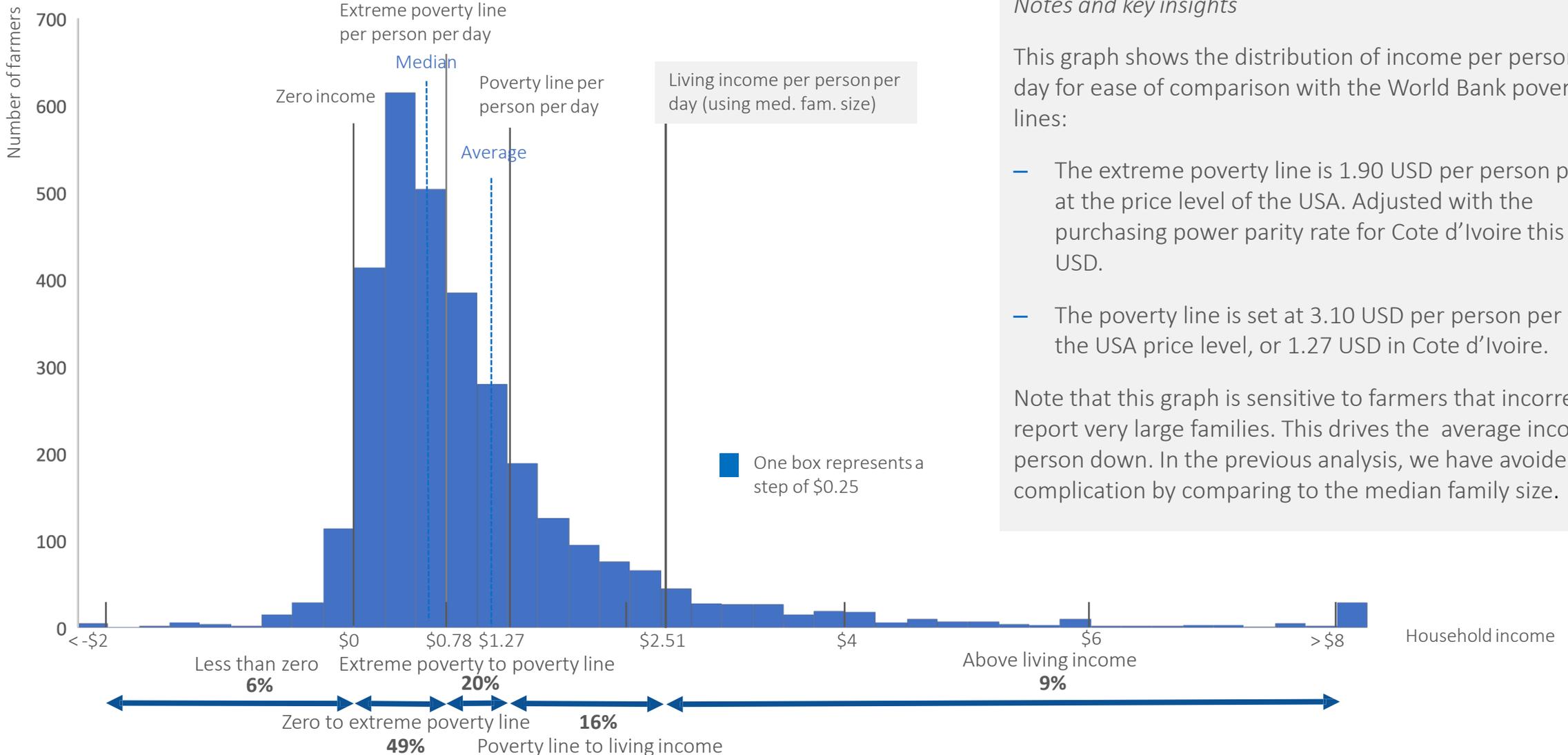
Notes and key insights

This graph shows the distribution of income per person per day for ease of comparison with the World Bank poverty lines:
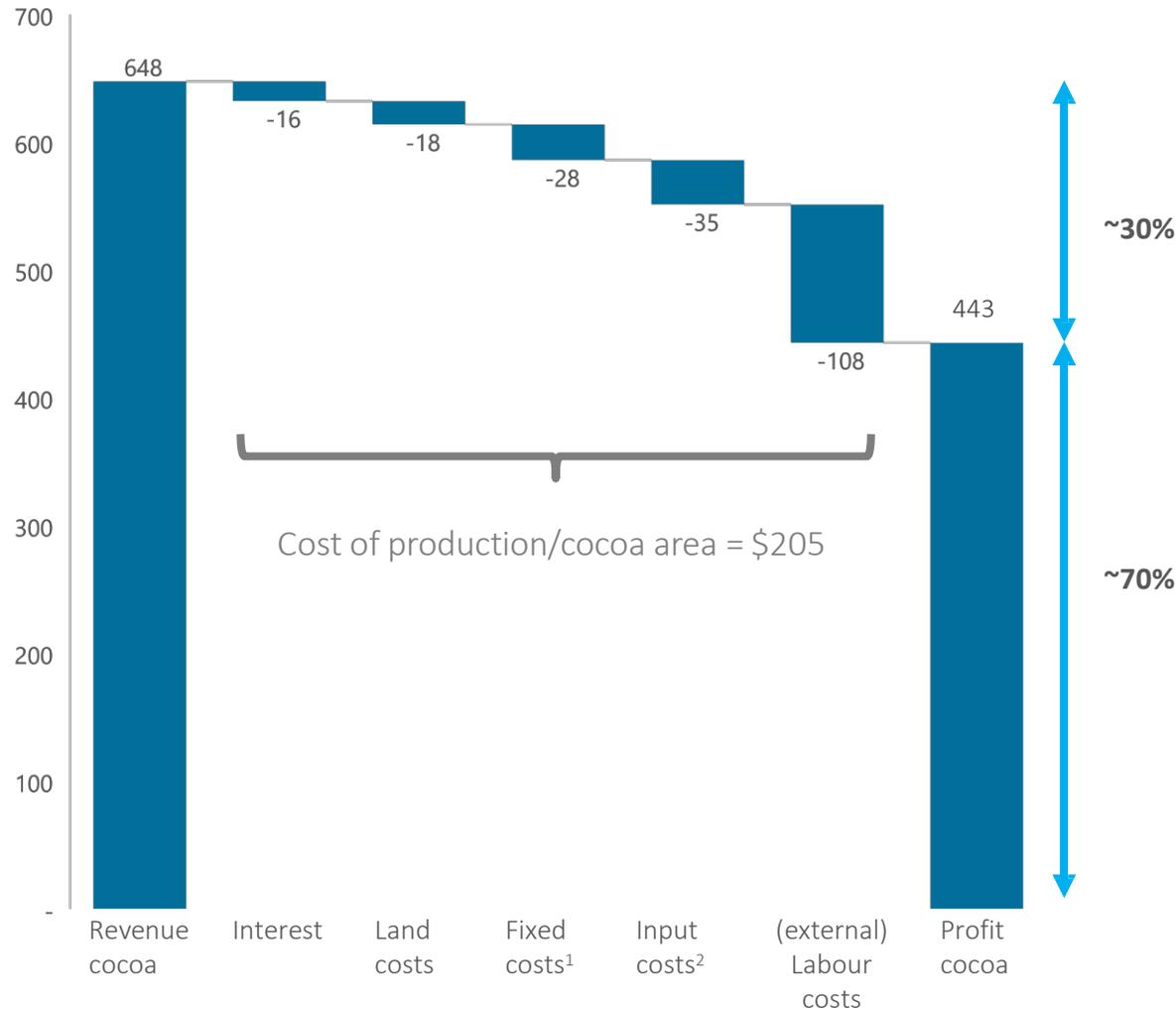
- The extreme poverty line is 1.90 USD per person per day at the price level of the USA. Adjusted with the purchasing power parity rate for Cote d'Ivoire this is 0.78 USD.

- The poverty line is set at 3.10 USD per person per day at the USA price level, or 1.27 USD in Cote d'Ivoire.

Note that this graph is sensitive to farmers that incorrectly report very large families. This drives the average income per person down. In the previous analysis, we have avoided this complication by comparing to the median family size.

Low cost of production for cocoa, but in line with other studies

Profit from cocoa production per cocoa area (USD/ha)

Cost of production/cocoa area = $205

~30%

~70%

Revenue cocoa: 648
Interest: -16
Land costs: -18
Fixed costs[1]: -28
Input costs[2]: -35
(external) Labour costs: -108
Profit cocoa: 443

Comparison of costs of cocoa production (USD/hectare):
Costs of production are low, but in line with other studies. All results exclude the opportunity costs of household labour.

Study	Value	Comment
Cost of production current Fairtrade study	205	Did not include household labour costs, did include external labour costs
Cost of production cocoa in Côte d'Ivoire 2014	123	Did not include fixed costs or land costs
Cost of production cocoa in Côte d'Ivoire 2016	324	Labour costs were calculated with living income; included depreciation costs

Notes

• The costs of cocoa production exclude water costs (not part of the questionnaire). These costs might increase the production costs with approximately 8%.

• On average, additional costs of cooperative registration are 1% of the total farmer household income. These are not included in the analysis. A full overview of the cooperative costs are given in the appendix.

[1]Fixed costs include machete, machete file, tarpaulins, pick, basket, rope, axe, mechanic pruner, bag, boots, bucket, fuel and other fixed costs
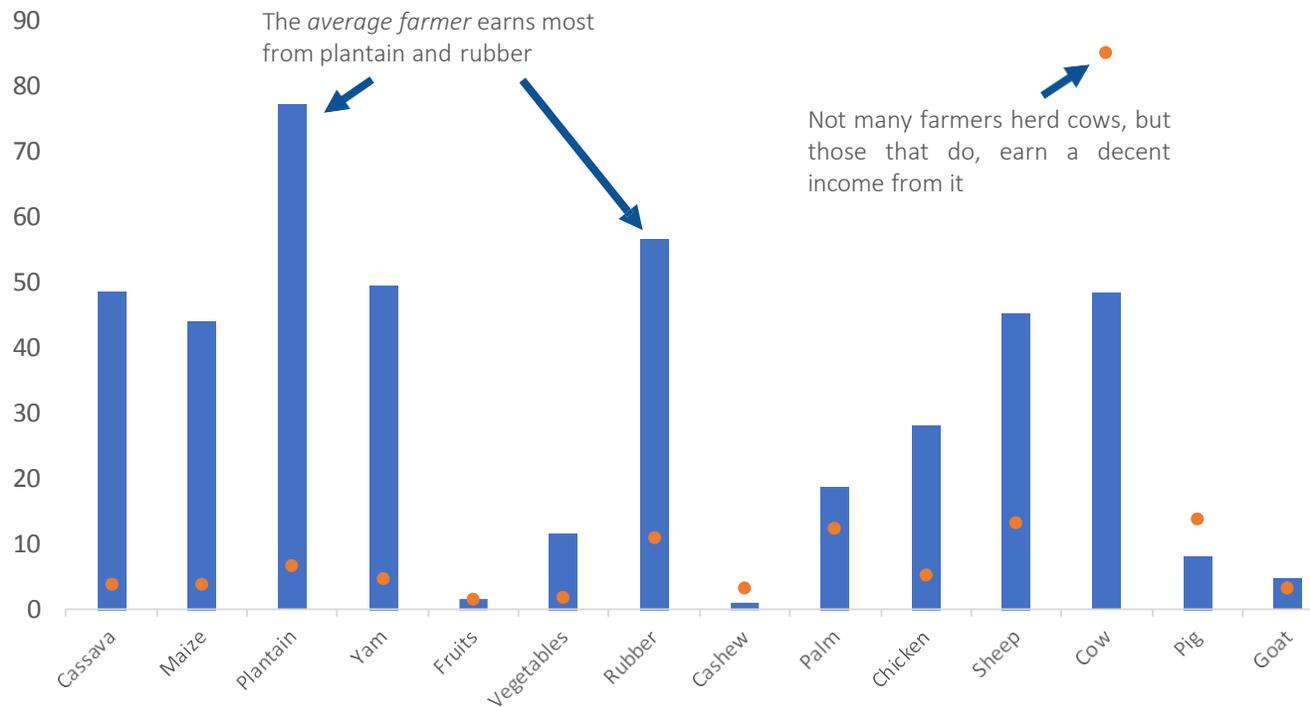[2]Input costs include fertilizer, pesticide, transport and seedlings costs

Analysis of net income from other goods

Average net income other goods per farm (USD/farm)

Notes

- Over 55% of the farmers have diversified their production to some degree and produce other goods next to cocoa

- Growing crops is more popular than keeping animals

- Other goods serve both as a form of in-kind income (29% produce other goods only for in-kind purposes) and as a form of financial revenue (12% produce other goods only for sales purposes). 59% of farmers produce other goods both for in-kind and for financial inco me

Blue bars: average income per crop/animal over all farmers (not all of them grow this crop/herd this animal)

The *average farmer* earns most from plantain and rubber

Not many farmers herd cows, but those that do, earn a decent income from it

Orange dots: average income for farmers that do grow a certain crop/herd a certain animal

	Cassava	Maize	Plantain	Yam	Fruits	Vegetables	Rubber	Cashew	Palm	Chicken	Sheep	Cow	Pig	Goat
Percentage of farmers that cultivate this good	28%	26%	26%	24%	2%	16%	12%	1%	3%	12%	8%	1%	1%	3%
Percentage of farmers that earns more than 10% of their household income from the cultivation of this good	10%	7%	8%	6%	0%	3%	5%	0%	2%	3%	5%	1%	1%	1%

Smaller households are better off than large households: More than 50%[18] of households with ≤ 8 members earn above extreme poverty
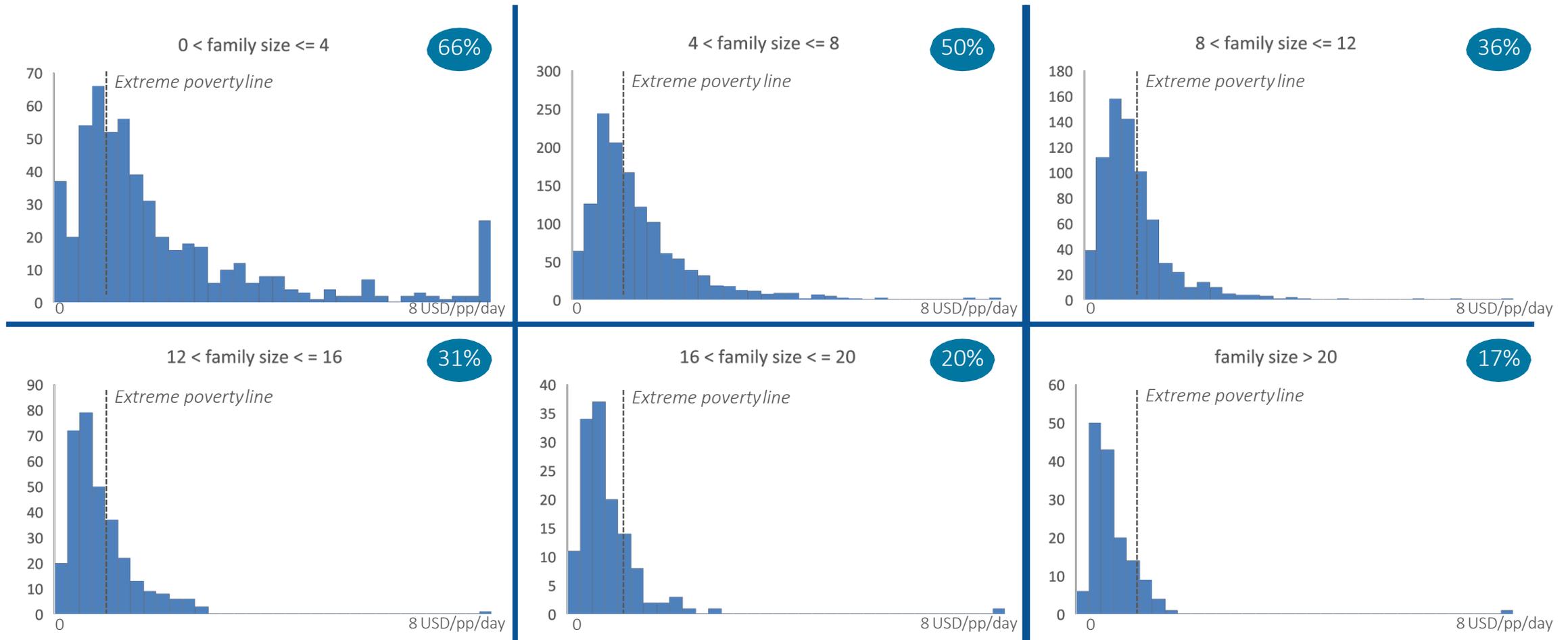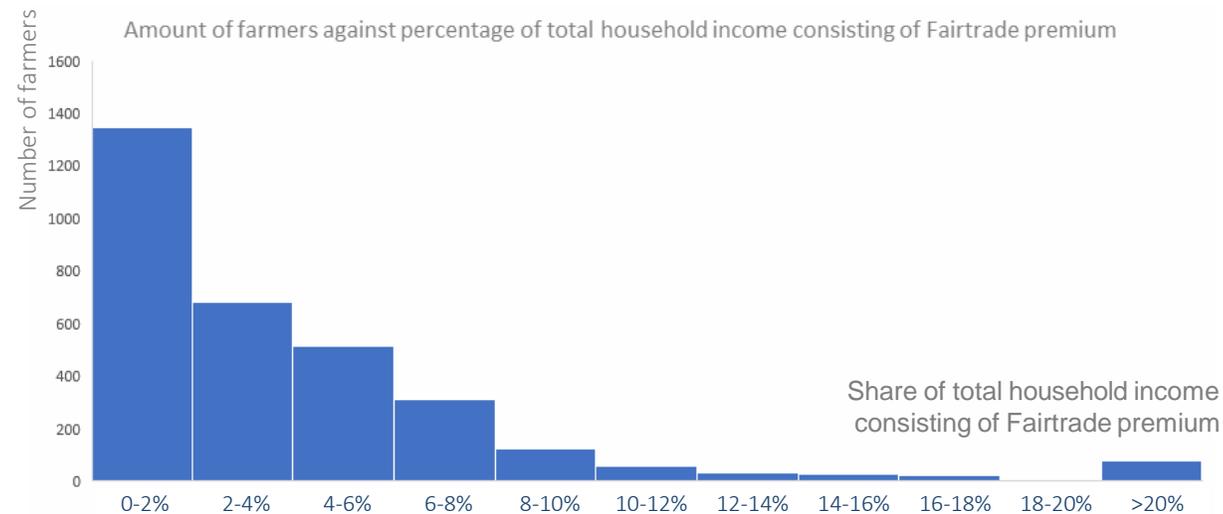
Fairtrade premiums help farmers earn more, but more support might be needed

Two elements of the use of Fairtrade premiums can be quantified. Note that this is not exhaustive. Data about other applications (e.g. in-kind benefits from SPOs) have not been explicitly collected through the questionnaire.

1. Fairtrade Premiums facilitate a cash bonus to the farmers

Amount of farmers against percentage of total household income consisting of Fairtrade premium

Number of farmers

Share of total household income consisting of Fairtrade premium

- For most farmers premiums adds less than 10% of the household income
- Most farmers are very far away from the living income (and the poverty line) – their income would basically need to triple. Using only the bonus to facilitate a living income is not realistic

2. Fairtrade Premiums can facilitate trainings that positively correlate with yields (note that not all trainings are paid for by Fairtrade premiums[1])

Training offered	Positive correlation on yields	Correlation value
Productivity and quality	Yes	0.06
Health and safety	Yes	0.12
Gender	Yes	0.11
Child labor and Social compliance	Yes	0.05
Financial management	Yes	0.06
FT Premium management	Unknown	0.04
Good Agricultural Practices	Yes	0.05
Environmental practices	Yes	0.07
Other	Yes	0.09

- These correlations do not automatically indicate causation. Selection biases might also explain the positive results
- Still, it is striking that *almost all* trainings are positively correlated to yields

[1] The questionnaire does not ask how trainings are financed. This can be an element of future improvement.

Added value analysis

4

Can both the farmers and their hired workers earn a decent living?

Incomes and wages

- Analysis so far has focused on the household income of the farmer-entrepreneurs. They work on their farm and typically (some) adult family members join them in their work
- The farmer and their relatives do not earn a 'wage' – instead, the profit from cocoa sales (and other activities) provides them with an income
- If external workers are hired (e.g. to help with the peaks in the harvest season), these workers *do* earn a wage
- These wages are a cost for the farmer, but a source of income for the workers

Goal = living income per FTE

$$\frac{Profit}{Household\ FTE}$$

$$= Income\ per\ household\ FTE$$

*Profit*

Living income and living wage

- The value added at a farm incorporates both profit and labour costs
- The aim is that farmers add sufficient value, such that
  - They make a living income for themselves
  - They can afford to pay a living wage to their workers

Goal = living income per FTE + living wage per FTE

$$\frac{Profit + labour\ costs}{household\ FTE + workers\ FTE}$$

$$= Income\ for\ household + hired\ labour$$

Wages of hired workers

- Wages of hired workers peak around $2 per full time equivalent (FTE) per day
- Given that 1 FTE needs to provide income for 2.95 household members, the extreme poverty line is 2.30 USD per day (2.95 * $0.78)
- Most hired workers (60%) currently earn slightly below the extreme poverty line
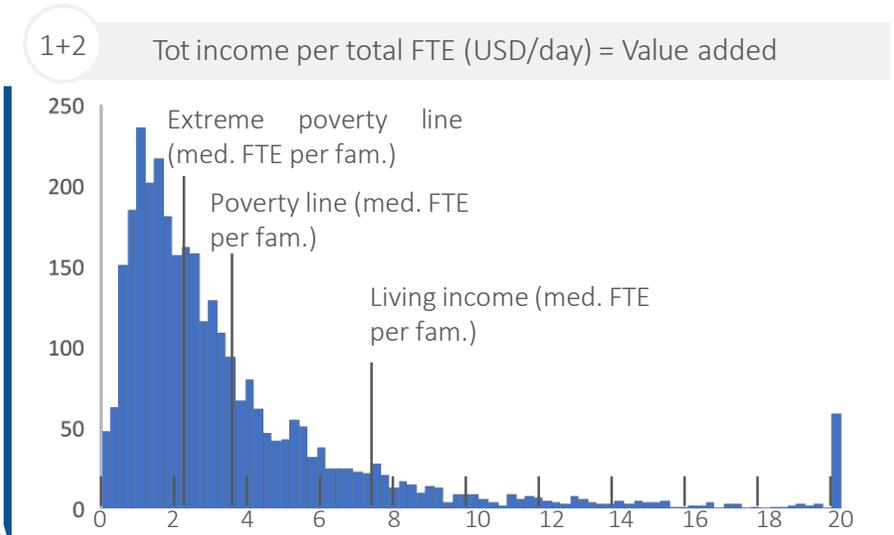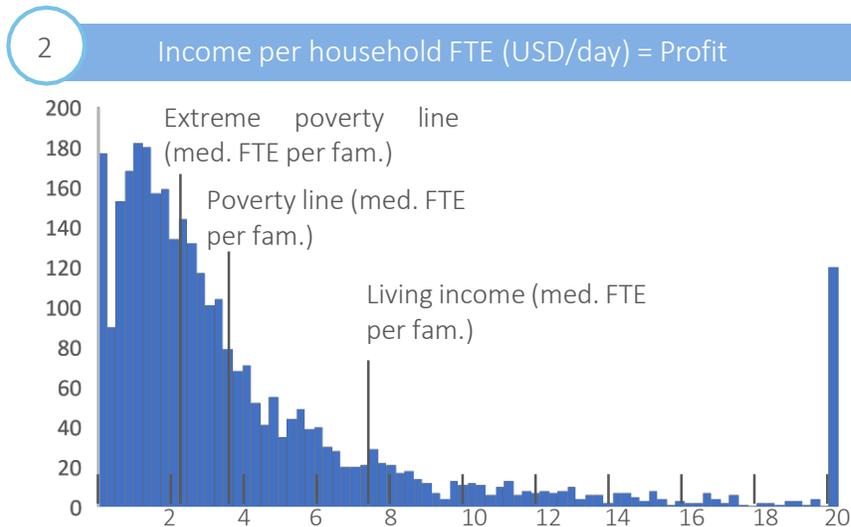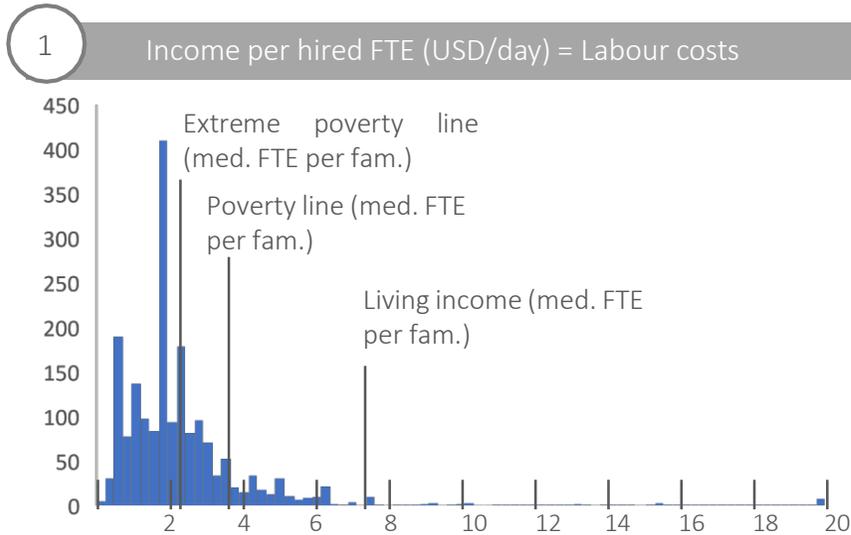
Average added value

- Given that most farmers do more work on the farm themselves with their family (median = 2.7 full time equivalent (FTE) and only hire few external workers (median = 0.1 FTE), the total work at a farm is driven by household members with a median of $2.27/FTE/day

Value added
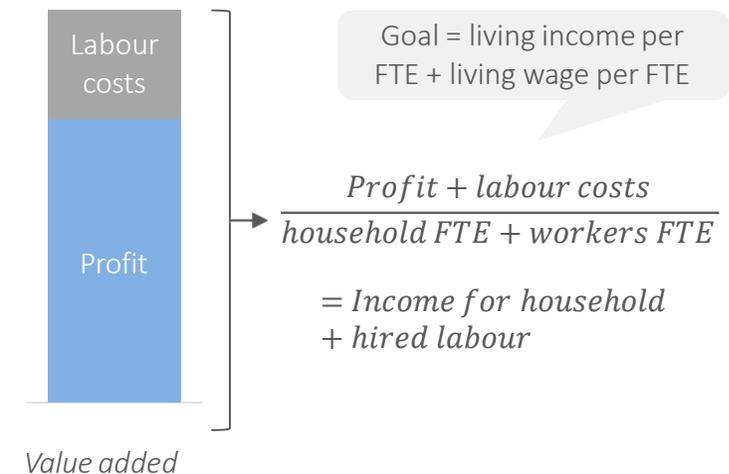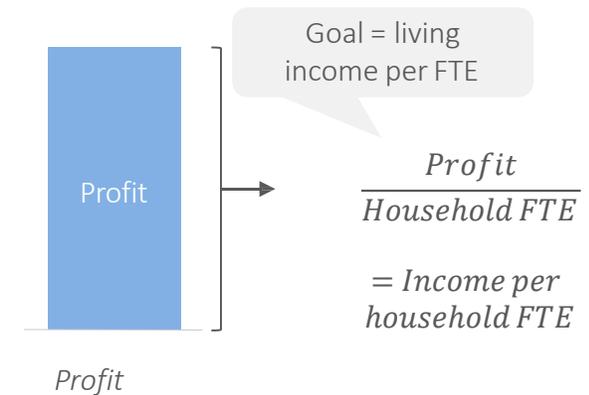
The average earnings per full time breadwinner is USD 4.06 per day – this comes mainly from the household members

Analysis of all paid and unpaid work in full time equivalent (FTE) at the farm

- In the graphs on the right, the distribution of income is given for the hired FTE (graph 1), household FTE (graph 2) and the total income per FTE (graph 1+2). This third graph gives the Value added distribution
- The median farm has 2.7 FTE of workers that are part of the household (e.g., the farmer, his/her spouse, their adult children)
- In addition, there are some hired workers (median = 0.1; average = 0.8 FTE). These are paid a fixed salary per day
- Given the relatively low share of external work, the total income per FTE is mainly driven by the farmer-entrepreneurs and their family

1 Income per hired FTE (USD/day) = Labour costs

2 Income per household FTE (USD/day) = Profit

1+2 Tot income per total FTE (USD/day) = Value added

- Average earnings per FTE are 4.06 USD
- Median earnings per FTE are 2.27 USD

- Extreme poverty line: 2.30 USD/FTE
- Poverty line: 3.75 USD/FTE
- Living wage: (approx) 7.40 USD/FTE

Threshold analysis: looking at the future

5

What are the conditions to enable more Fairtrade farmers to earn above the poverty line?

Aims of threshold analysis

- As shown above, only 42% of Fairtrade farmers earn above the extreme poverty line and 23% above the poverty line

- The 'threshold analysis' investigates under which conditions this can improve

- There is a number of factors that Fairtrade can influence to improve the household income of their farmers
    - Trainings to farmers – *seven out of eight trainings provided are positively correlated to yields*
    - Pesticide and fertilizer use – *pesticides and fertilizers are often provided at low prices by SPOs; they are positively correlated to yields*
    - Cocoa prices – *In 2016 the market price was above the Fairtrade Minimum Price; a higher FMP will help all farmers earn more*
    - Annual bonuses – *Part of the Fairtrade Premium is used to pay a cash bonus to farmers. On average, this contributes ~3% to the household income*

Central question of this section: under which conditions can Fairtade help farmers earn more, so that most of them earn above the (extreme) poverty line – or even help them make a living income

A closer look at very small farms as compared to available household labour

An observation

In the original sample there are some categories of farmers for which it might be difficult to increase the income to a decent level:

1. The median value of the ratio of cocoa area/FTE is 1.36 ha/FTE. This corresponds to a cocoa area of 3.7 hectare.

2. Some of the lowest areas for facilitating farm work (technically the 10th percentile score in the questionnaire) is 0.50 ha/FTE. This refers to farmers that spend a relatively high amount of time on each hectare of their area, perhaps due to land limitations. For them, the amount of area required to keep 2.7 FTE at work, is 1.3 hectare.

This suggests that farmers with less than 1.3 hectare will have a difficult time to keep all FTE effective at work. Farmers with between 1.3 and 3.7 hectares have less available land to keep 2.7 FTE's at work than the median household.

Directions for future research

The questionnaire does not specify non-farm income (wage income, remittances, gifts, etc.) of family members other than the owner of the farm. Collecting these data can provide better insights into the extent the available household labour is absorbed by farm work.

Farmers with too little land or too few breadwinners for a large family size are unlikely to earn a living income from farm revenues

- Fairtrade can help the farmers increase their household income

- However, for some farmers it is very difficult to increase their earnings towards a decent value per family member:

  1. Farmers that have too little land. In particular they do not have sufficient land for all the workers (from the household + external employees) to provide work
  For the purpose of benchmark setting we exclude the 10% with the lowest cocoa area/FTE ratio (less than 0.50 hectare/FTE)

  2. Farmers that have too few breadwinners per household member supported
  For the purpose of benchmark setting we exclude the 10% with the lowest household FTE/family size (less than 0.10 FTE/member, or 10 mouths to be fed by a single FTE)

  Note that this automatically excludes the farmers with unrealistically large families (>20 family members), as the household FTE in these families is typically not much larger than the average

In the new sample, the average household income per person is $1.32/day. Approximately 51% of farmers earn above the extreme poverty line of $0.78/day.
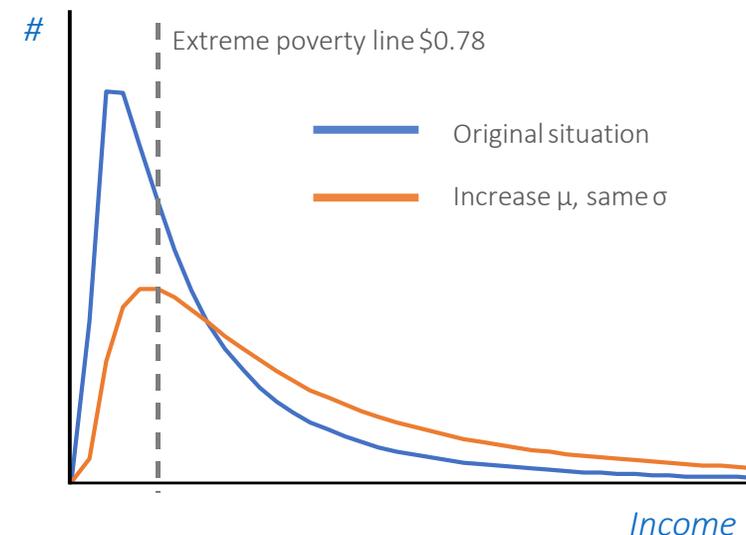
Lifting 80% of farmers above the extreme poverty line requires doubling prices – a focus on poorest farmers is more efficient

- The income distribution is strongly asymmetric. When the average farmer earns *almost twice* the extreme poverty line, still 45% of farmers are below the line.

- As a result, raising 80% of farmers above the extreme poverty line is challenging – let alone above the poverty line or towards a living income.

- The following table gives the values of cocoa prices and annual bonuses required to meet the objective by solely increasing price.

Objective	80% of farmers above extreme poverty line	80% of farmers above poverty line	80% of farmers above living income
Value of threshold ($/pp/day)	0.78	1.27	2.51
Median income ($/pp/day)	1.81	2.94	5.80
Average income ($/pp/day)	2.95	4.81	9.47
Required cocoa price $/kg	2.92	4.72	9.26
Increase in cocoa price	103%	229%	545%

- These price increases seem unrealistic. The problem is that a large share of the extra value goes to the farmers that already earn much above the (extreme) poverty line – See for instance the orange line on the right

- In order to increase incomes of the poorest farmers a more holistic approach is needed.

Income per person in household per day

Income after optimizing for fertilizer use and trainings (blue) and after raising the prices to $2.92/kg to lift 80% of the farmers above the extreme poverty line (orange) The orange line has a higher average value, but the same Standard Deviation

1) We have assumed that bonuses also contribute to the additional income – in particular that the relative increase in bonus is the same

Conclusions and future research

6

Main conclusions: farmer income is currently low, but contributions of Fairtrade are positive

Living income

- The median family in the sample is large: 8 family members.
- This translates to a living income of $7318 per household per year, or $2.51 per person per day.
- This is significantly above the extreme poverty line ($0.78/pp/day) and the poverty line ($1.27/pp/day).

Farmer household income

- The average household income is $2707/year. This is significantly below the living income. Seven percent of farmers currently earn a living income.
- Smaller households are better off than large households. More than 50% of households with ≤ 8 members earn above extreme poverty.
- Hired workers contribute to the work on cocoa farms to a limited amount. The income per hired FTE is lower than that of household FTE.

Role of Fairtrade

- The trainings provided by SPOs (and supported by Fairtrade) correlate significantly with higher yields.
- Pesticides and fertilizers are often provided at low prices by SPOs. These are also positively correlated to yields.
- Increasing the cocoa prices is a way to lift farmers above poverty. For example, to help 80% of farmers above the extreme poverty line through price increase only, prices would need to double approximately.
- However, this is not very efficient. The problem is that a large share of the extra value goes to the farmers that already earn relatively well. In order to increase incomes of the poorest farmers a more holistic approach is needed.

Suggestions for future research: broader supply chain perspective

Future research

- More interesting insights would be obtained when including a broader supply chain perspective. Mapping the constraints of productivity (soil fertility, land tenure change opportunities, climate) for certain countries and regions would help to inform, design and set up realistic programs and targets (e.g. on labour productivity).

- A broader supply chain perspective can inform Fairtrade on how the supply chain influences the farmer's household income.

- An in-depth financial analysis of the Fairtrade premium projects (and incorporating this into the model) would help to prove and improve the impact of Fairtrade on farm households.

- More analysis on the variables for other goods can increase insight into necessity or profitability of crop diversification. For instance insight into the distribution of self-consumption and sales of other goods or an analysis on the production of other goods in sub samples.

- Several correlations can be specified for sub-samples, such as specifically for the poorest farmers, or specifically for the farmers that do grow other crops as well.

- Researching ways to specifically increase income of the poorest farmers can support efficient ways to fight poverty.

Appendix: Methodology and key assumptions

Explanatory list of variables

Financial farm income	Financial income from the household's farm(s)
Net profit other goods	Revenues of goods besides cocoa that are sold for cash minus the extra costs of these other products (including costs of goods sold, overhead costs, non-operating costs, and net investment outlays)
Net investment outlays	Investment costs on capital assets, spread out over the useful life years. This includes costs of structures, facilities, tools, materials, machinery and equipment, and establishment costs of new cocoa trees
Overhead costs	Overhead costs include book keeping costs, memberships fees to the SPO and other member organizations, insurance, pre-studies and analysis, and possible other overhead costs
Interest	Interest costs on outstanding loans
Taxes	Government taxes
Subsidies	Subsidies in cash received from the SPO or other parties
Revenue cocoa	Financial revenues of cocoa sold for cash
COGS (costs of goods sold) cocoa	Operational costs of cocoa including input costs and hired labour costs; all costs from cocoa crop management, cocoa processing, cocoa packing, and storage and cocoa transport
In-kind farm income	In-kind income from the household's farm(s)
Exchanged goods received	Monetary value of goods and services received from SPO or others in exchange for farm goods
In-kind contribution association	Monetary value of goods and services received from SPO or others not in exchange for farm goods
Farm goods consumed by household	Monetary value of farm goods that are consumed by the household
In-kind income from other farms	Monetary value of in-kind goods that are received from other farms
Off-farm income	Income from sources other than the household's farm(s)
Wage income	Income from off-farm wages earned by the household members
Rental income	Income from rental of land, house, vehicle or other property owned by the household
Other income and remittances	Money or checks received from non-household members, either family or not family (usually internationally), or any other not farm related income source that was not earned from a job or rent

The elaborate questionnaires enabled detailed calculation – However some variables are missing and there are ambiguities

Potentially relevant missing variables

1. Water costs
2. Taxes
3. (In-kind) contribution SPOs
4. Income other family members
5. In-kind payment of hired labour (this might modify the added value analysis and the farmer's income)
6. Duration of the harvest season (this is asked per SPO, but individual farmers might have a different duration during which their hours peak.)[1]

These values have been estimated as well as possible, but still lead to uncertainty in the results.
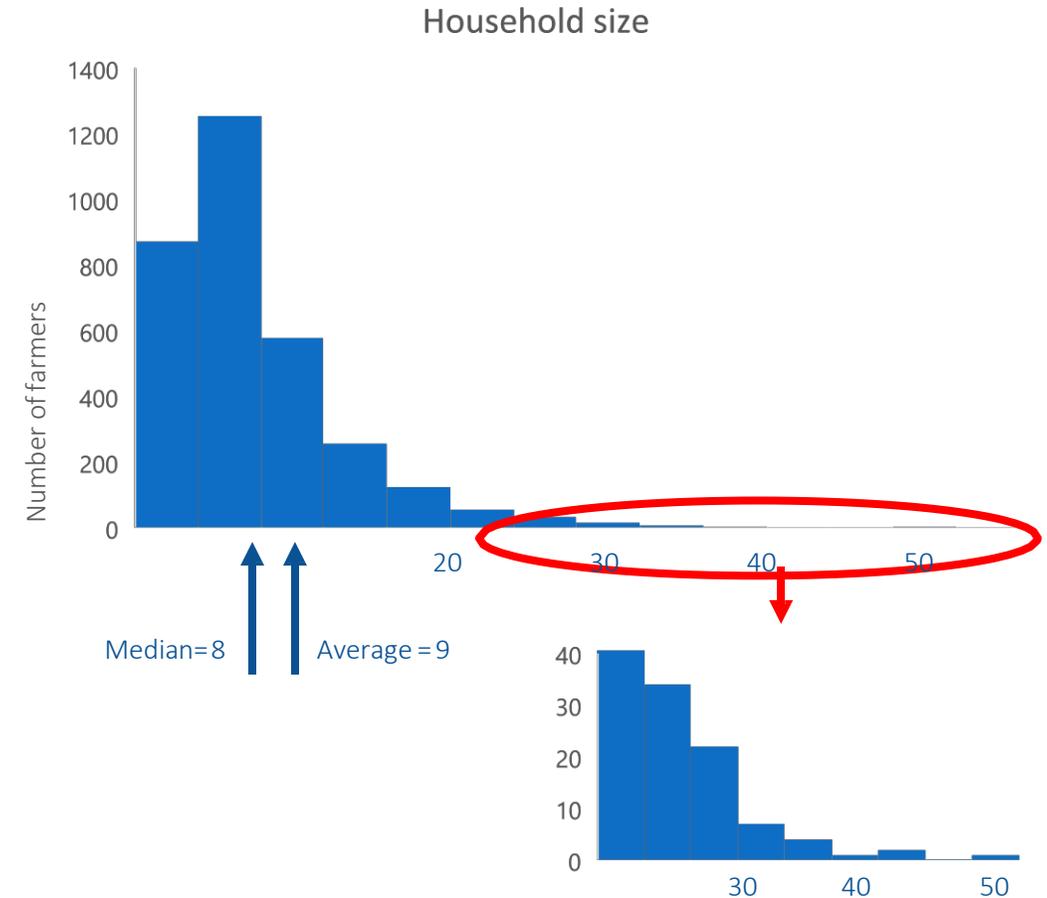
Relevant ambiguities

1. Land costs are not specified to refer to purchase or rent. For some farmers these can be very high. Do they present one-off costs?
2. Farmers indicate how many *months a* year they worked (for the other activities next to farming) However, when a 'weekly' or 'daily' pay rate is selected, the questionnaire is unclear in how many days or weeks were actually worked
3. The "value" of other crops and cattle kept is not clearly defined. It may refer to profit or revenue
4. The survey showed that most farmers do not keep records, which means that the origin of the numbers provided by them is unclear – Actually, this is a clear improvement potential for Fairtrade and their farmers

[1] As an alternative, we tried setting the harvest season to 6 months for all farmers from all SPOs. The results are not significantly different under this assumption, since the farmers report long working hours both inside and outside of harvest season.

Some farmers report family sizes up to 50 people - to counter the impact, we use median instead of average family sizes

Household size distribution

- The questionnaire includes a question on household size ("Total number of household members, not including farmer")

- Some farmers have filled in very large numbers – values up to 50 have been recorded (see figure). This might correspond to genuinely large households, but alternatively, this number might include relatives not living in the household.

- We believe that these very large household sizes are not realistic. However, we would prefer not to use a 'hard' cut-off, as all choices (16?, 20?, 25?) are arbitrary.

- The main effect of the very large households, is that they drive up the average family size. The average family in the sample consists of 9 people.

- Note that the family size does not directly affect the farmer household income[1]. However, the household income needs to be compared to the (extreme) poverty line and living income based on larger families.

- We 'counter' the effect of the very large families by using the median instead of the average family size in comparisons. The median family size with 8 people ~11% lower than the average.

Household size

Median = 8   Average = 9

[1] Some of the family member might provide their own sources of income. However, this is not clearly reported. Only for the principal farmer, other sources of income are asked for. The category 'other income' might include the income of other family members, but this is far from certain.

Living Income sources

The main source for the living income calculations is the Côte d'Ivoire national statistics bureau on household income distribution. Other sources are Centre for Affordable Housing Africa, International Social Security Association, KPMG, United Stated department of labor and the World Bank.

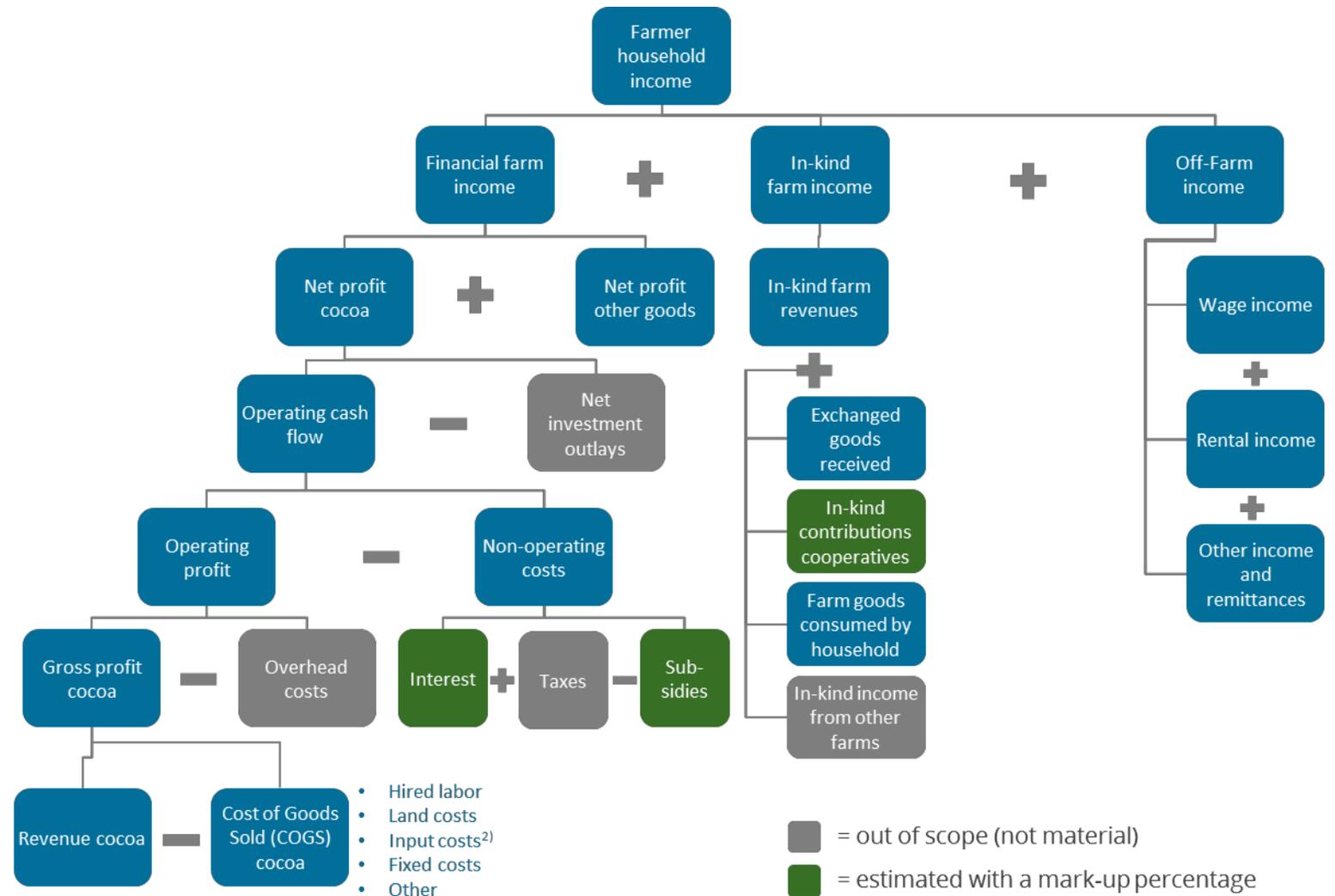| Data point	Source
Food	http://www.ins.ci/n/templates/docss/env2015.pdf
Housing	http://www.housingfinanceafrica.org/country/cote-d-ivoire/
Clothing	http://www.ins.ci/n/templates/docss/env2015.pdf
Healthcare	http://www.ins.ci/n/templates/docss/env2015.pdf
Education	http://www.ins.ci/n/templates/docss/env2015.pdf
Transport	http://www.ins.ci/n/templates/docss/env2015.pdf
ICT Expenses	http://www.ins.ci/n/templates/docss/env2015.pdf
Social security	https://www.ssa.gov/policy/docs/progdesc/ssptw/2014-2015/africa/ssptw15africa.pdf ; https://www.dol.gov/agencies/ilab/resources/reports/child-labor/c%C3%B4te-dIvoire
Unemployment insurance	http://www.tradingeconomics.com/ivory-coast/unemployment-rate
Sick leave insurance	https://www.ssa.gov/policy/docs/progdesc/ssptw/2014-2015/africa/ssptw15africa.pdf ; http://www.doingbusiness.org/data/exploretopics/labor-market-regulation#rigidityHours
Taxes	https://www.kpmg.com/Africa/en/KPMG-in-Africa/Documents/2014-15%20Fiscal%20Guides/IVORY%20COAST-Fiscal%20Guide-2014.pdf

Calculational framework

Farmer income is calculated based on the model developed by True Price. This was previously used to assess the household income of coffee farmers in 7 countries

Farmer income and other observables are calculated based on primary data collected

The next slides discuss the calculational approach and key assumptions

- Hired labor
- Land costs
- Input costs[2]
- Fixed costs
- Other

= out of scope (not material)

= estimated with a mark-up percentage

36

Farmer income methodology and key assumptions

General data cleaning procedures:

Empty cells and cells containing "Not Applicable" or "NA" are replaced by 0.

Cells containing "Does not know" or "Refuse to answer" are put to median of the non-zero values for that category.

Justification: We assume that farmers know whether a category applies, although they might not know the value. The fact that they do not answer "Not Applicable" therefore implies that the category is applicable. Therefore, a farmer that answers "Does not not know" in a category has, most likely, a non-zero value for the parameter. We take the median of the values from other farmers for whom direct data is available. We use the median instead of the average, as this is less sensitive to outliers.

Some of the 3235 farmers omitted from the calculation:

When there are zeros or blanks at cocoa produced and sales to all buyers, the farmer is omitted from the rest of the calculations. Applies to twenty-three farmers.

When the cocoa produced is smaller than one hundred (which is not a sensible number in this context) and the cocoa produced is found to be inconsistent with the cocoa sales (i.e.: cannot figure out production via sales), the farmer is omitted from the rest of the calculations. Applies to ten farmers.

Total: 33 farmers omitted

Data is used as indicated, unless:

An assumption is made.

A numerical value is inserted for text (e.g.: a pay rate that is "Monthly" could be changed to "12").

Farmer income methodology and key assumptions

Calculation of poverty line and extreme poverty line:

Extreme poverty line and poverty line are taken from the World Bank to be $1.90 and $3.10 respectively. This is yet to be corrected for purchasing power parity (PPP), which has a value of approximately 2.4 for Côte d'Ivoire. After this correction the extreme poverty line and the poverty line become $0.78 and $1.27 respectively.

FTE calculations:

Data about days entitled to paid leave, official publice holidays, working days per week and hours per working week of Côte d'Ivoire were sourced from the International Labour Organization (ILO). For full-time employement expressed in days, the year was corrected for the holidays, the weekends and the paid leaves. For full-time employment expressed in hours, this number was multiplied by the amount of working hours per day.

From the data, the amount of hours or days worked by the farmers, the household and the hired labour could be calculated, from which their respective amount of FTE's followed. For this calculation, the duration of the harvest season of the relevant cooperative per farmer was taken from the questionnaire of the cooperatives.

Assumption on household size:

The sum of the adults, youth and infants is taken as the household size, rather than the given household size of the farmer.

Farmer income methodology and key assumptions

Farmer income building block	Calculation
Revenue cocoa	Calculated as the sum of sales to different buyers plus bonus. Cocoa sales are calculated for each buyer (cooperative, other cooperative, exporter/trader, private company or individual, other) by multiplying the volume sold with the price.
Constituents of building block	**Assumptions**
Volume of cocoa sold (for each buyer)	We test the sum of all volumes sold versus the total volume produced: for most farmers, these are (almost) equal. Farmers for which the sum of all sales is much smaller than the cocoa produced (less than 50%), we use the following assumptions: 1) the amount sold is assumed to be the full amount produced. 2) all cocoa is assumed to be sold to the cooperative. Note also that we have omitted a number of farmers that have given very incoherent answers. See general note on omitted entries.
(Median) price per buyer	These are almost always either 850 XOF/kg or 1000 XOF/kg. All different values are clearly errors (e.g., the value at 'prices' are exactly equal to the values at 'volumes' in neighbouring cells in the Excel). When not 850 or 1000, the price assigned to each buyer is 'average price per kilo' for that farmer.
Annual bonus amount	Values smaller than 1000 are unrealistically small. However, they indicate a non-zero value. These values are changed to median value.

Farmer income methodology and key assumptions

Farmer income building block	Calculation
Cost of goods sold (COGS) cocoa	Calculated as the sum of hired labour, land costs, input costs, fixed costs and other costs. Hired labour consists of the following categories: 'people hired for general farming work', 'technical services staff', 'permanent staff', 'casual labourers hired for harvesting',and 'casual labourers hired for other activities'. For each labour category, the number of people hired is multiplied by the number of days worked by them and their daily pay rate. Input costs are calculated as the sum of 'fertilizer costs', 'pest management costs', 'transport costs' and the product of 'seedlings purchased' with 'seedling costs'. Fixed costs consist of 'machete', 'machete file', 'tarpaulin', 'pick', 'basket', 'rope', 'axe', 'pruner', 'bag', 'boots', 'bucket', 'fuel' and 'other'. It is calculated by taking the sum of the amount of these items multiplied by their respective costs. Expenses on these items are treated as a cost in the year that they occur, not depreciated over the lifetime. Other costs refer to trainings.

Constituents of building block	Assumptions
Hired labour - people hired (for workers in any category)	The normal rules for overwriting empty cells and cells containing "Non-applicable", can be overruled. This happens when one or two out of the three factors (people hired, days worked and daily pay rate) have a positive value, while the other(s) are not filled in (or are 0 or "Not Applicable"). In that case, the missing elements are replaced by their respective medians. For example: a farmer does not fill in the number of people hired, but gives values for days worked and the daily pay rate. The number of people hired is replaced by the median, instead of by 0 (as would happen under the regular replacement rules). We have checked that this procedure does not have a large influence on the results.
Hired labour - days worked (for workers in any category)	Idem
Hired labour - daily pay rate (for workers in any category)	Idem
Land costs	No additional assumptions.
Input costs	If seedling costs are higher than one thousand, it is likely to be refer to the total costs of all seedlings, not the average costs per seedling. Seedling costs smaller than 10 XOF per seedling are unrealistic and are replaced by the median. Water costs are not included in the questionnaire and are assumed to have a negligible effect on the input costs. This hypothesis needs further research.
Fixed costs - number of units purchased (in any category)	One farmer indicates buying 8 axes, while not providing a price. All other farmers buy at most 3 axes. The value for this farmer is assumed to be a typo and replaced by 0. Farmers that report a realistic value for bag and fuel costs (>100 XOF/piece), but do not provide amounts purchased, are assumed to have bought the median of those units. The same holds true for boots, but with a value of 10 XOF/piece.
Fixed costs - unit price (in any category)	Machete, machete file and tarpaulin costs below 200 XOF are unrealistic and are changed to their respective medians. This is also done for basket, rope, axe, mechanical pruner, boots and bucket costs below 100 XOF and fuel costs below 50 XOF.
Other costs	Training costs are all assumed to be 0, since there are only six farmer that give a non-zero value and all six values are unrealistically small.

Farmer income methodology and key assumptions

Farmer income building block	Calculation
Overhead costs	Out of scope for this study.

Farmer income building block	Calculation
Interest	
Constituents of building block	Assumptions
Interest	Assumed to be 2.4% of the cocoa revenue (based on two other studies, previously done by True Price).

Farmer income building block	Calculation
Taxes	Out of scope for this study.
Constituents of building block	Assumptions
Taxes	Our understanding is that the farmers are theoretically obliged to pay this, but are not doing so in practice. Tax burden is not included in the questionnaire and is assumed to be zero.

Farmer income building block	Calculation
Subsidies	
Constituents of building block	Assumptions
Subsidies	Assumed to be 1% of the cocoa revenue (based on the coffee project, done together by Fairtrade and True Price).

Farmer income building block	Calculation
Net investment outlays	Out of scope for this study.

Farmer income methodology and key assumptions

Farmer income building block	Calculation
Net profit other goods	Calculated as the sum over profits from each crop and each form of cattle. The crops consist of cassave, maize, plantain, yam, fruits, vegetables, rubber, cashew and palm. The cattle consists of chicken, sheep, cow, pig and goat. The profit of each category is calculated by taking the value (revenue) in that category and substracting some of the costs made to grow that crop or breed that type of cattle. The questionnaire reports the total costs per type. Some of these can be attributed to the commercial activities, the remainder to own consumption (see below). We calculate the share of costs relevant to commercial activities by multiplying total costs by the portion that is sold (instead of consumed in the household). When that portion could not be properly calculated from the given data, the full costs of production are assigned to the commercial activities. As a formula: profit = value - (total cost of production)*(volume sold/volume produced)
Constituents of building block	Assumptions
Crops - total volume produced (in any category)	No additional assumptions.
Crops - total volume sold (in any category)	It is assumed that all products that are not sold are consumed by the household.
Crops - cost of production (in any category)	For cassave, maize, plantain, yam and vegetables, costs of production smaller than 200 XOF are unrealistic and are multiplied by 1000. Exception: one entry in yam (150 XOF, but in line with the the other entries for yam of that farmer).
Crops - value (in any category)	For cassave, plantain and yam, values smaller than 200 XOF are unrealistic and are multiplied by 1000. Idem for vegetables and rubber with values equal to 1 or 3. In the category palm, there is one incoherent value, which is set to the costs of production of palm for that farmer.
Cattle - number raised (in any category)	No additional assumptions.
Cattle - number sold (in any category)	It is assumed that all animals that are not sold are consumed by the household.
Cattle - cost of production (in any category)	For chicken, all entries in the costs of production smaller than 200 XOF are multiplied by
Cattle - value (in any category)	1000. No additional assumptions.

Farmer income methodology and key assumptions

Farmer income building block	Calculation
In-kind contributions cooperatives	
Constituents of building block	Assumptions
In-kind contributions cooperatives	Assumed to be 1.1% of the cocoa revenue (based on the coffee project, done together by Fairtrade and True Price).

Farmer income building block	Calculation
Exchanged goods received	Consists of produce exchange for land.
Constituents of building block	Assumptions
Produce exchange for land	No additional assumptions.

Farmer income building block	Calculation
Other income and remittances	
Constituents of building block	Assumptions
Other sources of income	There is one entry that contains the value 2. This entry is put to 0, since there is no clear indication of what was originally meant.

Farmer income building block	Calculation
Rental income	Summation over house, vehicle and other sources of rental income.
Constituents of building block	Assumptions
Land rental income	No additional assumptions.
House rental income	There is one entry that contains the value 2. This entry is put to 0, since there is no clear indication at hand of what was originally meant.
Vehicle rental income	No additional assumptions.
Other sources of rental income	No additional assumptions.

Farmer income methodology and key assumptions

Farmer income building block	Calculation
Farm goods consumed by household	Calculated as the sum of the in-kind income from each crop and each form of cattle. The crops consist of cassave, maize, plantain, yam, fruits, vegetables, rubber, cashew and palm. The cattle consists of chicken, sheep, cow, pig and goat. The in-kind income of each category is calculated by taking the median price of that category, multiplied by the respective volume that is consumed by the household. A share of costs is then subtracted as described at 'Net profit of other goods' above. As a formula: in-kind income = (volume sold - volume produced)*(median price) - (total cost of production)*(volume sold - volume produced)/volume produced
Constituents of building block	
Crops - total volume produced (in any category)	No additional assumptions.
Crops - total volume sold (in any category)	It is assumed that all products that are not sold are consumed by the household.
Crops - cost of production (in any category)	See above at 'Net profit of other goods'
Crops - value (in any category)	See above at 'Net profit of other goods'
Cattle - number raised (in any category)	No additional assumptions.
Cattle - number sold (in any category)	It is assumed that all animals that are not sold are consumed by the household.
Cattle - cost of production (in any category)	See above at 'Net profit of other goods'
Cattle - value (in any category)	No additional assumptions.

Farmer income methodology and key assumptions

Farmer income building block	Calculation
Wage income	Calculated as the summation of the incomes of the different types of work. For each type of work, the income is calculated as the income per unit time, multiplied, when relevant, by the number of months worked. The other sources of work consist of other agricultural work, construction work, domestic labour, public service, wood charcol, palm wine and other work.

Constituents of building block	Assumptions
Other sources of work - months worked (in any category)	No additional assumptions.
Other sources of work - income (in any category)	No additional assumptions.
Other sources of work - rate basis (in any category)	If the rate basis is "Annually", then the 'income' is directly used. If the rate basis is "Monthly", then the income per month is multiplied by the number of months worked. If the rate basis is "Daily" or "Weekly", the income is still multiplied by the number of months worked. This is because the weeks or days worked per month are not known. In addition, this approach gives roughly equal contributions for the different rate bases. Multiplying with the number of days or weeks in a month, gives results that are out of line with the other entries. When the rate basis is "Does not know", "Refuse to answer" or "Not Applicable", but the the income has a positive value, the rate base is either changed to "Annually", or to "Monthly". When the income is larger than ten times the average of all the incomes that have a pay rate category of "Monthly", the rate basis is changed to "Annually", otherwise "Monthly" is used.

End

Condensatorweg 54, Amsterdam

Site: **www.trueprice.org**
Facebook: /trueprice.org
Twitter: true_price

Tel.:   +31 202 403 440

COPYRIGHT REQUEST
Information, data, and drawings embodied in this document should not be reproduced without prior written consent of True Price.