KIT | Sustainable Economic Development

Demystifying the cocoa sector in Côte d'Ivoire and Ghana

Desk research – Cedric Steijn

KIT works with farmer organisations, companies, governments, funders and NGOs abroad and in the Netherlands to build sustainable and inclusive value chains in the agricultural food sector in Africa, Asia and Latin America.

With our clients and partners we assess, design and study the required interventions and approaches for making value chains more sustainable and inclusive. The aim of the work is to realise development benefits along the entire value chain − especially for smallholder farmers and the labour market − alongside increases in trade and empowerment.

Moreover, KIT has a strong expertise on research design and implementation including data analysis & results documentation. Expertise includes baseline surveys, feasibility studies, impact assessments & participatory action research methods involving capacity building for national researchers and

Content

Cocoa desk research

COCOBOD operations

- COCOBOD finances the spraying of cocoa farms through the FOB price (see producer price). This way, all farmers pay indirectly for the service through their cocoa sales. The sprayers are organised in gangs and given pesticides, fungicides and fuel in order to perform the spraying. The farmer only needs to weed their farms and provide water for the sprayers and has no direct expenses. However, farmers do often complain about the way the spraying is performed. Farmers report that sprayers rush through the plantations without necessarily targeting cocoa trees. This is likely caused by the fact that spraying gangs are paid for the amount of land sprayed, which is why they attempt to maximise the amount of land sprayed in the least time possible without regard for effectiveness of their spraying for the farmers. The spraying would thus be aimed randomly in the field instead of on the cocoa or trees or on capsids in the canopy. Furthermore, sometimes farmer would get their farms sprayed only once a year with either fungicide and or pesticide, and not be told which was used on their farm. Also, farmers complain about the timing of the spraying. Stating that the spraying was performed at times when spraying would be less effective (Barrientos & Akyere, 2012).
- The spraying gangs are supposed to spray farms four times a year between July and November, however most farmers indicated that they had not received any spraying during the first 5 years of the program, making the program highly inefficient and unequitable. The goal of the program to limit yield loss due to pests and diseases is therefore not reached (Anang et al. 2011).
- Wessel & Quint-Wessel (2015) argue that the main factors that have contributed to the production increase in Ghana are the support measures from COCOBOD, namely increases in production prices, provision of spraying, provision of fertiliser, provision of improved planting material, improved marketing channels (LBCs) and the repair of roads. Another important factor explaining the increase in total production is the expansion of farms, mainly in the Western Region.
- Crop diversification is actively promoted by COCOBOD in order to make cocoa farmers more resilient. It is not known which crops are promoted (Aneani et al. 2011).
- It is very important for farmers to receive their inputs on time. Fertiliser, for instance, should be applied before the rainy season so the nutrients are absorbed better by the soil. If a farmer receives the fertiliser too late, applying it would have very little effect for cocoa trees. This leads to farmers applying it on other crops such as maize or selling it back to the market in order to generate some income. The supply of fertiliser by Hi-Tech would therefore not lead to increasing cocoa yields (Steijn, 2016).
- The provision of seedlings has been criticised for being inefficient. The seeds produced by the Seed Production Division (SPD) are important for farmers to be able to rehabilitate their

farms after outbreaks of CSSVD. The lack of availability of seedlings may prompt farmers to search other livelihoods, such as rubber (Steijn, 2016).

- Timing of pesticide application is critical to maximise its effectiveness in controlling mirids. The mirid population in West Africa, starts to build-up in July and reaches its peak between August and September while black pod occurrence increases from June with peaks in August and October. Consequently, it is recommended that cocoa farms in Ghana are sprayed between July and September. As indicated in this study, the majority of farmers had their farms sprayed between July and September but a significant proportion received their first spraying under CODAPEC in September when the population of Sahlbergella singularis would have been at its peak and therefore already caused damage to the crop.Surprisingly, some farmers had their farms sprayed in November. In these cases pod loss due to mirids would have already peaked before farms were sprayed (Kumi & Daymond, 2015).
- Most farmers state that their yield has increased since the beginning of the spraying by CODAPEC (see figure below). It is not known whether these yield increases can be attributed to CODAPEC as other factors can also influence yields (Kumi & Daymond, 2015).
- The direct impact of the CODAPEC mass spray is ambiguous. Contrary to the expectation that yield would be positively correlated to the number of mass sprayings, a weak negative relationship was found in the Western Region. In the other regions, substantial yield increases were noted among producers receiving 3 or more mass sprayings, but only 23 percent of producers actually received 3 or more. Unlike with the public sprays, there was clearly a positive yield response to private expenditures on fungicide in both Western and other regions. In our sample, 87 percent of the producers who reported not receiving CODAPEC sprays and 91 percent of those who did receive CODAPEC sprays undertook fungicide sprays of their own. The same was true for yield responses to private expenditures on insecticides. Yields declined with low levels of insecticide application, indicating that capsids were not adequately controlled at low dosages (Kolavalli et al. 2016).
- Fully liberalising the Ghanaian cocoa market has significant benefits for farmers, when assuming a competitive market structure for inputs is in place. Table 6.8 below shows net returns for farmers under different policy scenarios (Kolavalli et al. 2016).

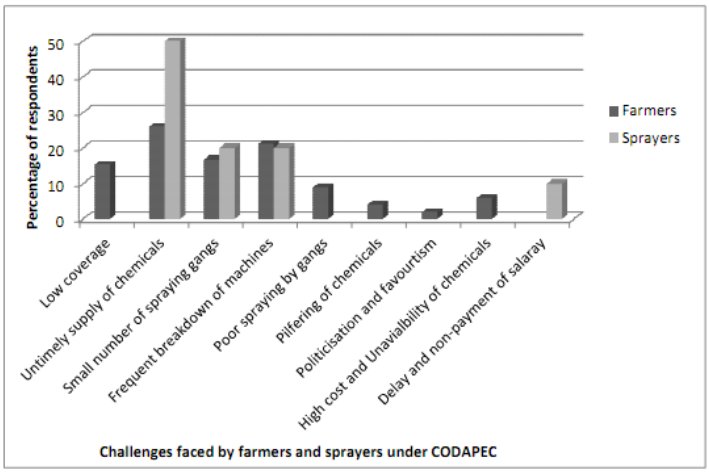

Fig. 5. Summary of farmers and sprayers response of the inefficiencies and challenges facing CODAPEC (n=160)

Kumi & Daymond, 2015).

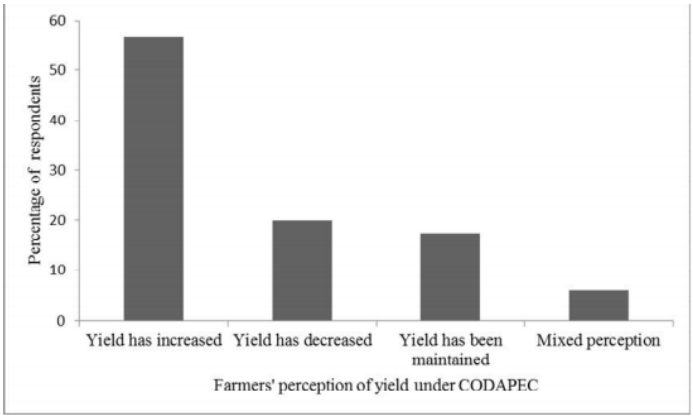

Fig. 6. Perception of farmers on the relationship between CODAPEC and yields (n=150)

Kumi & Daymond (2015).

Table 6. 7: Producer prices without various components of industry costs

Price/program scenario	2007/08	2008/09	2009/10	2010/11
	----------(GHc/t)----------			
Status quo producer price	950	1,632	2,208	3,200
Producer price ex budgeted CODAPEC cost	1,018	1,720	2,373	3,315
Producer price ex realized CODAPEC cost	1,074	1,766	2,373	3,315
Producer price ex budgeted liquid fertilizer cost	954	1,644	2,229	3,245
Producer price ex realized liquid fertilizer cost	954	1,638	2,244	3,290
Producer price ex budgeted dry fertilizer cost	1,002	1,692	2,258	3,309
Producer price ex realized dry fertilizer cost	1,015	1,749	2,392	3,418

Source: Authors' estimations

Kolavalli et al. (2016).

Table 6.8: Predicted net returns and production under the four policy scenarios.

	Price of	Price of	Bia district		STCP trainees		Bia district		STCP trainees	
Policy scenarios	cocoa	fertilizer	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive
2009/2010	GHc/kg	GHc/kg	----------GHc----------				----------kg----------			
0 Status quo	**2.208**	**0.500**	**3,653**	**6,220**	**1,747**	**3,379**	**1,726**	**3,244**	**836**	**1,784**
1 Eliminate liquid fertilizer	**2.244**	**0.500**	**3,715**	**6,337**	**1,777**	**3,444**	**1,726**	**3,244**	**836**	**1,784**
Change in status quo	*0.036*	*0.000*	*62*	*117*	*30*	*64*	*0*	*0*	*0*	*0*
2 Eliminate mass spraying	**2.373**	**0.500**	**3,682**	**6,512**	**1,761**	**3,509**	**1,615**	**3,138**	**784**	**1,715**
Change in status quo	*0.165*	*0.000*	*28*	*291*	*14*	*130*	*-112*	*-106*	*-52*	*-69*
3 Eliminate fertilizer subsidy	**2.428**	**1.538**	**4,033**	**7,134**	**1,931**	**3,353**	**1,726**	**4,267**	**836**	**1,455**
Change in status quo	*0.220*	*1.038*	*380*	*913*	*184*	*-26*	*0*	*1,024*	*0*	*-329*
4 Liberalize input markets	**2.593**	**1.538**	**4,037**	**7,570**	**1,933**	**3,413**	**1,615**	**4,161**	**784**	**1,385**
Change in status quo	*0.385*	*1.038*	*384*	*1,350*	*187*	*34*	*-112*	*917*	*-52*	*-399*
% change in status quo	*17%*	*208%*	*11%*	*22%*	*11%*	*1%*	*-6%*	*28%*	*-6%*	*-22%*
2010/2011										
0 Status quo	**3.200**	**0.600**	**5,366**	**9,326**	**2,577**	**5,073**	**1,726**	**3,244**	**836**	**1,784**
1 Eliminate liquid fertilizer	**3.290**	**0.600**	**5,521**	**9,618**	**2,652**	**5,233**	**1,726**	**3,244**	**836**	**1,784**
Change in status quo	*0.090*	*0.000*	*155*	*292*	*75*	*161*	*0*	*0*	*0*	*0*
2 Eliminate mass spraying	**3.315**	**0.600**	**5,203**	**9,355**	**2,500**	**5,048**	**1,615**	**3,138**	**784**	**1,715**
Change in status quo	*0.115*	*0.000*	*-163*	*29*	*-77*	*-24*	*-112*	*-106*	*-52*	*-69*
3 Eliminate fertilizer subsidy	**3.508**	**1.387**	**5,897**	**12,022**	**2,834**	**5,163**	**1,726**	**4,267**	**836**	**1,951**
Change in status quo	*0.308*	*0.787*	*532*	*2,696*	*258*	*91*	*0*	*1,024*	*0*	*167*
4 Liberalize input markets	**3.623**	**1.387**	**5,700**	**12,136**	**2,741**	**5,139**	**1,615**	**4,161**	**784**	**1,924**
Change in status quo	*0.423*	*0.787*	*334*	*2,810*	*165*	*66*	*-112*	*917*	*-52*	*140*
% change in status quo	*13%*	*131%*	*6%*	*30%*	*6%*	*1%*	*-6%*	*28%*	*-6%*	*8%*

Source: Authors' estimations using enterprise budgets and regression analysis.

Note: Predicted output is based on regression models of producers were grouped into extensive and intensive categories depending on whether they had adopted fertilizers in their production system. Elimination of fertilizer subsidy assumes competitive and unlimited supply at the given price by the private sector. Fertilizer use in Bia district under liberal assumption occurs at the CRIG recommended rate of 371

Net returns for farmers under different policy scenarios (Kolavalli et al. 2016).

Table 4.5: Growth in industry costs (GHC).

	00/01	01/02	02/03	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13
Per ton	14.9	90.7	76.1	67.1	109.3	80.2	282.4	269.8	537.8	940.1	593.3	410.5	353.6
Per ha			16.21		14. 5		19.6		69.5		269.5		
Per med farm			75.7		71.6		95.3		253.0		1036. 7		

Source: authors' calculations using IFPRI & COCOBOD (2014) and Ghana Cocoa Farmers Survey.

Cost of COCOBOD industry cost per ha/ton/med farm (Kolavalli et al. 2016).

CCC/ANADER/CNRA operations

- Plot characteristics are highly correlated with low yields, and the rejuvenation of plots is thus necessary. It is for this reason that the government of Côte d'Ivoire has launched rehabilitation and replanting programs, which provide farmers with materials, plant protection and fertilizers (Balineau et al. 2017).

Land tenure ship

Ghana

- The customary land tenure system in Ghana is pretty well developed and integrates a complex system of rights and interests in land. The main interests are the allodial title, the customary freehold, the common law freehold, sharecropping and leaseholds. The allodial title is the highest interest in customary law, and is held or vested in stools or skins. The right is acquired either by being the first to cultivate the land or by succession from the first owning group. Stool or skin ownership is corporate and does not vest any individual interest in the ruler. Customary law freehold is the right held by subgroups and individuals as part of the larger group that holds an allodial title. It is a "usufructuary title" that may be held on a corporate status by the sub-stool, lineage, family or individuals. The title exists in perpetuity as long as the superior title of the stool (the allodial title) is acknowledged. Common law freehold is an interest in land acquired through a freehold grant made by the allodial owner, either by sale or gift to another person out of his interest. The grant is contingent on the parties agreeing that their obligations and rights will be regulated by common law. Sharecropping arrangements are of two types, abunu (a half share) and abusa (a third share). As the name suggests, they involve the sharing of crops in that the tenant tills the land and, at harvest, gives a specified portion of the produce to the holder of permanent use rights (Ohiambo, 2014).
- It is becoming increasingly difficult to access land in the more densely populated areas. Tenure security challenges are rampant in areas where paramount chiefs control land transactions. Questions have been raised about the equity of transactions involving the acquisition of large tracts of rural land for commercial agriculture investments. Rising population pressures and growing commercial pressures on land have resulted in the rise of

land values, leading to significant reinterpretation of traditional chiefs' rights to administer communal land (Odhiambo, 2014).

- Insecurity of tenure is also a concern, which is linked largely with the absence of legal titles in customary land tenure systems. Communal land ownership is viewed as a constraint to agricultural productivity as it "invests rights in all but gives responsibility for management to none" (Odhiambo, 2014).
- The choice for full sun production systems and deforestation can be explained from a land tenure ship point of view: existing laws deny ownership of timber trees to smallholders. This is the case in both **Ghana** and **Côte d'Ivoire** (Ruf, 2011).
- Under the abusa system the caretaker assumes responsibility for a farm already established, the owner takes two parts and the caretaker takes one part of the output sold. Usually there are no formal contracts signed; most contracts are made orally (traditional) with witnesses and the offering of drinks. Mostly, the duration and quality of the contract depends on the character of the caretaker, and the relationship he develops with the farm owner. Under the abusa system, both the caretaker and the farm owner do the farm work, although the farm owner's input may be very limited. The owner mostly undertakes supervision (Barrientos & Akyere, 2012).
- The abunu system is mainly practised when a new area of forest is to be developed into a farm. Compensation under the abunu system is provided after the farm has been well established and harvesting has commenced. The farm is then divided into two between the land owner and the caretaker. In a few cases the farm is never divided and the two parties share produce or revenue from the farm. The latter practice offers no security to the caretaker and his family since he cannot pass on any portion of the farm to his heirs upon death or they may be disputed when the original owner of the farm dies and a relative succeeds him. The abunu contract also sometimes depends on the area and produce/type of crop. When a cocoa farm is being established, food crops are planted to provide food for the farm family and also to raise some income before the cocoa trees start yielding fruits. The food crops are divided between the caretaker and the owner of the farm in an abusa arrangement, even though the cocoa may be under an abunu arrangement (Barrientos & Akyere, 2012).
- There are issues related to family owned land and the way inheritance is arranged in the traditional farming systems. It is the case in many of the land tenure arrangements that a cocoa farm is passed on to the farmers' sons when he passes away. The cocoa farm is subsequently divided amongst the sons meaning that a farm could be divided into four smaller farms. The fragmentation of farm land caused by this inheritance system leads to decreasing yields as small farms are a disincentive for investments besides the fact that the income generated from the farm is low (Steijn, 2016).
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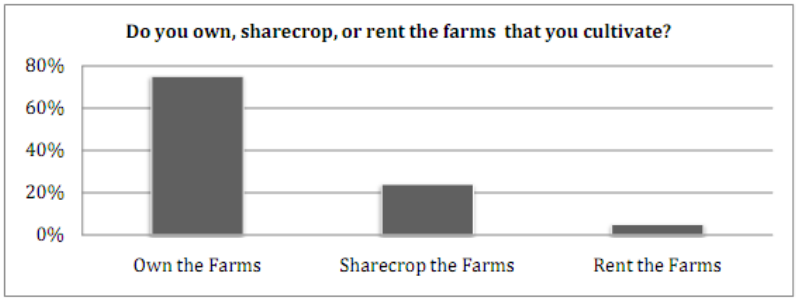
Land ownership arrangement	Percentage
Owner-operator	83
Abunu	9
Abusa	7
Annual labourer	1

Ownership arrangements (Baah et al. 2012).

Land ownership arrangement	Percentage
Owner-operator	89
Abunu	5
Abusa	2

Kolavalli et al. (2016).

Figure 6: Ownership of Farms



Land ownership arrangements (Hainmueller et al. 2011).

Table 3: Farm Size and Ownership by Region

Region	Median Farm Size Overall Reported (Acres)	Percent of Farmers that Own Their Farm	Median Size of Largest Farm Reported (Acres)	Median Size of Largest Farm Measured (Acres)
Ashanti	4	87%	4.7	4.02
Brong Ahafo	4	74%	6.5	4.78
Central	3	71%	4	2.1
Eastern	2.5	72%	3	2.2
Western	3	77%	4	2.7
Total	3	76%	4	2.51

Farm ownership by region (Hainmueller et al. 2011).

Côte d'Ivoire

- The absence of clear legal property rights often prompts migrant farmers to quickly establish farms on forest land as an attempt to secure property rights. Leading to increased deforestation (Ruf, 2011).
- In Côte d'Ivoire, land tenure is directly linked with the issue of nationality. Only nationals are allowed to own land. As such, many cocoa farmers do not have the right to own the land they till, even if their families have been in the country for generations. This creates all sorts of complexities, including obstructions to obtaining credits necessary for improving productivity, as well as the possibility of crop diversification (Hütz-Adams & Fountain, 2015).
- Cocoa is produced largely in traditionally structured societies, where women experience great difficulty to obtain legal land titles; even when their husband dies and they would run the farm themselves. Without land titles, they are often excluded from saving and credit systems, as well as from access to training and certification schemes. But women increasingly run cocoa farms. This is largely the result of the age differences between husbands and wives

(leading to a high number of widows), HIV/aids, social conflicts and male rural-urban migration (Hütz-Adams & Fountain, 2015).

- In Côte d'Ivoire, a much used property arrangement is the 'planter-partager' (P&P), which literary means planting-sharing. Colin & Ruf (2011) identify 3 types of P&P arrangements (see table below).
    - The first type, noted as 'plantation et terre' in the table below, is similar to the Abuna sharecropping in Ghana. A piece of land is 'given' to a farmer, the farmer then creates the plantation on the land. Once the farm has been completed and entered into production, the land is shared between the landowner and the farmer. This way, a farmer can receive (informal) land titles. The share of land the farmer receives depends on the arrangement. The cost of creating the plantation can be seen as a payment for the land received by the farmer from the landowner.
    - The second type, noted in the table as 'uniquement la plantation', the plantation is shared between owner and sharecropper, but the land remains property of the owner. The farmer establishes the plantation and receives a share of the plantation (the trees, but not the land). In this case the cost of farm establishment can be seen as land-rent transferred from the lessee to the landowner. Once sharing has started, each farmer exploits his part of the plantation indepently.
    - In the third type of arrangement, noted as 'partage de récolte', there is no sharing of land, neither of plantation, but the harvest is shared. Once production has started, the person that created the farm pays part of the harvest to the landowner. The land remains property of the landowner, the ownership of the plantation, however, remains vague. The plantation could be shared between landowner and farmer, but in this case, the farmer 'rents' the plantation with part of the harvest. The previous arrangement has only one payment moment, and that payment is the cost of farm establishment.
- The duration of these kind of arrangements is usually 'until the plantation (trees) dies'. This clause is rather ambiguous as the end of life cycle for cocoa trees can differ from tree to tree or from plantation to plantation. This is especially the case when part of a farm is replanted. However, Colin and Ruf (2011) argue that these arrangements typically last between 50 and 70 years for rubber, between 25 and 70 years for cocoa, and between 25 and 30 years for palm oil.
- Access to land can be divided into three different ways: by buying land, by receiving land from parents/husbands or by inheritance. Young men have in general more chance of receiving land by inheritance compared to young women. Furthermore, in some areas (Krobous) and in certain ethnic groups (Abbeys) women are forbidden to own land (FLA, 2015).
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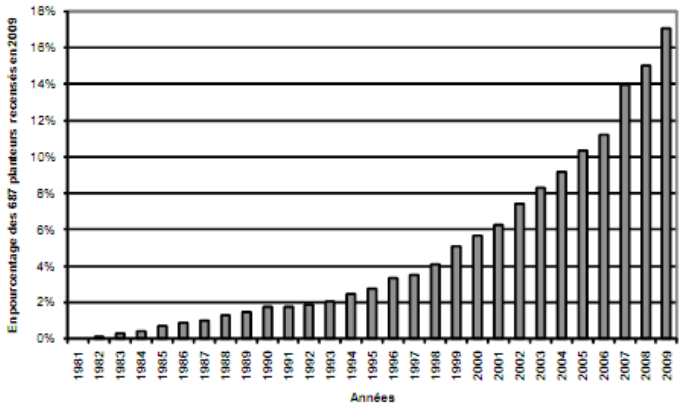
Figure 1 : Évolution du nombre de planteurs de cacao accédant à la terre par le contrat de P&P pour au moins une parcelle, 1981 – 2009



Sources : suivi de 700 planteurs depuis 2000 par le CIRAD, Ruf 2001, actualisé 2010.

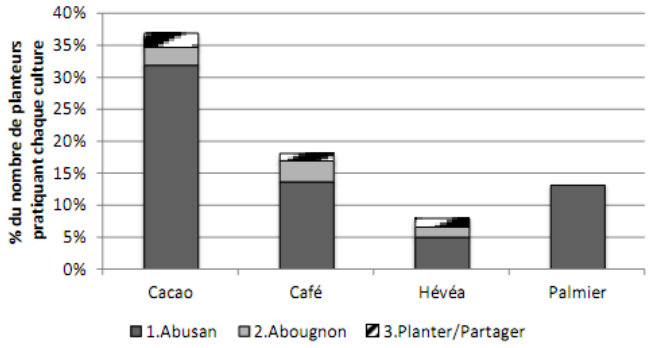
Number of P&P farmers (Colins & Ruf, 2011).

Tableau 2 : Les différents types de contrats de P&P

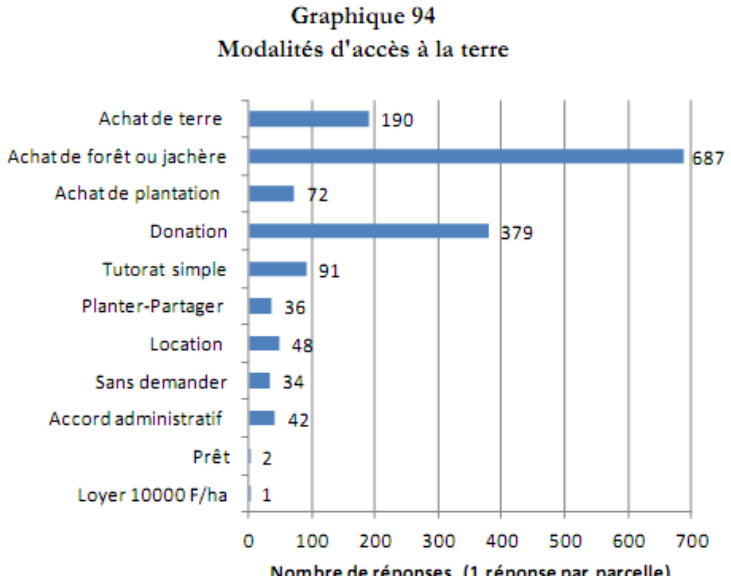
	Partage de la plantation		Partage de la récolte
	Uniquement la plantation	Plantation et terre	
Superficie	339,9 ha (81,2 %)	13,5 ha (3,2 %)	65 ha (15,5 %)
Nombre de parcelles	92 (80,7 %)	3 (2,6 %)	19 (16,7 %)

Number of farms under different P&P arrangements (Colin & Ruf, 2011).

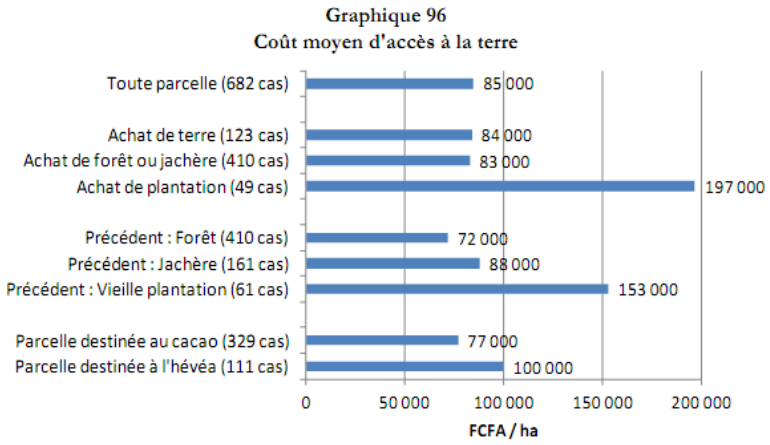
Graphique 88
Recours à des contrats de partage



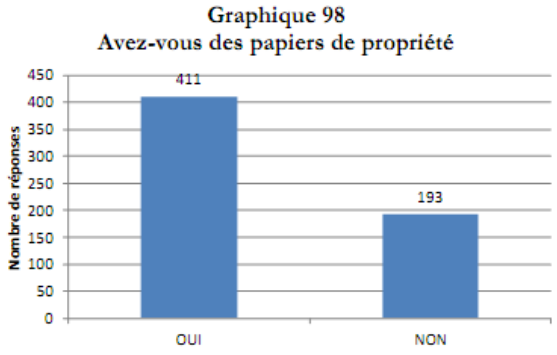
Sharecropping contract by percentage (Varlet & Kouamé, 2015).



How land is accessed (Varlet & Kouamé, 2013).



Cost of land per hectare for different crops (Varlet & Kouamé, 2013).



Amount of farmers that have ownership papers (Varlet & Kouamé, 2013).

Land size/type

Ghana:

Farm size (ha or acres)	Region	Source	Note:
4,6 ha 2,2 ha	Western Eastern	Ruf (2011)	-
3,0 ha	Unknown	Aneani et al (2011).	-
2 types: 1,4-2,7 ha (smallholder) 5,5 ha or more (larger farms)	Unknown	Barrientos & Akyere (2012)	Larger farms mostly in Western Region
2-3 ha	Unknown	Blackmore & Heilbron (2015)	-
2 ha	Unknown	Victor et al. (2010)	-
7.14 acres	Mean for Ashanti, Eastern, Western	Waarts et al. (2013)	Certified farmers Highest acreage in Ashanti Smallest acreage in Eastern
5 acres	Mean for all regions	Hainmueller et al (2011)	Difference between reported (3.6 a) and measured (5.1 a) farm sizes
4 acres 4 acres 3 acres 2,5 acres 3 acres	Ashanti Bhrong-Ahafo Central Eastern Western	Hainmueller et al (2011)	Median sizes reported
4,66 ha	Mean for Ghana	Calkins & Ngo (2005)	Older source, larger farms in Western compared to Ashanti
7,14 acres	Mean for Ghana	Waarts et al. (2013)	Certified farmers Highest acreage in Ashanti
2,27 ha	Mean for Ghana	Wiggins & Leturque (2011)	-
7,8 acres	Western Region	Anang (2016)	-
3,0 ha (mean) 0,4 ha (min) 36 ha (max)	Whole of Ghana	Aneani et al (2011)	Research conducted over different cocoa growing regions
10,47 acres	Ashanti region	Schouten (2016)	Three communities in Ashanti
5,54 acres	Mean for Ghana	Hiscox & Goldstein (2014)	-
7,5 acres	Mean for Ghana	Tulane university (2015)	Farm size decreased from 9.6 acres in 2009 to 7.5 in 2014
Q1: 1,65 ha Q2: 3,14 ha Q3: 5,24 ha Q4: 10,12 ha	Mean for Ghana	Kolavalli et al. (2016)	Makes distinction between 4 quartiles of landholdings based on size
4,98 acres 10,6 acres 4,78 acres 8,73 acres	Eastern Western Volta Mean for all three	Baah et al. (2012)	-
2-4 ha	Average for West Africa	Barry Callebaut (2014)	-
66% of farm sizes 0-8 ha 18,9% of farm sizes 20 ha+	Whole of Ghana	Addae (2014)	-
12.4 acres (76% for cocoa) 10.9 acres (74% for cocoa)	Uncertified farmers Certified farmers	Nelson et al. (2013)	Acreage mentioned here is the acreage that is used for cocoa, total acreage of farm(s) is higher
2,47 ha	Mean for Ghana	Oomes et al. (2016)	-
4.3 ha (total farm sizes of which 30% is fully for cocoa	Mean for Ghana	Donovan et al. (2016)	-
2,14 ha 1,94 ha	Ashanti Western	Vigneri et al. (2016)	Average calculated based on 4 districts in Ashanti, 2 in Western
2-5 ha	Mean for Ghana	LAMBERT ET AL. (2014)	Rather broad mean size

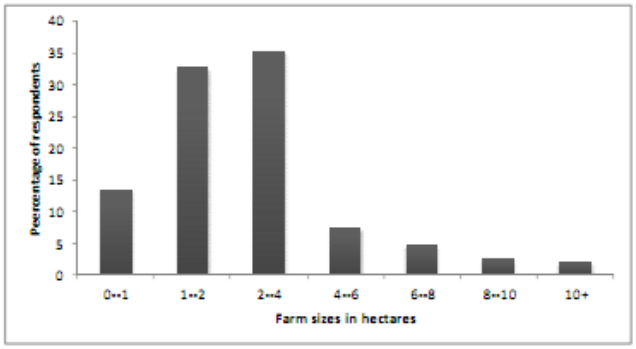
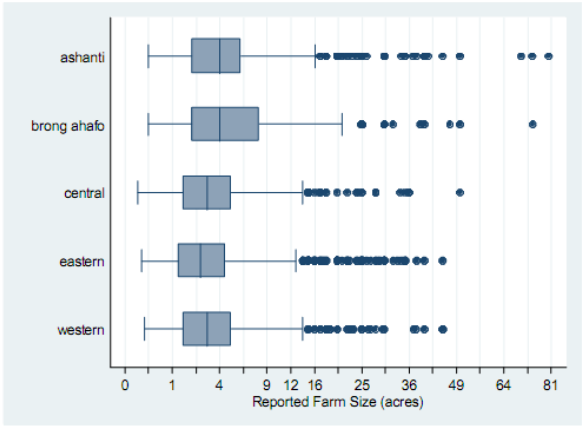


Fig. 2. Distribution of farm size hectares (n=150)

Kumi & Daymond (2015)

Figure 7: Reported Farm Size



Hainmueller et al. (2011)

Table 5.5: Cocoa farm size by district (acres)[a]

	Farm size by ranges (acres)					
District	1.0–3.0	3.01–6.0	6.01–9.0	9.01–12.0	12.0	Total
Agona Mampong	9 (25.0%)	15 (44.4%)	5 (15.7%)	2 (5.6%)	3 (8.3%)	36 (100.0%)
New Edubiase	3 (8.6%)	11 (31.4%)	7 (20.0%)	5 (14.3%)	9 (25.7%)	35 (100.0%)
Akim Oda	3 (11.1%)	8 (29.6%)	6 (22.2%)	2 (7.4%)	8 (29.6%)	27 (100.0%)
New Tafo	3 (7.9%)	13 (34.2%)	8 (21.1%)	2 (5.3%)	12 (31.6%)	38 (100.0%)
Dunkwa	4 (9.8%)	9 (22.0%)	8 (19.5%)	5 (12.2%)	15 (36.6%)	41 (100.0%)
Manso Amenfi	4 (12.9%)	7 (22.6%)	4 (12.9%)	4 (12.9%)	12 (38.7%)	31 (100.0%)
Total	26 (12.5%)	64 (30.8%)	39 (18.8%)	20 (9.6%)	59 (28.4%)	208 (100.0%)

Barrientos & Akyere (2012)

TABLE 3.11 Gross margins on different land quartiles

	Western N.	Ashanti	Total
Q1: [.05, 1.17]			
Gross Margin	1,568	435	1,169
Revenue from sale	4,695	2,929	4,073
Total Production Costs	3,128	2,493	2,904
Total Wage Bill	2,521	1,966	2,325
Total non-lab input costs	607	527	579
Q2: [1.26, 1.94]			
Gross Margin	1,106	492	879
Revenue from sale	2,191	1,261	1,847
Total Production Costs	1,085	769	968
Total Wage Bill	818	550	719
Total non-lab input costs	267	219	249
Q3: [2.07, 3.37]			
Gross Margin	748	635	709
Revenue from sale	1,683	1,321	1,560
Total Production Costs	935	686	851
Total Wage Bill	732	520	660
Total non-lab input costs	204	167	191
Q4: [3.49, 38.61]			
Gross Margin	759	639	720
Revenue from sale	1,502	1,485	1,497
Total Production Costs	743	846	777
Total Wage Bill	528	613	556
Total non-lab input costs	215	232	221
Total			
Gross Margin	1,042	547	870
Revenue from sale	2,512	1,750	2,247
Total Production Costs	1,471	1,203	1,378
Total Wage Bill	1,148	916	1,068
Total non-lab input costs	322	287	310

Note: *Farmers' wage bill was derived by summing up for each respondent the cost paid for each type of labour (contract and daily) across all tasks.*
Source: *adult's questionnaire, Ghana*

Vigneri et al. (2016)

Descriptives:

- Increasing cocoa output by expanding farms into forest land is relatively inefficient as farm expansion is expensive. Increasing productivity of existing farms through inputs (fertiliser, pesticides etc.) is more efficient (Aneani et al. 2011).
- The small farm sizes in Ghana may be due to cocoa establishment arrangements where sometimes the farm is split into two between the land-owner and the caretaker (Barrientos & Akyere, 2012).
- The inheritance system in Ghana often leads to fragmentation of farm land when a farmer leaves his farm to multiple sons. Smaller farm sizes lead to declining yields as small farms are a disincentive for investment leading to less fertiliser and fungicide/pesticide application (Steijn, 2016).
- 4 ha is the minimum farm size needed for cocoa to be profitable (Blackmore & Heilbron, 2015).
- Landholding size has a strong relationship with crop diversification and income (Wiggins & Leturque, 2011).
- Farm size is negatively correlated with farmer satisfaction of cocoa prices, but was not significant (Aneani et al. 2011).

- The average amount of land under cocoa cultivation has decreased between 2008 and 2014 from 9,6 ha to 7,5 ha (Tulane University, 2015).
- Smaller farms have lower incomes and lower returns on investment. Larger farms are characterised by higher technology uptake (i.e. higher input use) (Oomes et al. 2016).
- Small farm sizes are associated with a higher usage of household labour as smaller farmers often cannot afford hired labour (Vigneri et al. 2016).
- There is statistically significant evidence that smaller landholdings achieve higher yields. This implies that as land size increases, farmers are unable to efficiently allocate their labour and non-labour inputs (Vigneri et al. 2016).

Côte d'Ivoire

Farm size (ha or acres)	Region/other	Source	Note:
5 ha 2-10 ha	Local farmers National/migrant farmers	Smith-Dumont et al. (2014)	-
1.6-1.8 ha	Mean for CdI	Molenaar & Heilbron (2015)	-
2.8 ha 6.2 ha 9.5 ha 6.2 ha	Tiassalé Adzopé Abendgourou Mean for CdI	Calkins & Ngo (2005)	Older source. Mean for CdI has been calculated based on these three regions
5.34 ha (estimated) 3.7 ha (measured)	Mean for CdI	Ingram et al. (2014)	Farmers significantly overestimate farm sizes
3-4 ha	Mean for CdI	Wessel & Quint-Wessel (2015)	"No reliable statistics"
5,69 ha 5,84 ha	Uncertified farmers Certified farmers	PFCE (2016)	-
5.6 ha 6.4 ha	Uncertified farmers Certified farmers	Lemeilleur et al (2015)	-
6,3 ha	Mean for CdI	Deheuvels et al. (2009)	80% of the farmers have a farm smaller than 10 ha (also see tables on next page)
11.7 acres 8.8 acres	In 2009 In 2014	Tulane University (2015)	Average acreage used for cocoa by households
5,65 ha 4,96 ha 4,25 ha	For Baoulé For Bakwé For Burkinabé	Tanno (2012)	The study is about differences between ethnicities
5,8 ha	Mean for specific region in CdI	Varlet & Kouamé (2013)	Research about cocoa lands bordering the *Taï national park* near Liberia
6,76 ha 7,19 ha 5,29 ha 2,08 ha 5,77 ha	Indénie-Juabin Nawa Loh Jibua Haut-Sassandra Mean for all four	Vigneri et al. (2016)	-
7,2 ha 6,31 ha	Study A (mean for CdI) Study B (mean for CdI)	Maytak (2014)	Synthesis of 2 other reports
2-5 ha	Mean for CdI	LAMBERT ET AL. (2014)	Very broad classification
4.31 ha >12ha >23ha 4.87ha <3.34ha	Average cocoa plot size 5% of plots are >12ha 1% of plots are >23ha Average all plots combined 50% of plots are <3.34ha	Balineau et al. (2017)	Farmers have one or more cocoa plots. The first three statistics are the size per plot. The last two are the size of all plots combined.

Tableau 3: Taille moyenne par producteur des vergers de cacaoyers dans différents départements.

Zones de production de cacao	Départements	Surface moyenne des cacaoyères (ha/producteur)
Est et Sud-Est	Abengourou	10,9 ± 1,8 a
	Aboisso	6,7 ± 1,1 b
	Agboville	7,0 ± 2,3 b
	Bongouanou	3,3 ± 0,9 cd
Centre-Ouest	Divo	5,0 ± 0,9 bc
	Sinfra	6,8 ± 1,7 b
	Bouaflé	5,2 ± 0,9 bc
	Issia	2,3 ± 1,7 d
Sud-Ouest et Ouest	Soubré	6,4 ± 1,0 b
	Guiglo	5,2 ± 0,8 bc

Deheuvels et al. (2009).

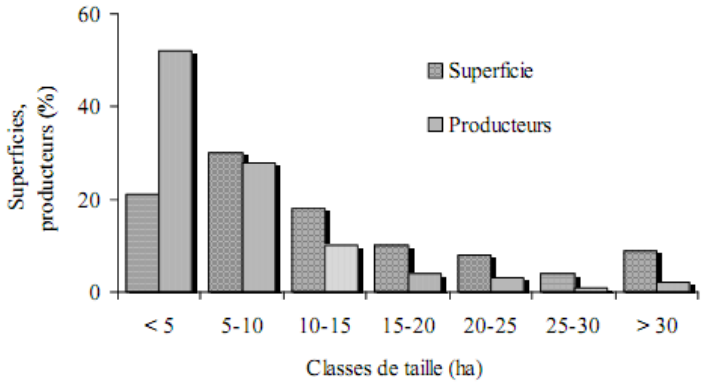


Figure 3: Répartition des cacaoyères et des producteurs selon la taille des vergers.

Deheuvels et al. (2009)

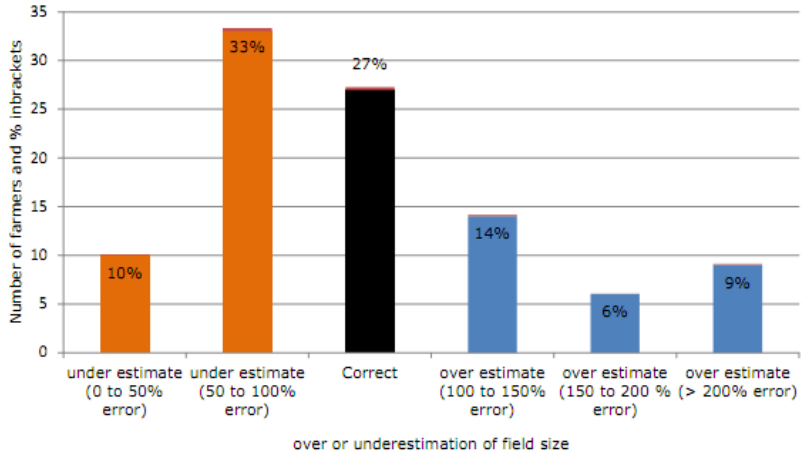
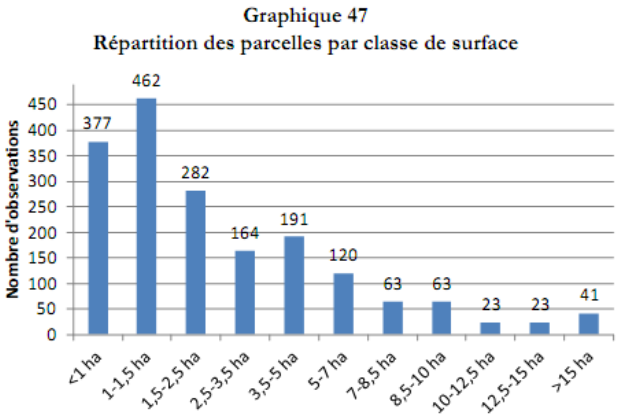
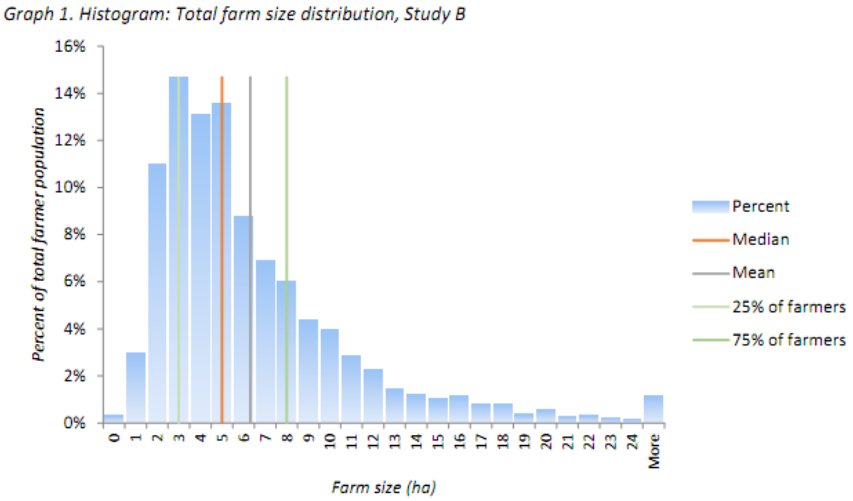


Figure 39 *Percentage of farmers over and underestimating field size.*

Ingram et al. (2014)



Number of farmers stating they have a certain size plot (farmers can own multiple plots) (Varlet & Kouamé, 2013).

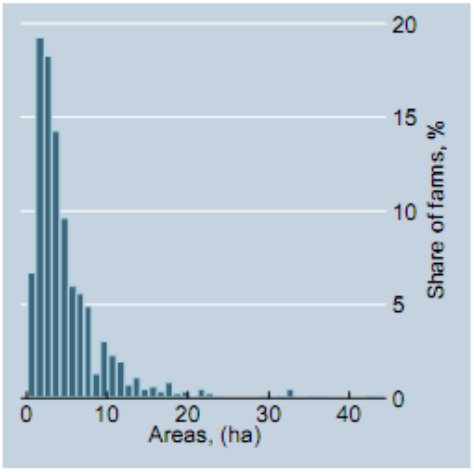


Maytak (2014)

Table 7 – Number of plots per farmer

Number of plots	Number of farmers	%	Total % c
1	649	89.39%	89.39%
2	62	8.54%	97.93%
3	13	1.79%	99.72%
4	1	0.14%	99.86%
5	1	0.14%	100%
Total	726	100%	

Figure 19 – Size of farms



Size of farms (Balineau et al. 2017).

Descriptives:

- Almost all sampled farmers (90%) have a single cocoa plot. 8% (62 farmers) have two plots, 13 farmers have three plots, one farmer has four plots, and one farmer has five plots (Balineau et al. 2017).
- Most farmers cultivate 1 plot (76%), 19% had 2 plots, 3% had three plots, and 2% had four or more (Smith Dumont et al. 2014).
- In general, local farmers have smaller farms than migrant farmers (Smith-Dumont et al. 2014).
- 4 ha is the minimum farm size for cocoa to be profitable (Blackmore & Heilbron, 2015).
- The overestimating of field sizes and yields by farmers leads to overuse of inputs (Blackmore & Heilbron, 2015).
- Larger farm sizes are associated with higher knowledge levels (about GAPs) (Ingram et al. 2014).
- Smaller farms have less means to buy inputs for their farms and have lower returns on investments. Larger farms are associated with higher technology uptake (Oomes et al. 2016).
- Most farmers have unused lands. The main reason why land remains fallow is that farmers lack financial means plant cocoa or other crops.
- Land needs to remain fallow for at least 5 years for optimal fertility (Varlet & Kouamé, 2013).
- Smaller farms are associated with a higher amount of working days per ha from both hired labour and from household (child) labour (Vigneri et al. 2016).
- Cocoa profitability tends to decrease for farmers cultivating larger landholdings. Gross margins per hectare are about 50% higher for farmers on landholdings comprised between 1.7 and 3.4 ha (second from bottom land quartile) than for farmers on landholdings over 6 ha (top land quartiles). As cocoa landholdings go up, the costs of inputs per hectare increase more rapidly than yields, so farmers earn less per unit of land (gross margins per hectare decline) (Vigneri et al. 2016).

- 1. Farmers have on average 2,5 cocoa farms (Study A).
  2. 43% of farmers cultivate 1 farm, 36% cultivate 2 farms, 16% cultivate 3 or 4 farms and 5% cultivate more than 5 farms (Study C).
  3. Farmers cultivate 1.16 farms on average (Study C) (Maytak, 2014).

Climate

Ghana and Côte d'Ivoire unless indicated otherwise:

- Climate is prescribed in terms of solar radiation, precipitation, temperature, humidity, wind velocity and barometric pressure (Olesen et al. 2013).
- Rainfall is the factor with most variability, even between growing regions within Ghana. Rainfall is expected to decrease. Furthermore, the late onset or early end of the rainy season can negatively impact the growing cycle of crops. (Olesen et al. 2013)
- The current rate of increase in cocoa production in West-Africa is likely to slow down as cocoa trees are very sensitive to changing weather patterns. Periods of drought and of excessive rain or wind is likely to negatively impact yields in the future (WCF, 2014).
- Research in to future climate in West Africa predicts an increase in temperature which will decrease the amount of land suitable for cocoa production. Farmers will have to adapt their agronomic management to these new conditions. Furthermore, climate change is accompanied by increasing population and increasing urbanisation which further decreases available land while simultaneously increasing the demand for food crops and increasing the price of food crops. Shifts from cocoa to food crops is therefore a likely scenario in the future (Wessel & Quint-Wessel, 2015).
- Climatic changes also impact crops other than cocoa. Droughts, sudden large amounts of rainfall and hard winds have made cultivating certain crops in certain areas impossible. An example of this is farmers in Aboisso (CdI) stating that their banana trees cannot handle the hard rainfalls (FLA, 2015).
- Most farmers in CdI do not change crop/farm method because of changing climatic factors (see tableau 27/28 below)(Varlet & Kouamé, 2013).
- A less perceptible environmental change resulting from the progressive replacement of forests by farms at a regional scale is one of a drier microclimate. This can exacerbate the difficulties of replanting crops such as cocoa which have high humidity requirements. Indeed, farmers around the world agree that rainfall patterns have changed after years of deforestation. In several of the main cocoa-growing regions of Côte d'Ivoire, Ghana, Cameroon and Indonesia, farmers have moved on to rubber, oil palm, cashew and teak. These crops are better than cocoa at withstanding these climatic changes. Climate change increases the vulnerability of a monoculture and thus makes farm diversification more appealing. It attracts international attention, especially in areas subject to frequent and/or extreme weather events (Ruf & Schrotz, 2015).
- In the current production environment – declining soil fertility, the change in the amount and distribution of rainfall – lead to most attempts to replant orchards failing (CNRA, 2016).

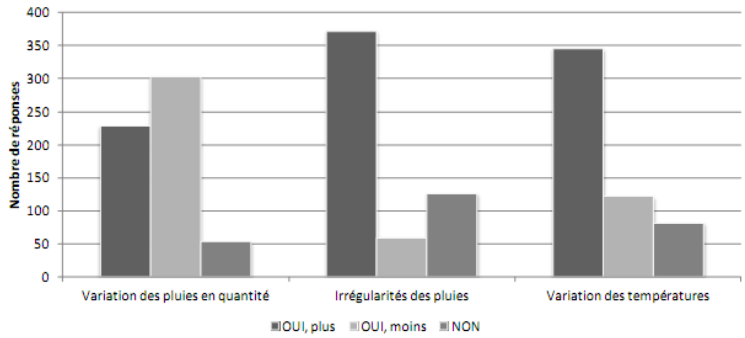
Table 1: Rainfall and agro-ecological zones for rice production in Ghana

	Mean annual rainfall (mm)	Major growing season (days)	Minor growing season (days)	Corresponding regions
Rainforest	2200	150 - 160	100	Western region
Deciduous rain forest	1500	150 - 160	90	Ashanti, Eastern, Brong Ahafo and and parts of the Volta regions
Transitional	1300	200 - 220	60	Brong Ahafo and parts of Volta regions
Coastal	800	100 - 110	50	Greater Accra, Central, and part of Western regions
Guinea savanna	1100	180 - 200	*	Northern, Upper West; and part of Upper East; and Volta regions
Sudan savannah	1000	150 - 160	*	Upper East region

Source: Ghana Meteorological services (2010)

Climatic differences between regions in Ghana. Rainforest/ deciduous rainforest are most suitable for cocoa (Asante-Poku & Angelucci, 2013).

Graphique 137
Perception des variations climatiques
(Tous les secteurs)



Variation in quantity of rain. Irregularities in rainfall. Variation in temperature (CDI) (Varlet & Kouamé (2013)

Tableau 28
Changements induits par les variations de température

Les variations de température entrainent-elles des changements de cultures ?	Nombre de réponses	Les variations de température entrainent-elles des changements de méthodes ?	Nombre de réponses
Ne sait pas	1	Ne sait pas	1
NON	276	NON	225
OUI	69	OUI	93
Hévéa	3	J'attends la pluie	18
Hévéa ou Teck	1	On fait les sachets	15
OUI, nous déplaçons les cultures	1	Éviter les feux de brousse	5
Cultures appropriées au temps	1	Pépinière	3
Les plantes meurent	1	Séchage facile	3
L'hévéa ne réussit pas	1	Planting direct ou semis direct	2
Maïs	1	Déplacement des cultures	1
		Extension des parcelles	1
		Faible production	1
		La fraicheur fait venir la pourriture	1
		Les jeunes cacaoyers meurent	1
		Séchage difficile	1
		Arrosage	1

Farmer responses to changes in temperature (CdI) (Varlet & Kouamé, 2013).

Tableau 26
Changements induits par les variations de pluviométrie

Les variations de pluie entrainent-elles des changements de cultures ?	Nombre de réponses	Les variations de pluie entrainent-elles des changements de méthodes ?	Nombre de réponses
Ne sait pas	0	Ne sait pas	2
NON	385	NON	315
OUI	79	OUI	87
Hévéa	20	On fait les sachets	25
Riz basfond au lieu de riz terre ferme	2	Le calendrier cultural change	16
Beaucoup de riz	1	J'attends la pluie	10
Faire une autre culture	1	Lutte contre pourriture brune	7
Hévéa et café	1	Moins de nettoyage	6
Hévéa ou Teck	1	OUI, les buttes	4
Igname	1	Beaucoup de planting	3
Maïs	1	Pépinière	3
Maïs au lieu du riz	1	Faible production	2
OUI, des remplacements	1	On met cacao dans bas-fond	2
Plus de riz et de maïs	1	Replantation	2
Riz basfond	1	Séchage difficile	2
Vivrier	1	Semis direct	2
		Trop de retard dans le travail	2
		Ajouter engrais	1
		Arrosage	1
		Déplacement des cultures	1
		Les cacaos meurent	1
		on cherche pente pour planter	1
		On fait la jachère	1
		On fait plus de vivriers	1
		OUI, plus de plants	1
		Pas de nettoyage	1
		Pas de planting, moins de nettoyage	1
		Planting plus serré	1
		Plus d'herbicide	1

Farmer responses to variations in rainfall. Left is changes in crops, right is changes in farm methods (CdI) (Varlet & Kouamé, 2013).

Transport/infrastructure

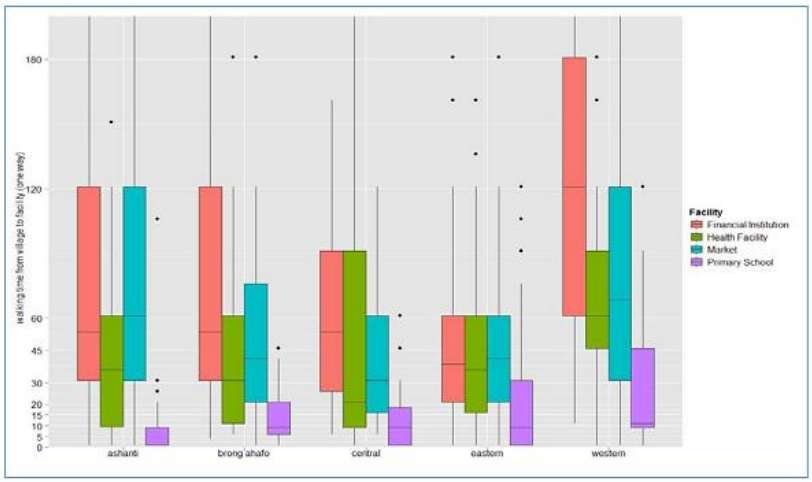
Ghana

- The access to critical inputs and extension services are important factors that can improve a farmers productivity and income. The delivery of these inputs and services can be hampered by bad accessibility of remote communities that are connected by bad roads or no roads at all (Barrientos & Akyere, 2012).
- The selling of cocoa poses problems for farmers from remote communities. There are about 3000 locations from which LBCs buy cocoa and bad road networks or lack of transportation forces farmers to carry heavy bags of cocoa by foot to the LBC buying points (Barrientos & Akyere, 2012).
- Farmers in focus groups indicated the need for better roads. Better roads would improve accessibility and farmers are certain this would benefit their communities. At the moment, unpaved roads can become inaccessible during some parts of the year (e.g. rainy season). Improved accessibility would decrease transportation costs as more taxis and trotro's would become willing to go to the village, reducing fares. Better roads would also make it easier for LBCs to access villages, improving the marketing position of farmers and reduce labour costs

of carrying cocoa to buying points. Improved roads could also lead to better access to markets for other crops (e.g. food crops). Finally, improved roads will improve access to health clinics and schools (Barrientos & Akyere, 2012).

- Long sun exposure of cocoa beans can reduce quality. Cocoa bags that need to be carried long ways can lose value due to loss in quality (Barrientos & Akyere, 2012).
- Food crops are mostly used for subsistence as bad roads and lack of transport infrastructure makes the marketing of food crops impossible due to the perishable nature of food crops (also for **CdI)** (ICCO, 2010).

Figure 34: Travel Times



Hainmueller et al. (2011).

Figure 35: Road Conditions

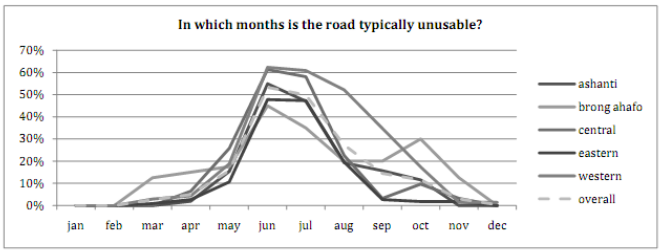
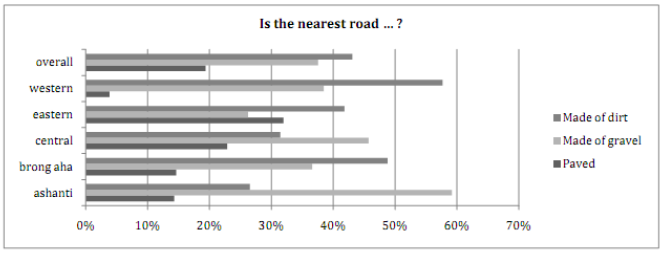


Figure 36: Road Construction



Hainmueller et al. (2011).

Certification

Ghana

- Benefits of certification include: Higher prices obtained through certification, enhanced bargaining power at the cooperative level and increases in yields positively impact farmers' income. Impacts are also observed on the community level with better working conditions, increased numbers of children attending schools and overall positive impacts in livelihoods (Basso et al. 2012).
- Some farmers are less likely to benefit from certification, in particular these are: 1) farmers with a cocoa plot smaller than 1ha, 2) farmers who are not a member of a coop and 3) farmers who have a low productivity improvement potential. It must be noted however, that even without productivity improvement, farmers of sufficient size will generally benefit from certification (Basso et al. 2012).
- There is still a large majority of farmers which cannot benefit from certification because their way of working is not certifiable yet, and they do not have the means (or the incentives) to implement the required changes. Within the community of certified farmers, there are complaints about the burden of certification in terms of compliance costs (Basso et al. 2012).
- Leakage indicates the proportion of production of a certified farmer that is not sold as certified product. In other words, the percentage of cocoa that is sold to the conventional channel without certificate. Leakage can occur for several reasons: 1.there is insufficient demand for the certified product, 2. the farmer is not incentivized to sell the product as certified, 3. the farmer has immediate cash-needs and sells its products to the first buyer available (Basso et al. 2012).
- Some farmers benefit more from certification than others, in particular farms with a large plot of cocoa trees benefit more than farmers with small plots. More case studies, field work or monitoring are required to really differentiate between schemes from a farmer perspective (Basso et al. 2012).
- Farmers who participated in more trainings other than the cocoa programme trainings implement practices in a better way than farmers who participated in fewer trainings. Other findings are that lead farmers implement practices in a significantly better way than other project farmers, which is an interesting finding as their knowledge level was not significantly higher than those of the other project farmers. Furthermore, men implement practices in a significantly better way than women. A possible explanation for this is that women generally have a lower education level than men (Waarts et al. 2013).
- Farmers who participated in the UTZ programme for longer did not have a higher cocoa productivity or a higher income than farmers who just started their participation in the programme (Waarts et al. 2013).
- There is no significant difference between certified and uncertified farmers when it comes to producing food crops. Certified farmers do produce palm oil significantly more often (Nelson et al. 2013).
- There is no significant difference between certified and uncertified farmers related to food security. Both groups reported eating 2 meals per day on average (Nelson et al. 2013).
- Fairtrade certification does not have a significant impact on income, household welfare or education levels. This is partially because the minimum fair trade price is below the ensured minimum COCOBOD price (Kolavalli et al. 2016).

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Table 4. Cash flow projections for high input certified cocoa production system.

Year	Labor quantity (days)	Labor costs (GHc/ha)	Physical input costs (GHc/ha)	Total costs (GHc/ha)	Total revenues (GHc/ha)	Net annual return (GHc/ha)	Expenditures during production season (GHc/ha)	Expenditures during harvest season (GHc/ha)
1	121	420	223	643	0	-643	643	0
2	85	295	64	359	900	541	307	52
3	91	317	7	324	500	176	295	29
4	136	471	367	838	374	-464	648	190
5	241	837	267	1,104	1,094	-9	548	556
6	259	900	267	1,167	1,219	52	548	619
7	275	954	267	1,221	1,326	104	548	673
8	288	1,000	267	1,267	1,415	148	548	718
9	299	1,036	367	1,403	1,487	84	648	755
10	306	1,063	267	1,330	1,541	210	548	782
11	312	1,082	267	1,349	1,577	228	548	801
12	315	1,092	267	1,359	1,596	238	548	810
13	315	1,092	267	1,359	1,598	238	548	811
14	312	1,084	367	1,451	1,581	130	648	803
15	307	1,067	267	1,334	1,548	214	548	786
16	300	1,041	267	1,308	1,496	188	548	760
17	290	1,006	267	1,273	1,427	154	548	725
18	277	962	267	1,229	1,341	112	548	681
19	262	909	367	1,276	1,237	-39	648	628
20	244	847	267	1,114	1,115	1	548	566
21	1434	4,977	267	5,244	6,576	1,332	548	4,696

Cash flows for certified farmers (Victor et al. 2010).

Table A3.13	Reasons of preference of purchasing clerks for UTZ certified and regular cocoa		
UTZ		**Regular cocoa**	
Less re-drying is required	3	Less administration is required	
More bags to buy from farmers	5	No bags must be kept separate	
More professional attitude of the farmer	1	Less control	1
Other	2	Other (could not get UTZ certified anywhere)	2

Waarts et al. (2013).

Table 15 Credit and savings (comparisons over time)

	Non-certified farmers			FT-certified farmers		
	2010	2012	Sig	2010	2012	Sig
N	*349*	*344*		*394*	*348*	
Credit ($)	105	341	**	64.1	146.1	*
Cash savings ($)	313	535	ns	288.9	324.3	ns

Sig = Significance of differences between groups: ns = not significant, *P≤0.05, **P≤0.01, *** P≤ 0.001

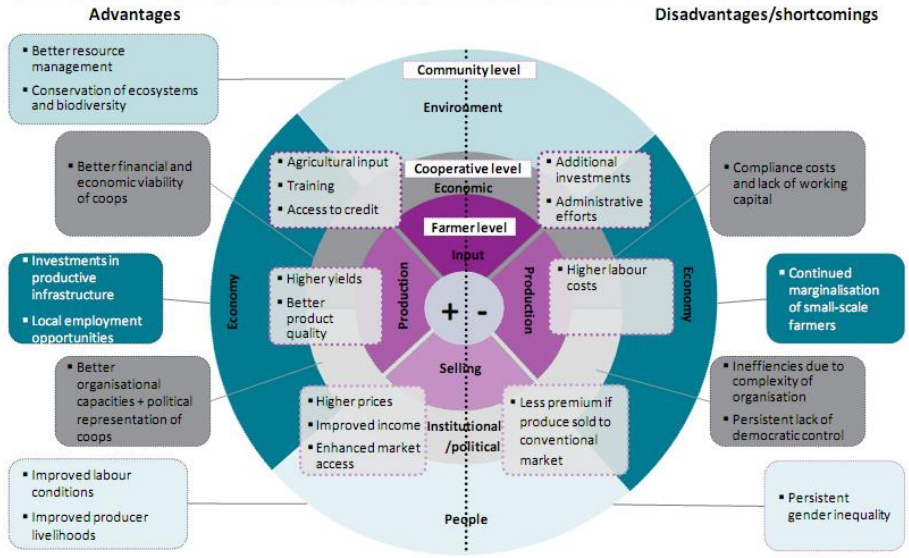
Credit and savings differences between farmers (Nelson et al. 2013).

Table 17: Farmers' assessment of changes (2012)

	No certification	FT certified	Sig
N	*343*	*350*	
-1 = decrease / deterioration; 0 = no change; 1 = increase / improvement			
Minimum price for cocoa	0.98	0.99	ns
Premium payments	-0.31	0.37	***
Credit including farm inputs on credit	-0.02	0.29	***
Advance payment for product	0.08	0.14	ns
Market access	0.25	0.32	*
Payments due to quality cocoa	0.05	0.14	***
Access to training	0.09	0.53	***
Extension services for cocoa	0.06	0.33	***
Transport of produce	0.07	0.18	***
Crop husbandry	0.10	0.07	ns
Availability of cocoa production inputs	-0.06	0.32	***
Post-harvest handling facilities for cocoa	0.16	0.16	ns
Diversification of farming enterprises	0.16	0.15	ns
Value addition on farm	0.27	0.50	***
Environment	-0.03	0.06	*
Safe use of pesticides	0.18	0.35	***
Primary Society	0.02	0.36	***
Social development	0.12	0.16	ns

Nelson et al. (2013).

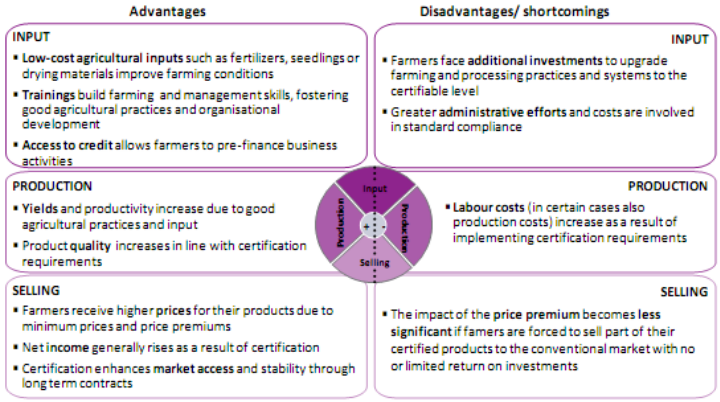
Figure 6: Overview of the advantages and disadvantages of certification from the producer perspective



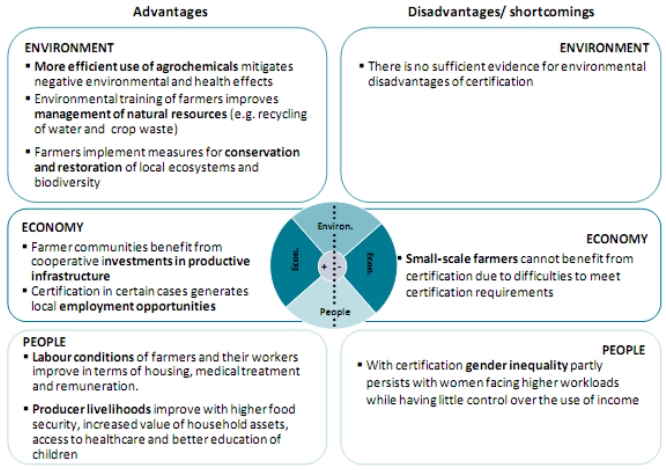
Source: KPMG Team Analysis

Benefits of certification for farmers (Basso et al. 2012).

Figure 7: Advantages and disadvantages of certification at the farm level



Basso et al. (2012).



Source: KPMG Team Analysis

Basso et al. (2012).

Table 6: Premium per certification scheme

Premium				
in US$ per certified ton of cocoa[33]	Base case	RFA	UTZ	FT
Ghana	195	150[34]	152,40	200
Côte d'Ivoire	195	200	140	200

Premium per scheme per country (Basso et al. 2012).

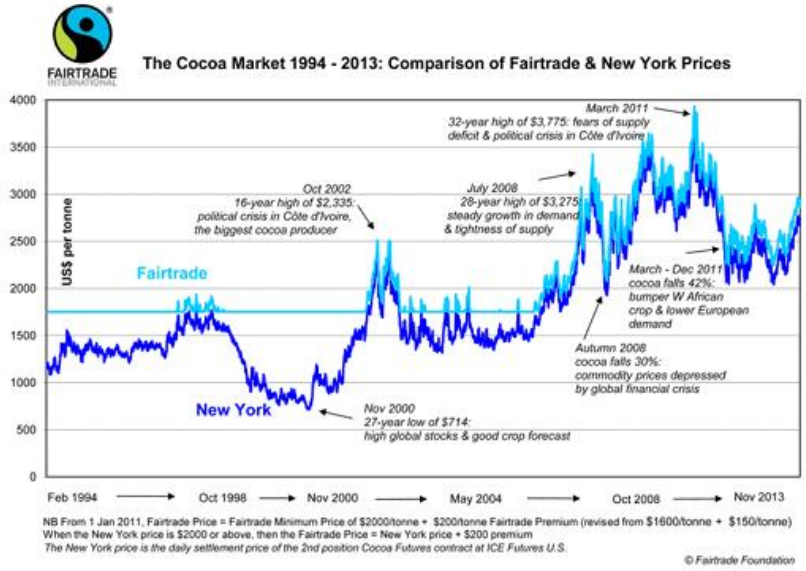


Figure 11, the Fairtrade minimum price. Source: (International)

Appelman (2016).

Côte d'Ivoire

- There are noticeable differences between Ghana and Côte d'Ivoire when it comes to certification impact. In Côte d'Ivoire, farmers who participated in either a public or private programme to increase yields had significantly higher yields than non-programme participants. Programme participants in Ghana did not have statistically significant higher yields relative to non-programme participants (ICI, 2015).
- Farmers that have participated in the UTZ programme longer have signficantly higher yields than farmers who only just recently joined. There was no significant difference between the two groups in **Ghana.** However, these differences could also be attributed to other factors, such as the fact that farmers who participated longer in the programme already had high yields before joining the programme. Other factors that play a role are related to rainfall, humidity and sun radiation (Ingram et al. 2013).
- The production costs of farmers who recently joined the programme are significantly lower than those that have been participating longer (67 CFA/kg vs. 135 CFA/kg) (Ingram et al. 2013).
- Certified farmers have lower efficiency ratios compared to uncertified farmers. This is an interesting result as farm size, gross income, productivity, number of farms and total production costs do not differ between certified and uncertified farmers. This finding helps explain the concern farmers have that the price premium does not cover cost of producing certified beans (Ingram et al. 2013).
- Benefits of certification reported by farmers are the ability to produce better quality cocoa and the earning of a higher income (Ingram et al. 2013).
- As mentioned before, farmers complain that the cost of producing certified cocoa is not fully covered. The initial investment cost is something most farmers cannot afford (Ingram et al. 2013).

- Farmers that have been trained as part of the UTZ programme sometimes indicate that they train others themselves. UTZ farmers usually train their wives and children, or to a lesser extent other farmers and labourers (Ingram et al. 2014).
- The majority of farmers report positive results from certification, namely improved farm management and an increased income (Ingram et al. 2014).
- Cooperatives can sometimes decide what the premium is used for. The premium can be paid in cash to farmers or can be used for community activities in the form of schools, wells, roads, health centers. etc. (Ingram et al. 2014).
- The price premium is the most important incentive to become certified, other farmers also stated access to inputs and transportation as incentives and also improvements in cocoa quality (Ruf, 2013).
- Certified have on average slightly larger farms. Furthermore, certified farmers are not more specialised in cocoa (i.e. not growing other crops) than uncertified farmers (Lemeilleur et al. 2015).
- The price premium is usually 50 CFA/kg (Lemeilleur et al. 2015).
- According to a MoU signed with the traitant, certified farmers receive FCFA 25 per kilogram as a premium. The premium payment for the certified cocoa is usually around FCFA 100 per kilo (US$ 0.2). In the assessed traitant's system, the premiums are divided into four parts: (1) a share for the pisteur to cover services to the farmers, (2) a share for the farmer, and (3) two shares for the traitant to cover the charges of certification audit visits, maintenance of the sustainability staff, and training-related expenses (FLA, 2016).

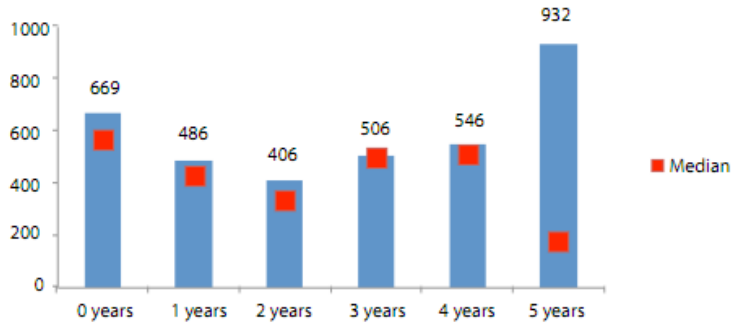


Figure 3: Average cocoa farm productivity per hectare per phase of the programme

Impact of UTZ programme on productivity (Ingram et al. 2013).

Multiple responses possible.

Figure 27 *UTZ programme participants' perceptions of the advantages of being cooperative member.*

Ingram et al. (2014).

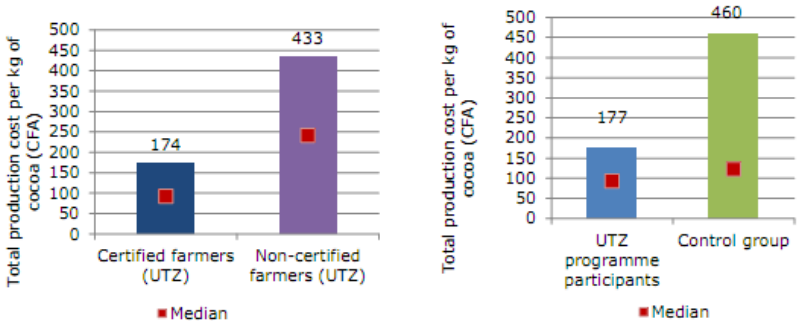


Figure 47 *Total production costs per kilo of cocoa.*

Production per kg (Ingram et al. 2014).

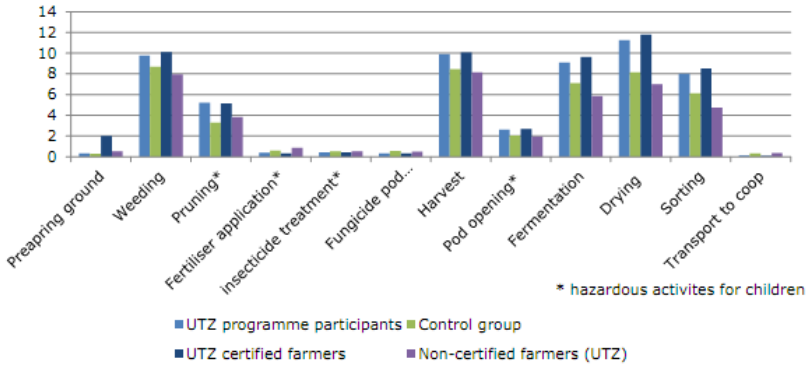
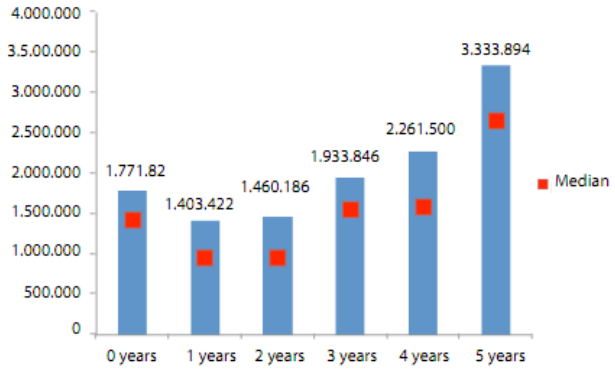


Figure 32 *Average hours spent by children per cocoa production activity in the year 2012.*

Tasks performed by children (Ingram et al. 2014).

Figure 7: Average net income from cocoa from the main farm in 2012 for farmers in all phases of the support program



Impact of UTZ programme on net income (Ingram et al. 2013).

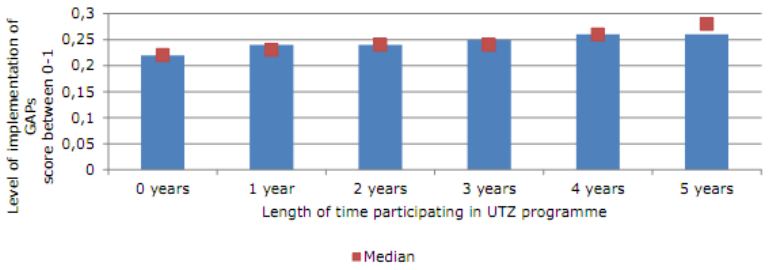
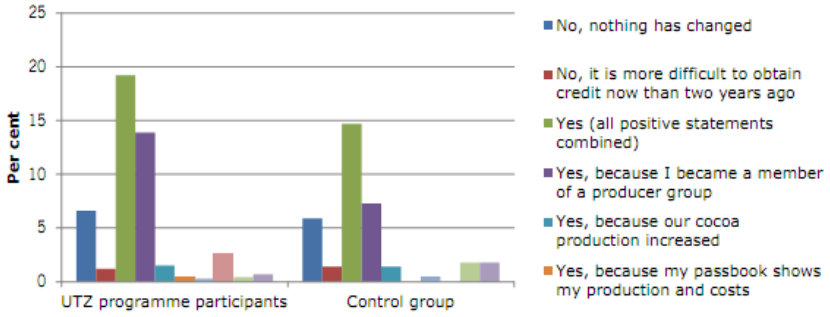


Figure 12 *Average implementation levels and length of participation in the UTZ programme.*

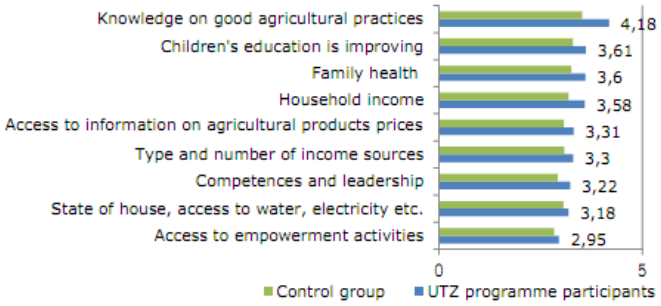
Ingram et al. (2014).



(N = 263).

Figure 38 *Changes in access to credit compared to two years ago.*

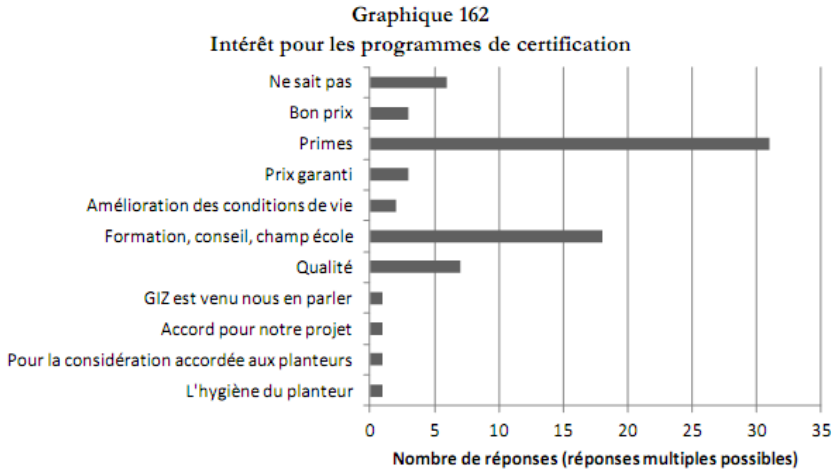
Ingram et al. (2014).



Key: 0 = unsatisfied 2.5= neutral 5 = very satisfied

Figure 16 *Farmers' satisfaction with their livelihoods.*

Ingram et al. (2014).



Reasons for interest in certification (Varlet & Kouamé, 2013).

Added value of being UTZ certified	
Farmers say the programme helps to increase productivity and income, while certification gives them access to premiums and services. The programme is professionalising the cooperatives. Some of the services provided by cooperatives can be improved.	UTZ programme participants and UTZ certified farmers are more productive and have lower production costs per kilogram than uncertified farmers.
	Farmers who have been in the programme the longest tend to produce more efficiently and have higher gross and net incomes from cultivating cocoa than farmers who joined later.
	Almost all (97%) programme participants are satisfied with the UTZ certification and training. Farmers say that the programme's added value is that it gives them access to certification premiums and, since they work in a cooperative, access to services they need and are satisfied with. As farmers are organised in groups for UTZ certification, they can be more easily reached by traders and organisations and offerd services. These relationships give farmers and their groups access to market support services.
	Being in a cooperative has many benefits, according to the farmers, such as fetching a good price for their beans, gaining access to information and training, providing a forum where they can exchange information and network.
	Farmers believe that activities associated with certification, often provided by traders, have helped to professionalise the cooperatives. Think, for example, of management training, models for internal control systems, financial support, equipment and vehicles to transport produce.
	60% of the farmers say that inputs are provided on time or in sufficient quantity, and 70% have access to credit.
	Farmers believe that their cooperatives can be further professionalised by improving access to fertilisers, credit, and seedlings. They mention the need for their groups to be more transparent and accountable, particularly in terms of providing more information on prices and benefits, on how premiums are used by the group. They also stress the need to train managers. Farmers require more support to improve their families' livelihoods, and to manage and diversify their sources of revenue.

WUR (2014).

Conclusion	Results
	Better income and better crops (PROFIT)
Livelihoods seem to improve for those who joined the programme.	Farmers are generally satisfied with the impact that certification and training has on their livelihoods. Farmers in the programme are more satisfied about many facets of their livelihood than farmers who did not join the programme.
	82% farmers say their living conditions have improved since joining the certification programme.
	92% of farmers report positive changes following certification.
Certification seems to increase farmers' incomes, but they are concerned about the long-term viability of cocoa farming and the potential discontinuation of the premium for certified cocoa.	Farmers say that the higher income they have been earning since joining the programme has enabled them to give more of the proceeds from cocoa to their spouses and also use part of it to meet basic family needs and pay for their children's schooling.
	Farmers require more support when it comes to improving access to health care, schooling and infrastructure.
	About 50% of farmers say that their income has increased since certification.
	The net household income per year in 2012 from cocoa for certified farmers is on average CFA1,535,000 (€2,343), whereas for non-certified farmers it was CFA1,318,000 (€2,013). The longer farmers are in the UTZ programme, the higher their net income.
	Average production costs for UTZ programmes participants are CFA152 per kg, compared to CFA129 per kg for other farmers.
	Farmers in the UTZ programme produced an average of 453 kg per hectare, whereas other farmers produced 329 kg per hectare. Certified farmers have higher yields (467 kg hectare) than non-certified farmers (315 kg per hectare).
	30% of farmers had measured the size of their farms. 25% miscalculated the size, generally over-estimating by 7%.
	Bean quality is high, with 98% of farmers saying their beans meet the cooperative's quality standards. 37% of farmers say that quality has improved since certification.
	On average, cocoa farming represents 79% of the total gross household income, and it is either the only or the main source of cash income for most farmers.
	Although 72% of farmers intend to continue producing cocoa over the next five years, they do not see cocoa farming as an attractive source of income in the long term. Some are investing in rubber and other crops, which require less labour and provide higher, more regular income. A third (34%) of farmers would like their children to continue in cocoa.
	90% of the farmers say that the premium is not enough to cover the costs of producing certified beans. Yet the reported production costs are fairly low, which may be because farmers generally have difficulty accurately estimating these costs.
	Farmers and cooperatives are concerned that if premium payments are discontinued, this would severely diminish the added value of being certified.

WUR (2014).

Groups/organisations

Definition (Calkins & Ngo, 2005).

1. *Voluntary and Open Membership* — Cooperatives are voluntary organisations, open to all persons able to use their services and willing to accept the responsibilities of membership, without gender, social, racial, political, or religious discrimination.

2. *Democratic Member Control* — Cooperatives are democratic organisations controlled by their members, who actively participate in setting policies and making decisions. The elected representatives are accountable to the membership. In primary cooperatives, members have equal voting rights (one member, one vote) and cooperatives at other levels are organized in a democratic manner.

3. *Members' Economic Participation* — Members contribute equitably to, and democratically control, the capital of their cooperative. At least part of that capital is usually the common property of the cooperative. Members usually receive limited compensation, if any, on capital subscribed as a condition of membership. Members allocate surpluses for any or all of the following purposes: developing the cooperative, possibly by setting up reserves, part of which at least would be

indivisible; benefiting members in proportion to their transactions with the cooperative; and supporting other activities approved by the membership.

4. *Autonomy and Independence* — Cooperatives are autonomous, self-help organisations controlled by their members. If they enter into agreements with other organisations, including governments, or raise capital from external sources, they do so on terms that ensure democratic control by their members and maintain their cooperative autonomy.

5. *Education, Training, and Information* — Cooperatives provide education and training for their members, elected representatives, managers, and employees so they can contribute effectively to the development of their cooperatives. They inform the general public, particularly young people and opinion leaders, about the nature and benefits of cooperation.

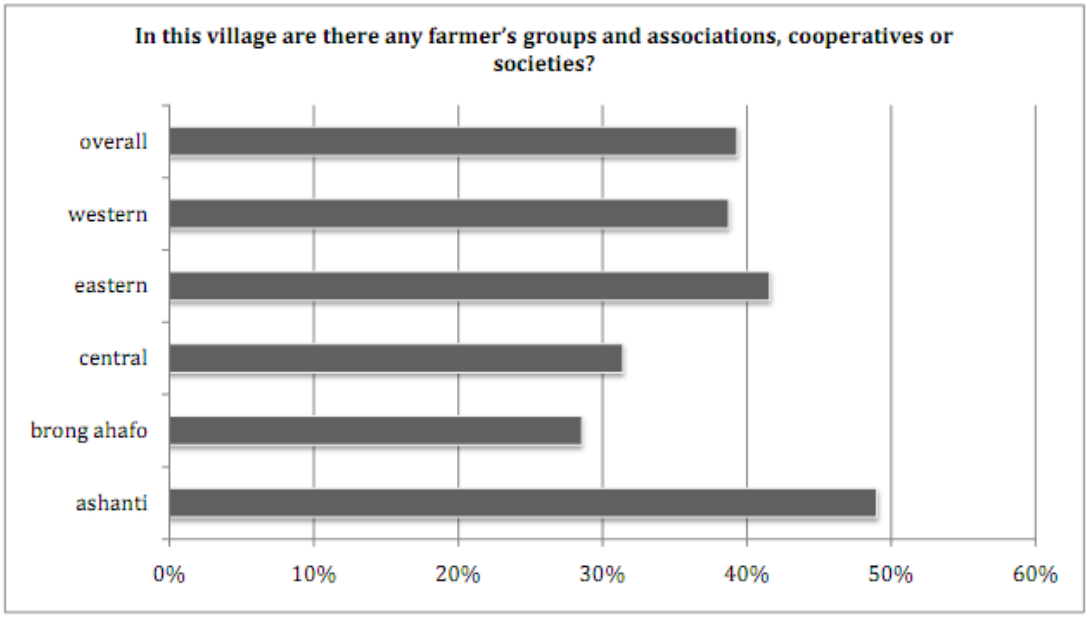
Ghana:

- Only 15% of the farmers in the sample were member of farmer group. However, many non-members still participate in farmer group activities, such as rallies (Baah & Anchinarah, 2010).
- Being member of a farmer collective is positively correlated with higher incomes from cocoa (Barrientos & Akyere, 2012).
- Social capital in the form of farmer groups is very important for farmers as it minimises the occurrence of cheating by purchasing clerks when the cocoa is bought (i.e. adjusting of scales). Most farmers are not member of farmer groups (Barrientos & Akyere, 2012).
- Organisation of farmers into collective is unlikely to yield large benefits as prices and quality are fixed (Blackmore & Heilbron, 2015).
- Most frequently mentioned benefits of farmer groups are: better social contacts between farmers, increased knowledge exchange between farmers and the possibility to discuss communal problems during meetings. Extremely few farmers named disadvantages (such as membership fees) of producer groups (Also for CdI) (Waarts et al. 2013: Ingram et al. 2014).
- Most important benefit of producer group membership is access to trainings (Steijn, 2016).
- Collective marketing does not lead to higher prices in countries where prices are fixed (i.e. Ghana and CdI). However, benefits of membership do include: tailor made services (e.g. training), access to inputs (on credit) and investments in community development (Oomes et al. 2016).
- Cooperatives are important for the provision of technical assistance such as access to spraying machines and chain saws, which are usually very hard to access (Donovan et al. 2016).

Table A3.14	Satisfaction with the services of the producer group			
Services of the producer group	**Obs.**	**Satisfied**	**Neutral**	**Unsatisfied**
Access to training	128	91.4%	0.9%	7.7%
Market information on inputs	127	70.1%	14.9%	15.0%
Market information on sales (e.g. also of other crops)	128	61.7%	14.9%	23.4%
Feedback information from Internal Controls (ICS)	124	46.8%	26.7%	26.5%
Feedback information from the external controls (audit)	123	43.1%	23.5%	33.4%
Information on COCOBOD services and COCOBOD spraying gangs and how to access them	122	59.0%	20.3%	20.6%
Access to fertiliser	119	38.7%	9.5%	51.9%
Access to seedlings/pods	120	48.3%	13.9%	37.8%
Access to pesticides	118	44.9%	7.9%	47.2%
Access to credits	117	14.5%	3.5%	82.0%
Insurance systems are set up	117	13.7%	7.1%	79.2%
Assistance in my relationship with the LBC (representation)	126	73.8%	11.3%	14.9%
Assistance in relation with COCOBOD (representation)	125	49.6%	25.9%	24.5%
Commercial activities	122	39.3%	13.2%	47.5%

Farmer satisfaction with producer group services (Waarts et al. 2013).

Figure 30: Village Leaders Report on Farmers' Groups



Presence of farmer's groups in the different regions (Ghana) (Hainmueller et al. 2011).

Table V.1: Descriptive production statistics for hypothesis 1

Variables of cooperative impact on productive efficiency	Yield per hectare (kg)	Gross household cocoa income (USD)	Fertiliser cost/ha (USD)	Pesticide use per hectare (USD)	Gross margin/ha including sales in off-season (USD)
Whole sample (N=433)	254.00	814.28	17.66	12.52	177.58
Members	262.14	869.89	15.09	11.42	188.88
Non-members	274.26	837.63	19.91	12.25	191.83
Control	220.26	**689.83** [c]	19.92	14.96	**145.15** [b]
Côte d'Ivoire (N=213)	261.41	861.81	0.71	10.41	155.21
Members	255.49	881.92	0.35	12.61	146.56
Non-members	299.23	918.08	0.16	9.46	182.87
Control	239.07	767.79	1.93	**7.56**[b]	146.40
Ghana (N=220)	246.82	764.81	35.07	14.69	199.23
Members	268.72	857.52	30.25	10.21	229.39
Non-members	252.68	753.09	40.66	15.18	199.58
Control	**200.79**[b]	**607.78** [b]	37.90	**21.83**[b]	**143.85**[b]
By regional area					
Tiassale	243.37	296.14	1.46	5.11	135.19
Adzopé	310.33	1180.62	0.41	12.85	197.28
Abendgourou	226.76	1116.10	0.25	13.21	129.12
Tepah	232.16	888.69	25.81	14.38	194.40
Konongo	230.55	533.20	49.56	15.26	164.51
New Edubiase	277.35	875.87	29.63	14.41	238.66

a= significantly different from members at the 1% level, b = significant at the 5% level, c= significant at the 10% level.

Differences between members and non-member in Ghana and CdI (Calkins & Ngo, 2005).

Table V. 4: Descriptive marketing statistics for hypotheses 2 through 4

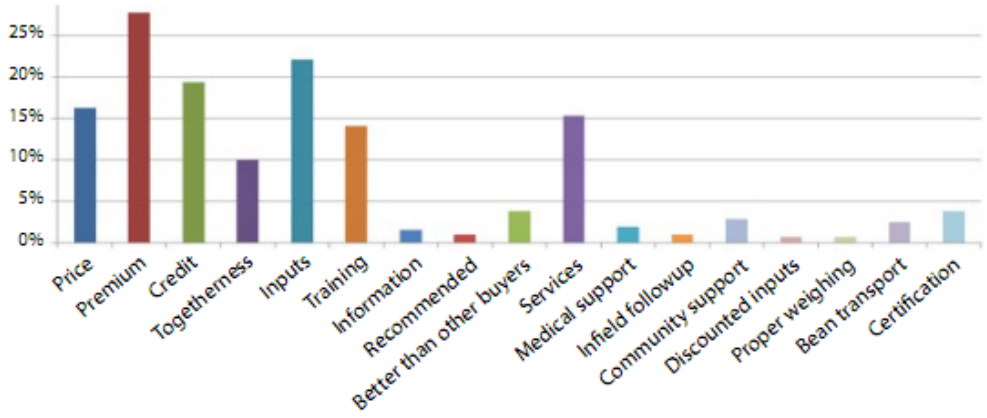
Variables of cooperative impact on marketing	% of cocoa sales in total income	True weight (scale of 5)	True quality (scale of 5)	Cooperative members receive more revenue/bag (scale of 5)	Coop marketing performan-ce score (max= 20)	Producers should assume more roles in marketing (scale of 5)	Ease of transport used by producers (scale of 5)
Whole sample	71%	4.02	4.22	3.36	14.87	3.70	1.96
Members	76.4%	4.45	4.45	3.67	16.16	3.59	2.04
Non-members	**71.0%**[c]	**3.88**[a]	**4.13**[a]	**3.24**[b]	**14.67**[a]	**3.93**[b]	1.97
Control	**63.9%**[a]	**3.23**[a]	**3.90**[a]	**2.73**[a]	**12.69**[a]	3.67	**1.81**[b]
Côte d'Ivoire	64%	4.03	3.98	2.92	13.76	3.61	2.72
Members	69.6%	4.43	4.35	3.16	15.23	3.41	2.8
Non-members	61.0%	**3.81**[a]	**3.87**[a]	2.97	**13.42**[a]	3.75	2.70
Control	**58.0%**[b]	**3.50**[a]	**3.40**[a]	**1.83**[a]	**11.41**[a]	**3.82**[c]	**2.60**[c]
Ghana	79%	4.01	4.46	3.69	15.95	3.79	1.20
Members	84%	4.62	4.55	4.16	17.10	3.77	1.27
Non-members	82.%	**3.93**[a]	**4.37**[c]	**3.41**[a]	**15.83**[a]	**4.08**[c]	1.24
Control	**69%**[a]	**2.95**[a]	4.42	**3.11**[a]	**13.98**[a]	3.51	**1.03**[b]
By regional area							
Tiassale	52.69%	3.97	3.61	2.05	11.78	2.83	2.28
Adzopé	61.16%	3.84	3.87	2.89	14.82	4.31	2.88
Abengourou	77.41%	4.27	4.40	3.84	14.39	3.57	2.99
Tepah	81.97%	4.13	4.47	3.19	15.31	3.51	1.38
Konongo	74.20%	3.84	4.42	3.89	16.00	3.85	1.20
New Edubiase	81.78%	4.08	4.50	3.96	16.53	3.99	1.01

a= significantly different from members at the 1% level, b = significant at the 5% level, c= significant at the 10% level.

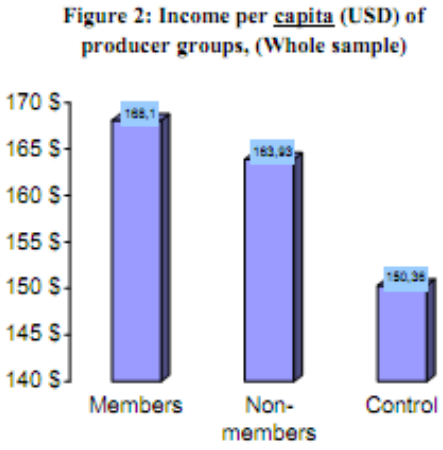
Differences between members and non-members in Ghana and CdI (Calkins & Ngo, 2005).

Côte d'Ivoire

- Cooperative benefits mostly relate to prompt payment and service and support activities, such as access to transport, inputs, credit and information on ANADER services (http://www.anader.ci/) (Ingram et al. 2013).
- Cooperative members appeared to have more benefits from modern inputs such as fertilisers, pesticides and fungicides. Cooperative members have a 19% higher per hectare yield compared to non-members. This result was significant in both Ghana and CdI (Calkins & Ngo, 2005).
- Cooperative members receive fairer weight and quality evaluations, have superior marketing channels, better access to transportation and receive higher revenues per bag (For Ghana and CdI) (Calkins & Ngo, 2005).
- Around 80% of farmers in CdI are not organised. This increases the risk of labour exploitation and child labour as governance structures are lacking (higher incidence of exploitation/child labour amongst unorganised farmers) (Kapoor, 2016).
- The absence of farmer's group is the most important reason why certain farmers are not a member (Varlet & Kouamé, 2013).



Cooperative benefits (Ingram et al. 2013).



Per capita income of cooperative members vs non-members (Calkins & Ngo, 2005).

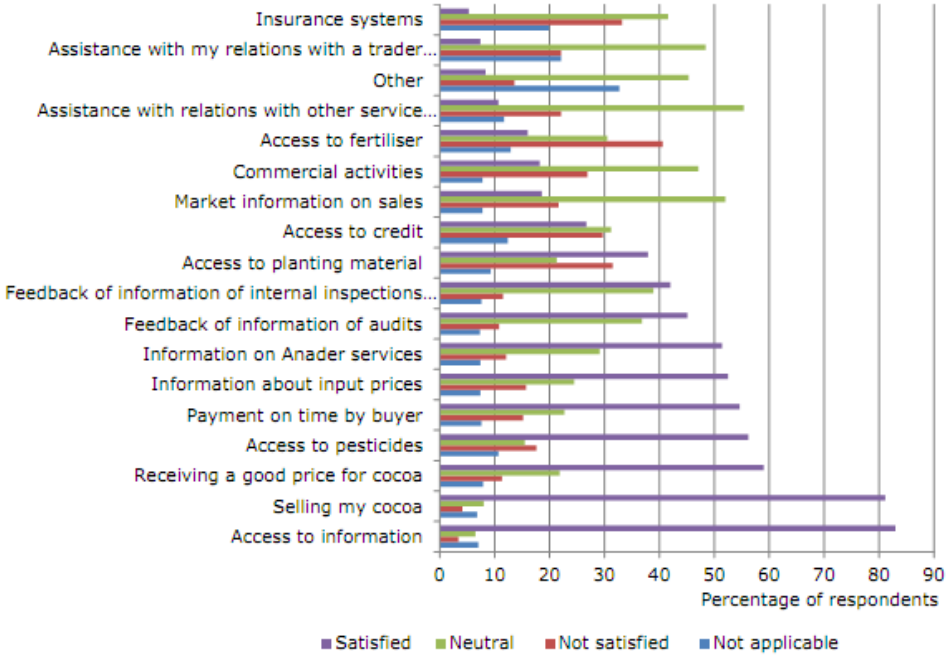
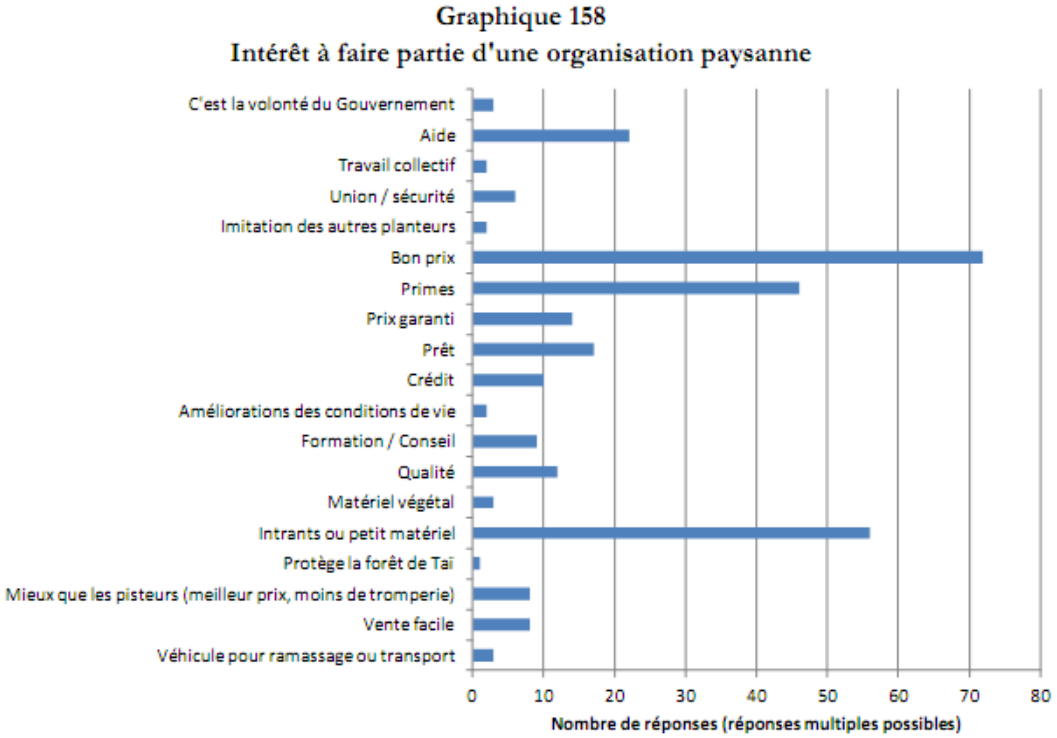


Figure 26 *UTZ programme farmer's level of satisfaction with specific services offered by their cooperative*

Certified farmers only (CdI) (Ingram et al. 2014).



Farmer's reasons for joining a farmer's group (Varlet & Kouamé, 2013).

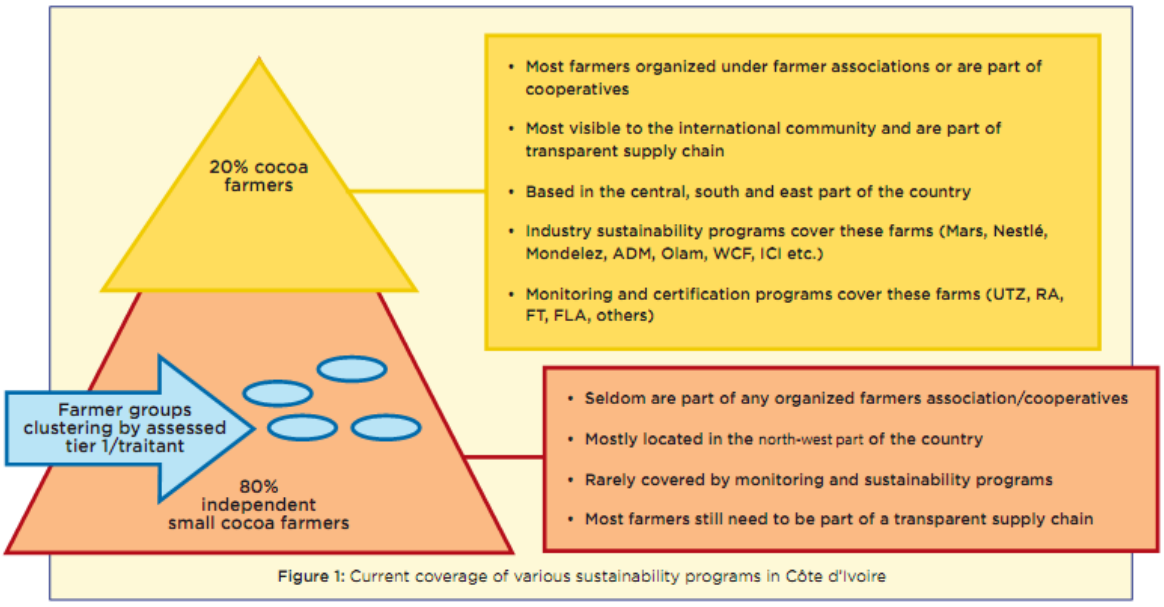


Figure 1: Current coverage of various sustainability programs in Côte d'Ivoire

FLA (2016).

Cocoa Production

Labour (household/waged)

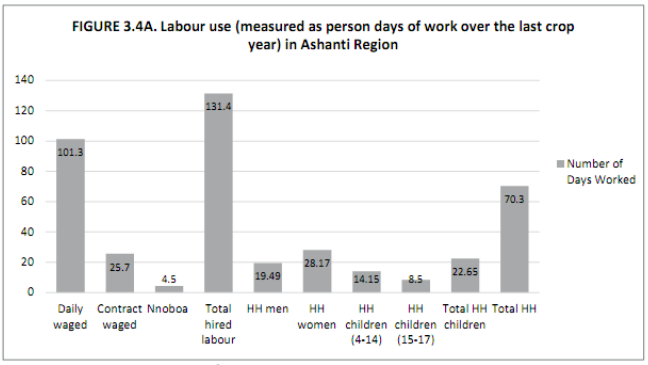
Ghana

- There are two mainstream waged labour arrangements in Ghana, daily waged and and long-term (Barrientos & Alyere, 2012):
    - Daily waged: person is engaged by the farm operator for specific tasks during a day. The labourer is then paid by task or by day. This type of waged labour is usually seasonal (e.g. during harvesting).
    - Long-term: usually per year. The labourer is then usually taken care of by the farmer (i.e. clothing, housing, food and healthcare) and given an agreed sum of money at the end of the period. The labourer in this case is always male and can be assisted by his wife and children.
- It becomes increasingly difficult to find labourers, especially in small communities where a pool of labour workers is lacking. Larger communities usually have people working outside of cocoa that are willing to work on a farm on a day to day basis. Another problem is the cost of labour. Taking care of the farm (weeding etc.) is important hard labour that is often physically demanding. Especially women and older farmers rely on hired labour for this, but often cannot afford it, leading to bad farm maintenance, ultimately resulting in lower yields and lower incomes (Barrientos & Akyere, 2012).
- The lack of long-handled pruning knives increase the need for labour for the pruning of mistletoe. When the appropriate tools are lacking, farmers need to climb trees to cut

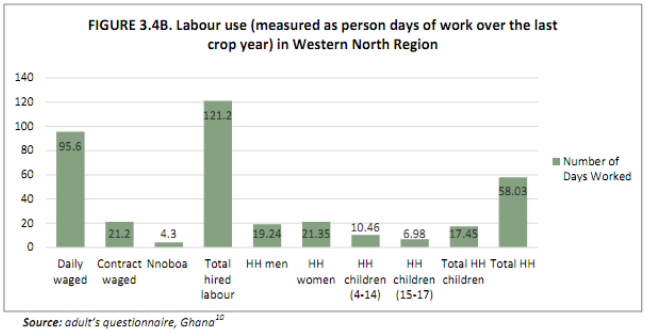
mistletoe, which is too physically demanding for older and female farmers (Barrientos & Akyere, 2012).

- When hiring labour, nearly all farmers agree upon the exact time the labourer will spent on the farm beforehand. Hours spent on the farms vary between 0,5 and 9 hours, with a mean of 4,8 hours. This culminates into an average cost of 71 GHC per acre for the main farm (Waarts et al. 2013).
- The main farmers report that during the busiest cocoa season they typically spend an average of 34 hours per week working on the cocoa farms that they cultivate. During the least busy season they spend an average of 15 hours per week working on their farms. Around 40% of farmers also report that they spend some time in paid work outside the farms that they cultivate; 20% report doing unpaid work outside the farms. Among those farmers that report working outside the farm, the average time spent doing work outside the farm is 15 hours per week during the busiest cocoa season and 19 hours per week during the least busy season (Hainmueller et al. 2011).
- There is extensive use of family labour on smaller cocoa farms in Ghana which might be supplemented by hired labour while on large farms it is common to have a caretaker working full-time throughout the year. Due to the high cost of hired labor, the farmer may prefer using the entire household, relatives and friends in the farm activities (Anang et al 2011).
- The wages paid to hired labourers for a day's work is 15 GHC or higher depending on the task (certified farmers, Ashanti). The minimum wage for a day's work in Ghana in 2016 is 8 GHC (Steijn, 2016).
- In terms of wage rates, on average, in the baseline survey hired male labour per day cost GHC 7.49 (USD 5.35), and female labour cost GHC 4.44 (USD 3.17). Certified farmers paid female labourers significantly more (GHC 4.57 or USD 3.26) than non-certified farmers (GHC 4.13 or USD 2.95). In comparison, in terms of family labour costs, irrespective of gender, the average payment was GHC 2.71 (USD 1.94). In the final survey farmers paid on average GHC 9.50 (USD 6.33) to male labourers and GHC 7.46 (USD 4.97) to female labourers, whereas family members earned on average GHC 5.42(USD 3.61). There were no significant differences in level of payments between certified and noncertified farmers (Nelson et al. 2013).
- Labour becomes scarcer in certain cocoa growing regions. Because of the meagre opportunities in cocoa farming, the youth of Ghana migrates from the farms to urban areas to look for employment opportunities. This again affects the cocoa production, because labour becomes scarce and hired labour unaffordable for cocoa farmers (Oomes et al. 2016).
- Another type of hired labour traditionally used in cocoa production in Ghana, is nnoboa, a shared labour group practice common for neighbouring farmers. Nnoboa does not entitle to a monetary payment for the help offered on neighbours' cocoa farms, but is simply an exchange of labour hours spent on each other's farms. Their incidence has generally declined in time because farmers prefer to work for a pay, and when these arrangements exist, the group size is smaller than it used to be (Vigneri et al. 2016).
- Wages are the single highest production cost. Farmers with smallest landholdings spend more on paid labour, it is farmers with the largest landholdings that have the lowest revenues from cocoa, both in absolute levels and per unit of land (Vigneri et al. 2016).

- Farmers with higher yields usually employ more household and child labour (Vigneri et al. 2016).
- Selten (2015) found that spouses account for roughly 15% of all labour used on a farm, and that household labour is the most important labour source.



Source: adult's questionnaire, Ghana[9]



Source: adult's questionnaire, Ghana[10]

Vigneri et al. (2016).

Table 1: Farmers' source of labor for cocoa production

Source of labor	Frequency	%
Family labor	39	48.8
Hired labor	34	42.5
Others	7	8.8
Total	80	100.0

Anang et al. (2011).

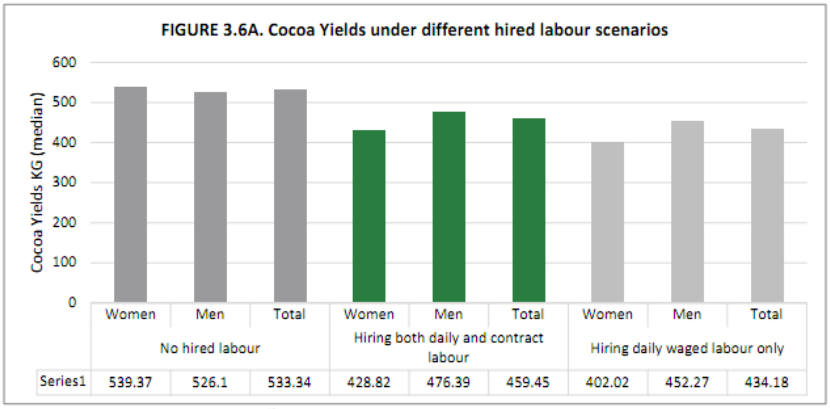
TABLE 3.5A. Daily and contract wages paid by task (wage bill): district averages

Region / District	Cocoa task							
	Land clearing, slash/ burning bush, tree felling, clearing debris	Weeding	Applying fertilizer, fungicide/ herbicide	Spraying insecticide	Pod plucking, gathering/ heaping, pod breaking	Fermenting	Carrying cocoa dry beans for sale	N obs
Daily Wages Cocoa farming Tasks (GH¢)								
Ashanti	**13.5**	**15.16**	**20.63**	**25.86**	**15.85**	**13.99**	**12.45**	**319**
Atwima	12.4	14.14	20.96	27.5	15.6	14.38	14.44	75
Adansi East	16	19.9	23.18	29.29	17.78	16	13.44	74
Offinso	12.33	11.7	19	23.06	13.51	10.83	10.25	87
Asante Akim Central	13.29	14.89	19.38	23.61	16.51	14.75	11.67	83
Western N.	**15.72**	**16.02**	**22.45**	**21.33**	**21.04**	**16.19**	**16.49**	**599**
Sefwi-Wiawso	15.62	15.45	21	21.11	20.78	15.95	14.73	357
Juabeso-Bia	16.17	18.27	28.24	22.23	22.08	16.75	21.78	242
Contract Wages Cocoa farming Tasks (GH¢)								
Ashanti	**297.11**	**229.43**	**122.67**	**51.25**	**104.75**	**93.75**	**81.56**	**319**
Atwima	450	256.82	150	45	45	.	60	75
Adansi East	300	239.04	60	.	40	.	110	74
Offinso	151.43	203.1	158	57.5	134	87.5	86.25	87
Asante Akim Central	287	218.75	.	.	200	100	70	83
Western N.	**206.89**	**257.26**	**122.44**	**118.17**	**138.44**	**52.5**	**48.13**	**599**
Sefwi-Wiawso	189.27	246.95	134.85	140	165.83	65	56.67	357
Juabeso-Bia	253.89	298.52	91.42	74.5	56.25	27.5	39.58	242

Source: adult's questionnaire, Ghana.

Vigneri et al. (2016).

FIGURE 3.6A. Cocoa Yields under different hired labour scenarios



Source: *adult's questionnaire, Ghana*[12]

Vigneri et al. (2016).

TABLE 3.7. Key measures of labour use and cocoa yields

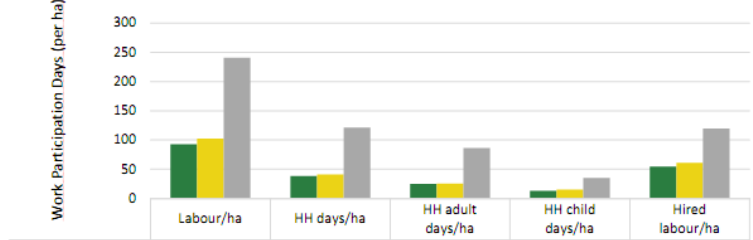
Indicator	Unit measure	Ashanti	Western N.	Total sample
Sample size	N observations	319	598	917
Cocoa production 2011/2012	Kg	1,116.45	1,515.15	1,378.04
Cocoa production 2013/2014	Kg	1,063.42	1,408.60	1,288.52
Yields in 2013	Kg/ha (median)	321.61	452.27	402.02
Labour productivity	Kg/person days	14	23.94	20.46
(HH person + hired labour days)/ha	Person days/ha	127.36	115.37	119.54
HH person days/ha	Person days/ha	52.89	43.99	47.09
HH adult days/ha	Person days/ha	35.23	29.84	31.72
HH children days/ha	Person days/ha	17.66	14.15	15.37
Hired labour days/ha *	Person days/ha	74.46	71.38	72.45
Paid labour days/ha †	Person days/ha	71.49	69.27	70.04
Total cost of hired labour/ha	(GH¢/ha)	916.07	1,148.37	1,067.56
Expenditure on daily wages/ha	(GH¢/ha)	848.13	1,101.98	1,013.67
Expenditure on contract wages/ha	(GH¢/ha)	67.95	46.39	53.89

* ***Note***: *Includes Nnoboa groups.* † *Does not include Nnoboa groups.*

Source: *adult's questionnaire, Ghana*

Vigneri et al. (2016).

FIGURE 3.8 Labour use by Yield Ranges (Technology level) Ashanti region

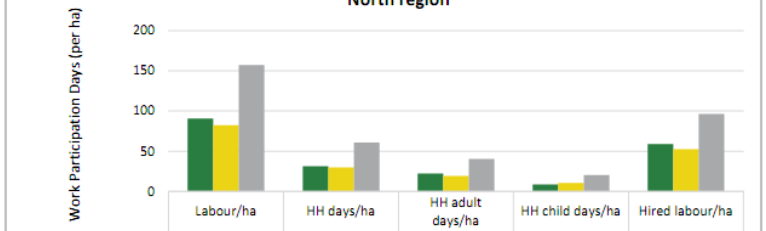


	Labour/ha	HH days/ha	HH adult days/ha	HH child days/ha	Hired labour/ha
T1: yields ≤ 400	92.94	38.54	25.16	13.38	54.39
T2: yields >400-850	102.17	40.85	25.36	15.49	61.32
T3>850	240.56	121.3	86.43	34.87	119.26

Source: *adult's questionnaire, Ghana*[15]

Vigneri et al. (2016).

FIGURE 3.8A Labour use by Yield Ranges (Technology level) Western North region



	Labour/ha	HH days/ha	HH adult days/ha	HH child days/ha	Hired labour/ha
T1: yields ≤ 400	90.47	31.3	22.39	8.91	59.17
T2: yields >400-850	82.53	29.91	19.25	10.67	52.62
T3: yields > 850	157.32	60.99	40.51	20.48	96.33

Source: *adult's questionnaire, Ghana*[16]

Vigneri et al. (2016).

TABLE 3.9B Sharecropping as captured in the ICI Labour Study Survey Data

Variables	Unit measures	Owner	Abunu (1:2)	Abusa (1:3)
Sample size	N observations	819 (89%)	46 (5%)	15 (2%)
Yields	Kg cocoa/ha (median)	402.02	211.69	482.42
Labour productivity	Kg cocoa/labour days used	20.86	9.68	27.00
Hired labour productivity	Kg cocoa/hired labour days	32.23	18.04	93.58***
Hired person days/ha	(Hired persons * N days worked)/ha	74.88	54.43	57.01
HH person days/ha	(HH persons * N days worked)/ha	47.23	37.29	26.57
Child person days/ha	(HH children * N days worked)/ha	15.17	14.59	14.05
Child person days	HH children * N days worked	18.94	21.59	35.67***
% Hired labour	Hired labour/total labour	0.57	0.58	0.51
Fertilizer/ha	Kg/ha	123.94	49.73	141.94
Fungicide/ha	Kg/ha	2.41	1.06	0.26
Insecticide/ha	Lit/ha	4.53	5.46	5.34

*** suggests a 1% level of statistically significant difference in the t-test of difference in means between being Abusa sharecropper relative to being a land owner or Abunu sharecropper

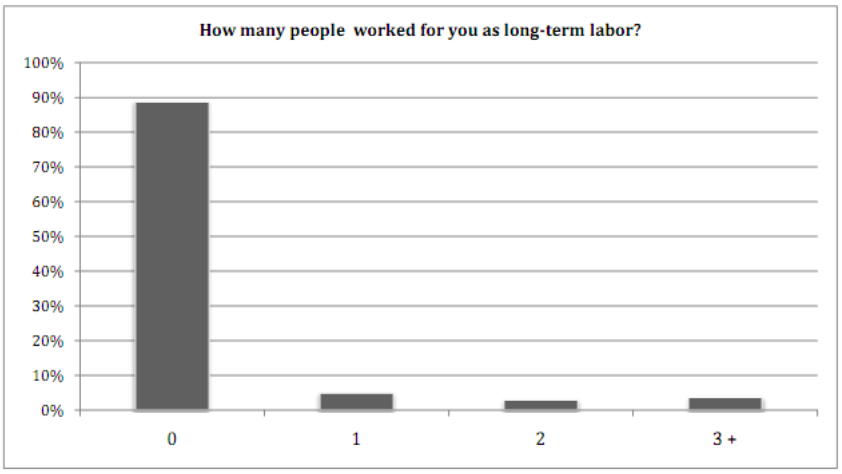
Source: adult's questionnaire, Ghana

Vigneri et al. (2016)

Table A4.11a	Average labour input per activity per acre on the main farm in 2011 (days/acre)					
Activity	**Own**	**Hired labour**	**Share-crop-per**	**Family labour**	**Other labour**	**Total labour per activity**
Land preparation	1.5	1.9	0.0	0.4	0.1	1.4
Weeding	6.7	9.7	1.2	12.6	2.7	14.1
Pruning	2.8	3.0	0.2	0.7	0.5	3.4
Fertiliser application	0.5	1.0	0.2	0.4	0.1	0.9
Pest control (Capsis)	0.8	1.1	0.1	0.3	0.5	1.3
Disease control (Black pod)	0.8	0.6	0.1	0.1	0.1	0.7
Harvesting	3.4	4.1	1.1	5.1	2.2	7.5
Pod breaking	1.7	2.1	0.5	2.3	7.9	7.9
Fermenting	3.8	1.6	1.0	2.1	2.3	5.2
Drying	6.4	2.2	2.9	3.3	3.7	9.1
Transport to purchasing clerk	4.1	1.1	0.3	1.4	1.4	4.2
Total labour for all activities	**26.7**	**18.2**	**42.7**	**20.5**	**14.9**	**97.3**
Note: the numbers were rounded to one decimal point, a value of 0.0 means that the average number of days was less than 0.1.						

Labour input per activity (Waarts et al. 2013).

Figure 24: Long-Term Labor



Hainmueller et al. (2011)

Côte d'Ivoire

- Nearly half of employed labourers in cocoa have no formal contracts and no knowledge on labour rights or access to labour representatives (Ingram et al. 2013).
- Farms in marginal agro-ecological zones have higher labour and production cost per kg of cocoa and per hectare. Farmers spend on average 82 CFA (0,12€) per kg (Ingram et al. 2013).
- Farmers spent an average of 118.123 CFA per hectare on labour (Ingram et al. 2013).
- Urbanisation trends will lead to younger people moving to cities, significantly reducing labour availability and increasing labour costs (Wessel & Quint-Wessel, 2015).
- About half the farmers state that they have more difficulty finding (migrant) labour since the 2002/2003 conflict and the recent political crisis, making wage negotiations harder. Furthermore, the influx of migrant farmers (Burkinabé labourers that have become landowners) has led to more demand for labour, further limiting the farmers bargaining power. However, roughly half of the farmers state that finding labour is easy if you treat labourers well (Ruf & Agkpo,2008).

- Tanno (2012) makes a distinction between two type of worker contracts:
    - Daily wage: work on a daily basis for specific tasks. These workers are usually employed for work in food crops or for the weeding of cocoa farms and the breaking of pods at harvest time. There is no official minimum wage set for daily labour. The wage is usually agreed upon through consensus between farmer and labourer and is estimated at an average of 1000 CFA for the weeding of 1 ha of plantation.
    - Seasonary work: usually six month contracts for specific tasks during a long period of time. These are usually younger men and women coming from Baoulé regions to work on cocoa farms between July/August and December/January. Their tasks usually consists of weeding and harvesting and sometimes also the harvesting yams. The wage is usually around 75.000 CFA for the whole season (6 months).
- The wage paid to labourers varies between farmers and depends on age of the worker and his family situation. If a labourer is married, a household head and over 40, the wage is usually around 150.000 to 200.000 CFA/year. The wage for younger workers (around 20) is 100.000 CFA/year. This is also due to older workers having more experience in working in cocoa (Tanno, 2012).
- Growing multiple crops can lead to problems related to labour shortage. Especially the surveying of rice in August can conflict with the maintenance of cocoa farms. This is usually solved by increasing the use of household labour and having children keep an eye on rice fields during vacations, while the older household members work on the cocoa farms (Tanno, 2012).
- Around 80% of farmers are not member of a farmer group. The risk of exploitation, child labour and slavery are therefore very high in this group compared to cooperative farmers (Kapoor, 2016).
- Labour supply is not a major constraint but affordability is according to cocoa farm managers. While less than 15% of farmers stated that labour is unavailable, 44% of the respondents stated that labour is too expensive – as wages have increased. About half of sampled farmers hire some type of labour, either on a daily basis or under a seasonal contract (Vigneri et al. 2016).
- Total labour use per hectare is inversely related to land size: at the top land quartile (>5.9 ha), household labour per hectare is less than one fourth of what it is in the bottom land quartile (<1.7 ha); and the quantities of hired labour per hectare in the top land quartile are less than half as those employed on the smallest cocoa farms. Since labour and non-labour inputs are likely to be complements in cocoa production, rather than substitutes, farmers who are unable to apply sufficient amounts of labour per hectare end up with lower yields. Indeed, farmers in the top land quartile have lower yields (242 kg/ha) than farmers in the first quartile (333 kg/ha) (Vigneri et al. 2016).
- Some farmers emphasise that hired labour is scarce and most respondents mentioned that it is expensive when available. The scarcity of labour is due to different causes, including the emergence of alternative forms of employment (such as palm oil or rubber tree agriculture or gold mines) and alternative income generating activities, such as vegetable production or trade (Vigneri et al. 2016).
- Most farmers employ at least one hired laborer to help maintain and harvest their small plots of land. Hired labor is typically sourced from neighboring countries such as Mali and Burkina

Faso. These workers and their families are considered the most marginalized actors in the cocoa supply chain. Not only are they involved in precarious (non-permanent) work, they are the least educated, and they typically do not speak the local language. In addition, these workers are even more impoverished than the producers that employ them. Since smallholder farmers make poverty incomes themselves, they have very little leftover to pay their hired laborers. Field research in Côte d'Ivoire revealed that hired workers receive poverty level wages. ILRF surveys revealed that hired workers receive between $209 and $1045 per year, which is far below the minimum wage set by the government (around $4 per day, or $1460 per year, although it is set lower for agricultural workers).The problem of these marginalized workers is further exacerbated when children migrate with hired workers, or come on their own, and are unable to attend school due to language barriers and income constraints (LAMBERT ET AL. 2014).

- The farmers maintain their farms with the support of workers. In the assessed farms, the farmers work with:
  1) family members,
  2) community based helping groups, or
  3) contractual workers.

  Family workers usually include the spouse (husband or wife) of the farmer, sons and daughters, cousins, nephews and nieces, brothers and sisters, in-laws and other family members. Family workers can be permanent workers working all year round, temporary workers working during vacations, or casual workers working for a specific task such as harvesting or cocoa pod opening. The family workers do not have a contract or any formal compensation. The income from the farm serves the household needs. In some instances, some family workers benefit from a gift or an impromptu amount provided by the family head. This is dependent upon the bounty of the harvest. Some family members are engaged as sharecroppers by their own parents. They receive the rate set for the sharecroppers (one-third of the farm's cocoa income) (FLA, 2016).
- A helping group is a group of farmers in the same community who work together on each other's farms on a rotating basis. This does not involve any compensation but exchange of services. Contractual workers are hired workers including sharecroppers, occasional workers, seasonal workers, annual workers, and daily workers. They are engaged on either a verbal or written contractual basis and are paid according to the terms and conditions as agreed upon (FLA, 2016).
- Given the labour shortage in the rural areas and exodus of younger people to cities, the numbers of farmers engaging in self-helps group is increasing. These groups consist of farmers residing in the same village or camp who agree to work on each other's farms on a rotational basis without a contract (FLA, 2016).

TABLE 4.4. Labour use (measured as person days of work*) at the region and district levels

Region	District	N	Daily waged	Contract waged	Work groups	Total hired labour	HH men	HH women	HH children (<11)	HH children (12-13)	HH children (14-17)	Total HH children	Total HH
Indenié-Djuablin	Abengourou	204	13.67	26.59	35.40	75.66	50.12	18.62	1.47	1.84	1.92	2.58	66.35
Loh Djiboua	Divo	382	7.65	11.99	14.80	34.44	70.23	10.95	2.86	3.23	7.46	6.60	85.90
Haut-Sassandra	Daloa	92	1.03	7.40	11.71	20.14	37.07	12.31	3.29	3.32	5.18	5.48	53.07
Nawa		226	2.43	11.10	11.92	26.62	110.80	13.83	0.90	2.15	6.67	5.06	127.81
	Soubré	87	1.85	17.90	14.79	37.44	121.85	15.99	0.27	1.64	8.58	3.76	140.30
	Buyo	139	2.80	6.87	10.12	19.88	103.79	12.52	1.28	2.37	6.04	5.82	119.99

***Note: Person days of work** = # individuals working * # days worked between the crop year running end of September 2013 and end of October 2014. **Source:** adult's questionnaire, Côte d'Ivoire*

Vigneri et al. (2016)

TABLE 4.5A. Daily and contract wages paid by task (wage bill): district averages

District	Land clearing, slash/burning bush, tree felling, clearing debris	Weeding	Applying fertilizer, fungicide/ herbicide	Water carrying for spraying	Spraying insecticide	Pod plucking, gathering/ heaping, pod breaking	Fermenting
Daily waged labour (in F CFA)							
Abengourou	1,666.67	1,869.50	2,670.00	1,750.00	3,556.85	2,247.06	2,400.00
Divo	1,566.67	2,565.05	2,700.00	1,812.50	2,346.15	1,948.72	2,000.00
Daloa	1,250.00	2,500.00	-	2,500.00	2,500.00	4,500.00	4,500.00
Soubré	-	1,750.00	1,200.00	3,000.00	-	1,600.00	-
Buyo	-	2,203.33	1,812.50	1,833.33	2,625.00	1,585.71	2,000.00
Contract waged labour (in F CFA)							
Abengourou	2,794.88	2,187.25	1,569.44	375.00	7,554.69	659.83	3,326.83
Divo	3,572.94	3,400.09	3,851.50	635.06	6,035.80	6,439.85	6,015.73
Daloa	3,081.04	1,198.41	-	-	-	1,516.67	2,500.00
Soubré	1,222.22	3,010.24	2,650.00	-	2,354.17	1,285.71	5,000.00
Buyo	1,464.29	2,446.64	1,458.15	467.61	2,979.38	3,725.21	3,770.00

***Source:** adult's questionnaire, Côte d'Ivoire*

Vigneri et al. (2016).

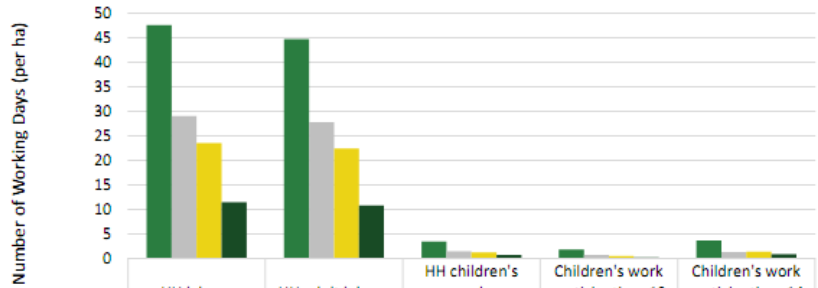
TABLE 4.6. Production, Yields and Gross Margins under Different Hired Labour Scenarios

Variable	Unit measure	No hired labour			Hiring both daily and contract labour			Hiring daily waged labour only			Hiring contract labour only		
		Women	Men	Total	Women	Men	Total	Women	Men	Total	Women	Men	Total
Sample size	N observations	10	415	425	14	124	138	6	118	124	15	202	217
Cocoa production	Kg (mean)	2,326.11	959.29	988.72	617.14	2,445.70	2,260.20	1,732.50	1,301.25	1,322.29	748.00	1,622.55	1,561.81
Land under cocoa	Ha (mean)	4.08	4.44	4.43	2.71	6.75	6.34	6.32	4.53	4.61	3.90	5.80	5.66
Land under cocoa	Ha (medium)	3.16	2.53	2.53	2.95	4.21	4.21	5.47	3.37	3.37	2.53	3.37	3.37
Yields	Kg/ha (median)	371.14	197.94	197.94	247.43	290.97	283.25	267.22	237.53	237.53	205.86	267.22	237.53
HH person total days	Person days/ha, (mean)	63.90	84.37	83.89	40.64	83.65	79.28	13.83	84.47	81.06	63.07	111.52	108.17
Paid labour	Person days/ha (mean)	-	-	-	59.92	62.09	61.88	30.50	24.82	25.10	48.13	37.05	37.82
Total cost of hired labour	F CFA (mean)	-	-	-	129,350	320,325	300,951	284,852	129,114	136,650	119,067	189,238	184,388
Gross margins	F CFA (mean)	1,691,250	673,023	694,947	322,881	1,357,184	1,259,038	945,190	803,760	810,659	424,400	927,336	892,084
Gross margins per hectare	F CFA/ha (mean)	276,128	140,538	140,816	146,046	137,074	141,033	149,273	135,540	135,540	89,074	119,359	112,728

***Source:** adult's questionnaire Côte d'Ivoire*

Vigneri et al. (2016).

FIGURE 4.7. Key measures of household labour use by land quartile

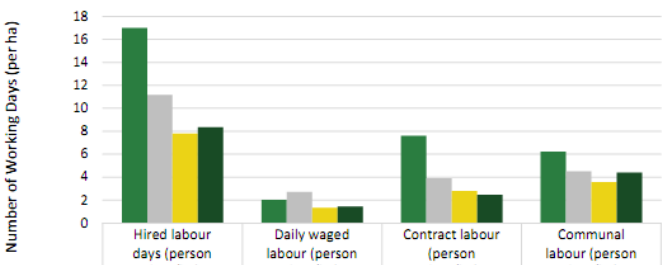


	HH labour (person days/ha)	HH adult labour (person days/ha)	HH children's work participation (person days/ha)	Children's work participation: 13 and under (person days/ha)	Children's work participation: 14 and above (person days/ha)
Q1 [0, 1.69] (ha)	47.58	44.69	3.43	1.84	3.67
Q2 [1.70, 3.37] (ha)	29.04	27.79	1.48	0.77	1.3
Q3 [3.78, 5.90] (ha)	23.51	22.41	1.26	0.52	1.42
Q4 [6.06, 69.05] (ha)	11.44	10.82	0.74	0.23	0.89

Source: *adult's questionnaire Côte d'Ivoire*[30]

Vigneri et al. (2016).

FIGURE 4.7A. Key measures of hired labour use by land quartile



	Hired labour days (person days/ha)	Daily waged labour (person days/ha)	Contract labour (person days/ha)	Communal labour (person days/ha)
Q1 [0, 1.69] (ha)	16.98	2.02	7.6	6.22
Q2 [1.70, 3.37] (ha)	11.18	2.73	3.91	4.53
Q3 [3.78, 5.90] (ha)	7.8	1.34	2.82	3.6
Q4 [6.06, 69.05] (ha)	8.35	1.45	2.49	4.41

Source: *adult's questionnaire Côte d'Ivoire*[31]

Vigneri et al. (2016).

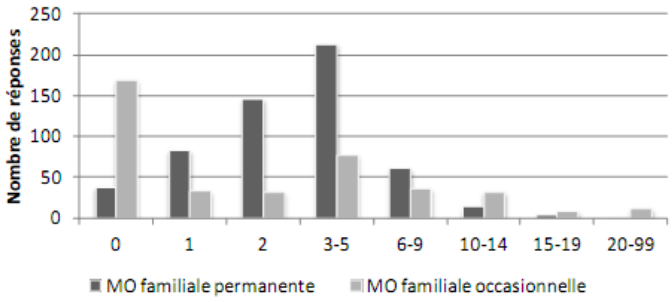
TABLE 4.8. Yields, Labour and Non-Labour Use, by Yield Ranges* (Technology Level)

	Yields = [100-250]	*Rate of change*	Yields = [251-599]	*Rate of change*	Yields ≥600
Sample size	285		303		107
Household size (mean)	6.07	*9%*	6.63	*-1%*	6.53
% of female farmers	6.67	*-35%*	4.95	*12%*	5.61
% of female farmers who are widows, separated or divorced	57.89	*10%*	64.29	*-61%*	40.00
Land size ha (median)	3.37	*0%*	3.37	*-33%*	2.53
Total labour input (household + hired) per hectare	31.90	*24%*	41.75	*6%*	44.64
Household person days per hectare	25.66	*24%*	33.85	*2%*	34.46
Household men days per hectare	21.59	*20%*	27.16	*1%*	27.47
Household women days per hectare	3.61	*40%*	6.03	*-15%*	5.22
Household child days per hectare	1.27	*30%*	1.82	*20%*	2.29
Hired person days per hectare	10.04	*26%*	13.60	*26%*	18.42
Shared/group work per hectare	3.80	*34%*	5.72	*30%*	8.23
Fertilizer per hectare (kg)	13.95	*46%*	25.70	*41%*	43.33
Fungicide per hectare (lts)	0.16	*54%*	0.34	*6%*	0.36
Insecticide per hectare (lts)	1.12	*31%*	1.64	*23%*	2.13

Source*: adult's questionnaire, Côte d'Ivoire.* ****Note****: The yield ranges were slightly modified in this table, to obtain discontinuous categories and eliminate those observations falling into the middle*

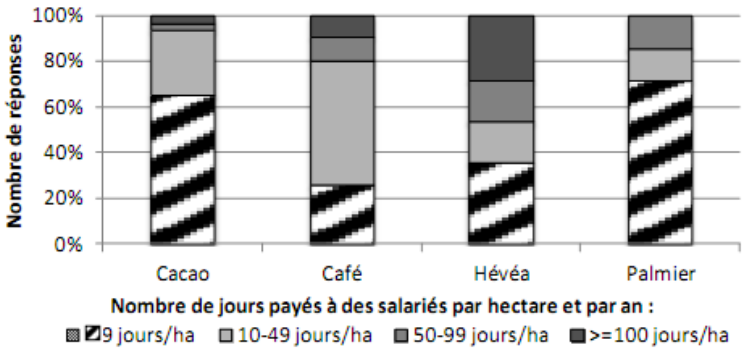
Vigneri et al. (2016)

Graphique 83
Main d'œuvre familiale sur les plantations de cacao



Household labour (Varlet & Kouamé, 2013).

Graphique 87
Nombre de jours payés à des salariés par hectare et par an



Number of waged labour days by crop (Varlet & Kouame, 2013).

TABLE 4.8. Yields, Labour and Non-Labour Use, by Yield Ranges* (Technology Level)

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Land size ha (median)	3.37	*0%*	3.37	*-33%*	2.53
Total labour input (household + hired) per hectare	31.90	*24%*	41.75	*6%*	44.64
Household person days per hectare	25.66	*24%*	33.85	*2%*	34.46
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Household women days per hectare	3.61	*40%*	6.03	*-15%*	5.22
Household child days per hectare	1.27	*30%*	1.82	*20%*	2.29
Hired person days per hectare	10.04	*26%*	13.60	*26%*	18.42
Shared/group work per hectare	3.80	*34%*	5.72	*30%*	8.23
Fertilizer per hectare (kg)	13.95	*46%*	25.70	*41%*	43.33
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Insecticide per hectare (lts)	1.12	*31%*	1.64	*23%*	2.13

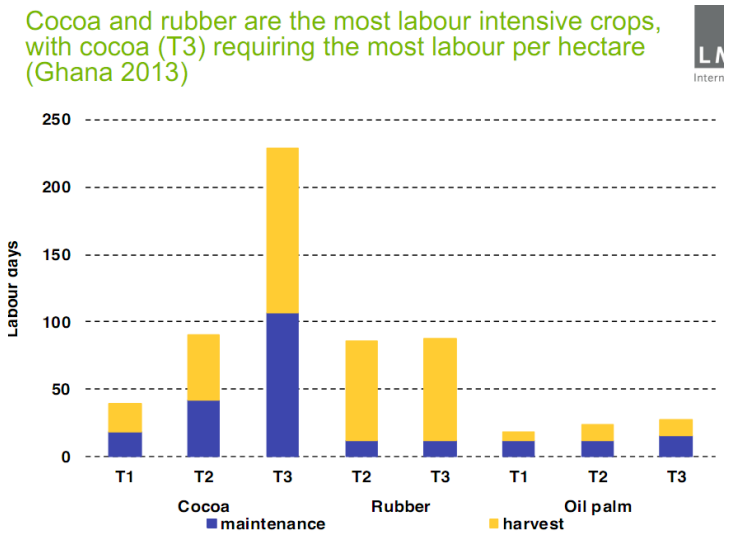
***Source**: adult's questionnaire, Côte d'Ivoire. ***Note**: The yield ranges were slightly modified in this table, to obtain discontinuous categories and eliminate those observations falling into the middle*

Labour use and other inputs by yield range (Vigneri et al. 2016).

Tableau 7: Nombre d'actifs familiaux (hors enfants) selon les groupes ethniques

Main d'œuvre familiale		Groupes ethniques		
		Bakwé	Baoulé	Burkinabè
Nombre moyen de résidents	Adultes : hommes et femmes	6,52	5,15	4,4
Nombre moyen des actifs	Adultes : hommes et femmes	4,34	5,15	4,4
Âge moyen		54	50	45

Amount of household members helping in cocoa by ethnic group (Tanno, 2012).



LMC (2014).

Child labour

Ghana

- The UTZ Code of Conduct has specified the terms under which terms children can work on cocoa farms (Ingram et al. 2014):
    - No persons under 18 years old is allowed to do hazardous work.
    - Labourers aged 15-18 can be hired as long as they do not do hazardous work.
    - Children under 15 may not be hired for work on the cocoa farm.
    - Children under 15 are allowed to help on the farm as long as it is outside of school hours and accompanied by an adult.
- The majority of children are engaged in activities not considered as 'work', such as taking care of siblings, fetching water, collecting firewood, cooking, cleaning and other household tasks (FAO, 2012).
- Children worked an average of 15,5 days per hectare during the 2013/2014 season. Increased yields lead to an increase in reliance on child labour, likely because waged labour is expensive or otherwise inaccessible. Especially the 5-14 age group experience higher labour demands, where a 10% yield increase leads to an 2,8% increase in child labour working days (ICI, 2015). In **CdI** there was no link between yields and child labour use.

- Children in the age group 15-17 (14-17 in **CdI**) are more often employed for hazardous tasks such as the spraying of chemicals than their younger counterparts. This is likely due to the limited access to post-primary education and vocational training in cocoa growing communities (ICI, 2015).
- The amount of child days employed per unit of land doubles from the lowest to the highest yield levels, it still represents less than 15% of total labour days employed within the group of farmers in the highest yield range. The data also show that farmers employ twice as much hired labour than adult household labour (Vigneri et al. 2016).
- Abusa sharecroppers used more child labour in absolute terms compared to Abunu and land-owner farmers (Vigneri et al. 2016).
- Farmers with high yields use significantly more household- and child labour (Vigneri et al. 2016).
- Children skip school one day a week on average to work on the farm. The amount of days missed from school are usually higher in the harvesting season (Vigneri et al. 2016).
- Child labour is more likely to occur for (Vigneri et al. 2016):
    - Female farmers
    - Older farmers
    - Farmers with small farms
    - Farmers hiring more labour
    - Among medium yield farmers (relative to low yield farmers

TABLE 3.16A. Child Labour Categories by Yield Category

	Hazardous Child Labor	Child Labour (non-hazardous)	Child work (permissible)	No Children working
% low yield farmers (105-400] kgs/Ha)	53	20	30	8
% medium yield farmers (>400-850] kgs/Ha)	51	28	12	10
% high yield farmers (> 850-2400] kgs/Ha	42	23	23	11

Source: *adult's and children's questionnaire, Ghana*

In order to explain the determinants of children's hazardous activities and child work typology, we

Vigneri et al. (2016).

TABLE 3.16. Profiling child labour categories against cocoa farm-manager characteristics[25]

	Hazardous child labour			Child labour (non-hazardous)		
	Western. N	Ashanti	Total	Western N.	Ashanti	Total
N observations	120	86	206 (49%)	58	46	104 (25%)
Yield (median)	482.42	337.7	402.02	482.42	291.46	407.76
Gross margins (median)	774.73	437.8	625.87	988.33	484.1	756.05
% Stating hiring labour unaffordable	79	67	74	64	74	68
% farmers in low yield group (≤ 400 kgs/Ha)	44	6	51	36	6	47
% farmers in medium yield group (> 400-850] kgs/Ha)	37	28	33	41	27	35
% farmers in high yield group (> 850-2000] kgs/Ha	19	12	16	22	13	18

Source: *children's questionnaire, Ghana*

Vigneri et al. (2016).

Table 5: Characteristics of task children performs in cocoa farms

Respondent status	Fetching water/ removal of placenta from broken pods/ gathering pod	Handle and apply pesticides	Apply fertilizers	Use farm sharp tools	No work	Total
Utz Certified	11	2	0	2	35	50
Rainforest	12	1	0	4	37	50
Conventional	8	3	0	7	32	50
Total	**31**	**6**	**0**	**13**	**100**	**150**

Tasks performed by children (Addae, 2014).

Table 10. Estimates of Children in Cocoa Growing Areas, 5-17 Years, Working, Working in Agriculture and in Child Labor in Agriculture in the last 12 Months, in Côte d'Ivoire and Ghana, 2008/09 and 2013/14

		All Children (Fig.1:1)	Children Working in Cocoa Growing Areas (Fig.1:2)			Children Working in Agriculture in Cocoa Growing Areas (Fig.1:4)			Child Laborers Working in Agriculture in Cocoa Growing Areas (Fig.1:8+9)		
		Number	Number	Percent	Percent change*	Number	Percent	Percent change*	Number	Percent	Percent change *
Total	2008/09	5,710,938	3,748,741	65.6%	+1.4%	3,473,202	60.8%	+0.5%	3,306,320	57.9%	-2.8%
	2013/14	5,969,385	3,970,442	66.5%		3,645,465	61.1%		3,358,186	56.3%	
Côte d'Ivoire	2008/09	3,550,060	2,069,959	58.3%	+1.0%	1,915,922	54.0%	+3.3%	1,847,631	52.0%	-4.0%
	2013/14	3,733,261	2,199,865	58.9%		2,083,114	55.8%		1,864,622	49.9%	
Ghana	2008/09	2,160,878	1,678,782	77.7%	+1.9%	1,557,280	72.1%	-3.1%	1,458,689	67.5%	-1.0%
	2013/14	2,236,124	1,770,577	79.2%		1,562,351	69.9%		1,493,564	66.8%	

Source: Tulane child survey 2008/09 and 2013/14, weighted, strata 1-3.
*Calculated by dividing the difference between the 2008/09 and 2013/14 percentages by the base (2008/09) percentage.

Children working in agriculture and in cocoa in Ghana and CdI (Tulane University, 2015).

Table 12c. Estimates of Boys and Girls in Cocoa Growing Areas, 5-17 Years, Working, Working in Agriculture and in Child Labor in Agriculture in the last 12 Months, in Ghana, 2008/09 and 2013/14

		All Children (Fig.1:1)	Children Working in Cocoa Growing Areas (Fig.1:2)			Children Working in Agriculture in Cocoa Growing Areas (Fig.1:4)			Child Laborers Working in Agriculture in Cocoa Growing Areas (Fig.1:8+9)		
		Number	Number	Percent	Percent change*	Number	Percent	Percent change*	Number	Percent	Percent change*
Total	2008/09	2,160,878	1,678,782	77.7%	+1.9%	1,557,280	72.1%	-3.1%	1,458,689	67.5%	-1.0%
	2013/14	2,236,124	1,770,577	79.2%		1,562,351	69.9%		1,493,564	66.8%	
Boys	2008/09	1,172,828	932,801	79.5%	-1.3%	879,174	75.0%	-2.1%	835,048	71.2%	-0.4%
	2013/14	1,172,588	919,906	78.5%		860,772	73.4%		830,968	70.9%	
Girls	2008/09	988,049	745,981	75.5%	+6.0%	678,106	68.6%	-3.8%	623,641	63.1%	-1.3%
	2013/14	1,063,536	850,672	80.0%		701,579	66.0%		662,596	62.3%	

Source: Tulane child survey 2008/09 and 2013/14, weighted, strata 1-3.
*Calculated by dividing the difference between the 2008/09 and 2013/14 percentages by the base (2008/09) percentage.

Boy/girl division in child labour (Tulane University, 2015).

Table 14. Estimates of Children in Cocoa Growing Areas, 5-17 Years, Working in Cocoa Production, in Child Labor in Cocoa Production and in Hazardous Work in the Cocoa Sector in the last 12 Months, in Côte d'Ivoire and Ghana, 2008/09 and 2013/14

		All Children (Fig.1:1)	Children Working in Cocoa Production (Fig.1:6)			Child Laborers Working in Cocoa Production (Fig.1:8)			Children Working in the Cocoa Sector in Hazardous Work* (Fig.1:10)		
		Number	Number	Percent	Percent change**	Number	Percent	Percent change**	Number	Percent	Percent change **
Total	2008/09	5,710,938	1,817,278	31.8%	+19.0%	1,757,612	30.8%	+15.5%	1,722,186	30.2%	+12.9%
	2013/14	5,969,385	2,260,407	37.9%		2,122,016	35.6%		2,032,267	34.0%	
Côte d'Ivoire	2008/09	3,550,060	819,921	23.1%	+51.1%	809,835	22.8%	+41.3%	791,181	22.3%	+38.7%
	2013/14	3,733,261	1,303,009	34.9%		1,203,473	32.2%		1,153,672	30.9%	
Ghana	2008/09	2,160,878	997,357	46.2%	-7.4%	947,777	43.9%	-6.4%	931,005	43.1%	-8.8%
	2013/14	2,236,124	957,398	42.8%		918,543	41.1%		878,595	39.3%	

Source: Tulane child survey 2008/09 and 2013/14, weighted, strata 1-3.
* Measured based on Variables 1-6, as described in Chapter 5 of this report.
** Calculated by dividing the difference between the 2008/09 and 2013/14 percentages by the base (2008/09) percentage.

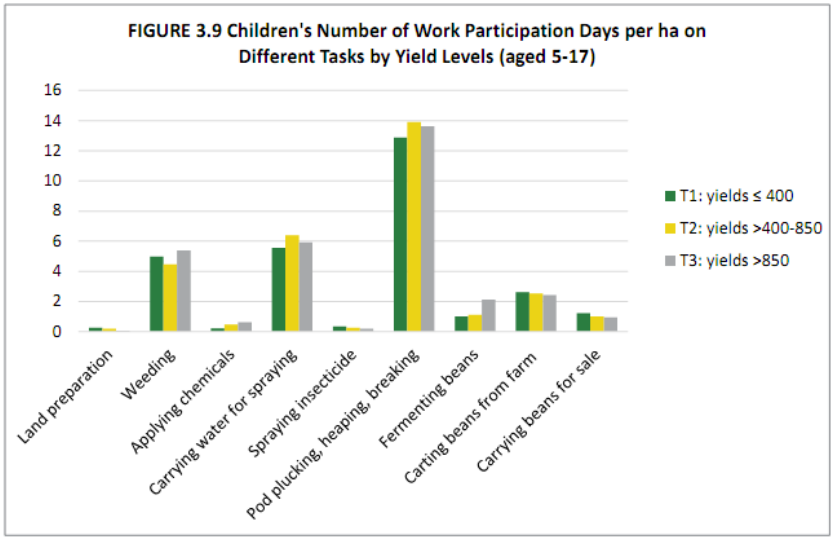
Children doing hazardous work (Tulane University, 2015).

Table 18a. Estimates of Percentages of all Children in Agricultural Households in Cocoa Growing Areas, 5-17 Years, Exposed to Hazardous Work Activities in the Cocoa Sector, in Côte d'Ivoire and Ghana, 2008/09 and 2013/14

Percentage of children in agricultural households exposed to:	Total			Côte d'Ivoire			Ghana		
	2008/09	2013/14	Percent Change*	2008/09	2013/14	Percent Change*	2008/09	2013/14	Percent Change*
Number of children in agricultural households	5,710,938	5,969,385	+4.5%	3,550,060	3,733,261	+5.2%	2,160,878	2,236,124	+3.5%
Land clearing in cocoa (V1)	12.0%	10.1%	-15.8%	14.8%	15.5%	+4.7%	7.3%	1.0%	-86.3%
Heavy loads in cocoa (V2)	23.5%	24.4%	+3.8%	18.4%	20.0%	+8.7%	31.7%	31.9%	+0.6%
Agro-chemicals in cocoa (V3)	4.7%	8.2%	+74.5%	3.5%	4.5%	+28.6%	6.7%	14.2%	+111.9%
Sharp tools in cocoa (V4)	26.1%	26.9%	+3.1%	18.3%	24.9%	+36.1%	38.9%	30.4%	-21.9%
Long working hours in cocoa (V5)	0.9%	0.8%	-11.1%	1.2%	1.1%	-8.3%	0.4%	0.4%	0.0%
Night work in cocoa (V6)	0.4%	0.6%	+50.0%	0.6%	0.8%	+33.3%	0.2%	0.3%	+50.0%
Exposed to one or more Variables in cocoa work	30.2%	34.4%	+13.9%	22.3%	30.9%	+38.6%	43.1%	39.3%	-8.8%

Source: Tulane child survey 2008/09 & 2013/14, weighted, strata 1-3.
*Calculated by dividing the difference between the 2008/09 and 2013/14 figures by the base (2008/09) figure.

Hazardous work performed by children (Tulane University, 2015).



***Source:** adult's questionnaire, Ghana*[17]

Vigneri et al. (2016).

TABLE 3.9 Means number of children's work days, by cocoa farming task, and by yield ranges

Indicator	T1: yields ≤ 400	T2: yields]400-850]	T3: yields]850-2000]
Children 15 - 17			
# Observations	111	96	53
Land preparation	0.19	0.12	0.07
Weeding	2.87	1.83	3.75
Applying chemicals	0.07	0.20	0.56
Carrying water for spraying	1.97	2.22	1.88
Spraying insecticide	0.12	0.06	0.20
Pod plucking, heaping, breaking	4.90	4.41	4.85
Fermenting beans	0.39	0.32	0.92
Carting beans from farm	1.00	0.75	1.08
Carrying beans for sale	0.48	0.38	0.54
Children 5 - 14			
# Observations	158	154	80
Land preparation	0.08	0.08	0.00
Weeding	2.10	2.64	1.64
Applying chemicals	0.15	0.26	0.08
Carrying water for spraying	3.54	4.17	4.05
Spraying insecticide	0.22	0.20	0.00
Pod plucking, heaping, breaking	7.97	9.50	8.78
Fermenting beans	0.61	0.79	1.20
Carting beans from farm	1.63	1.79	1.36
Carrying beans for sale	0.74	0.62	0.41
Total			
# Observations	208	189	100
Land preparation	0.26	0.20	0.07
Weeding	4.97	4.47	5.39
Applying chemicals	0.22	0.47	0.64
Carrying water for spraying	5.55	6.39	5.93
Spraying insecticide	0.34	0.26	0.20
Pod plucking, heaping, breaking	12.88	13.91	13.63
Fermenting beans	1.00	1.11	2.12
Carting beans from farm	2.63	2.54	2.44
Carrying beans for sale	1.22	1.00	0.95

***Source**: adult's questionnaire, Ghana*

Vigneri et al. (2016).

Table 21b. Child Work Involved in Cocoa Production in Cocoa Growing Areas, Children 5-17 Years Working in Cocoa Production, in Côte d'Ivoire and Ghana, 2008/09 and 2013/14

Percentage of children working in cocoa production	Côte d'Ivoire		Ghana	
	2008/09	2013/14	2008/09	2013/14
Population of children working in cocoa production	819,921	1,303,009	997,357	957,398
Land preparation activities in cocoa production				
Land clearing	63.6%	44.2%	14.3%	1.6%
Felling and chopping	4.0%	4.0%	4.2%	1.0%
Burning	5.0%	2.9%	3.3%	1.1%
Stumping	3.1%	2.6%	0.2%	0.6%
Cutting Stakes	5.0%	2.6%	0.4%	0.2%
Planting activities in cocoa production				
Planting suckers	3.9%	2.3%	4.0%	1.1%
Preparing seedlings	12.7%	6.1%	3.4%	2.4%
Planting seedlings	8.6%	2.8%	5.5%	2.8%
Sowing at stake	17.7%	2.5%	2.9%	4.7%
Farm maintenance activities in cocoa production				
Weeding	44.6%	36.3%	56.5%	52.2%
Spraying insecticides	1.8%	3.2%	0.6%	1.4%
Applying fertilizer	0.4%	1.4%	0.3%	1.1%
Applying fungicides/ herbicides/other chemicals	0.0%	1.9%	0.3%	1.5%
Carrying water for spraying	12.6%	6.7%	10.1%	24.5%
Doing sanitation and pruning	6.0%	4.0%	0.4%	3.8%
Doing mistletoe control	7.8%	3.7%	2.3%	3.2%
Harvest activities in cocoa production				
Plucking cocoa pods	39.4%	39.6%	29.5%	16.3%
Gathering and heaping cocoa pods	69.9%	81.2%	69.4%	78.0%
Breaking cocoa pods and fermentation	55.5%	49.8%	43.2%	42.0%
Post-harvest activities in cocoa production				
Carting fermented cocoa beans	37.3%	26.8%	28.9%	39.3%
Drying cocoa beans	37.3%	32.2%	28.0%	21.6%
Carting dry cocoa beans to shed	22.1%	13.6%	16.3%	15.2%

Source: Tulane child survey 2008/09 and 2013/14, weighted data, strata 1-3.

Activities performed by children (Tulane University, 2015).

Table 24b. Injuries Experienced by Children While Working in Agriculture, Children 5-17 Years Working in Cocoa Production, in Côte d'Ivoire and Ghana, 2013/14

Percentage of children working in cocoa production	Côte d'Ivoire	Ghana
	2013/14	2013/14
Population of children working in cocoa production	1,303,009	957,398
Type of injury		
Wounds/cuts	36.7%	26.2%
Broken bones	0.3%	0.3%
Snake bites	1.1%	0.5%
Insect bites	18.5%	18.9%
Back pains	1.5%	11.2%
Muscle pains	11.0%	6.7%
Other pains	0.5%	2.2%
Burns	3.2%	1.6%
Skin itchiness or scratches	5.3%	25.9%
Other	0.7%	0.2%

Source: Tulane child survey 2013/14, weighted data, strata 1-3.

injuries suffered by children (Tulane University, 2015).

Table A4.8 Tasks implemented by children (Frequency and percentage per project group)

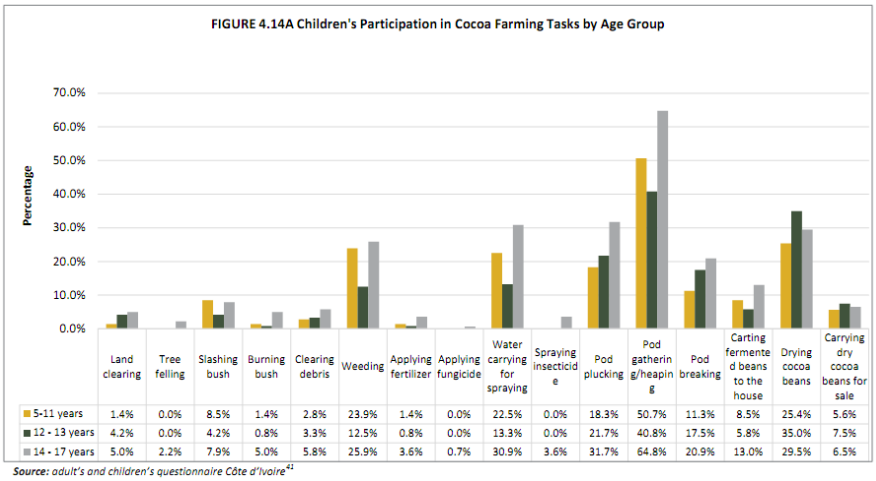
Activity	Project groups									Total
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Control Group Ashanti (1+3)	Control Group Eastern (2+6)	Control Group Western (4+6)	
Land preparation	1 (2%)	1 (2%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	4 (1%)
Weeding	1 (2%)	0 (0%)	1 (2%)	2 (5%)	1 (2%)	1 (2%)	4 (9%)	0 (0%)	2 (5%)	12 (3%)
Pruning	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)	1 (0%)
Fertiliser application	0 (0%)	1 (2%)	1 (2%)	4 (10%)	1 (2%)	1 (2%)	1 (2%)	0 (0%)	3 (7%)	12 (3%)
Pest control (Capsis)	0 (0%)	0 (0%)	1 (2%)	1 (2%)	0 (0%)	1 (2%)	1 (2%)	0 (0%)	2 (5%)	6 (2%)
Disease control (Black pod)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	1 (0%)
Harvesting	3 (7%)	2 (5%)	9 (20%)	4 (10%)	2 (5%)	3 (6%)	8 (19%)	3 (7%)	8 (20%)	42 (11%)
Pod breaking	3 (7%)	2 (5%)	8 (18%)	3 (7%)	5 (12%)	1 (2%)	7 (16%)	2 (5%)	7 (17%)	38 (10%)
Fermenting	2 (5%)	0 (0%)	1 (2%)	1 (2%)	0 (0%)	0 (0%)	2 (5%)	1 (2%)	0 (0%)	7 (2%)
Drying	1 (2%)	1 (2%)	1 (2%)	2 (5%)	0 (0%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	6 (2%)
Transport to purchasing clerk	1 (2%)	1 (2%)	1 (2%)	2 (5%)	1 (2%)	1 (2%)	3 (7%)	1 (2%)	1 (2%)	12 (3%)

Waarts et al. (2013).

Côte d'Ivoire

- Although children's work days increase as the yield category increases, the percentage of children's work in relation to total household labour use remains fairly constant across yield range levels and children's work utilisation remains quantitatively limited, representing only about 7% of total household labour use in the highest yield level (Vigneri et al. 2016).

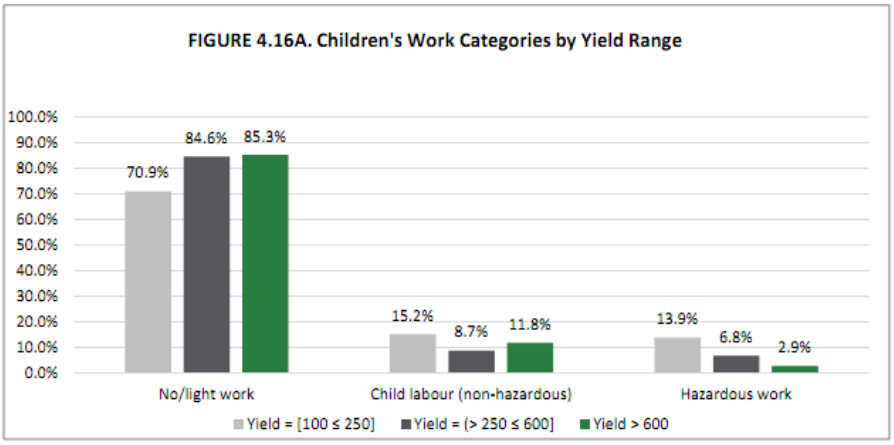
- An increase in past yields leads to a significantly greater demand for household labour but does not have instead a significant impact on the demand for children's work days. The variables that seem to affect the quantity employed of children's work days are whether the farmer is male (positive) and household size (negative) – indicating that farmers in smaller households may have greater demand for children's work days (Vigneri et al. 2016).
- Some community members and farmers say they are aware of the child labour policy and wish to comply, but face certain labour shortages driven by, 1) the low income provided by cocoa, which causes farmers to move on to more lucrative crops like rubber, palm oil, or bananas, 2) the aging of the current workforce, 3) the departure of many youth to nearby towns for better education, vocations, and job opportunities. Faced with such circumstances, when no one is available to work on the farms, the families stop sending their children to school and put them to work (FLA, 2016).



	Land clearing	Tree felling	Slashing bush	Burning bush	Clearing debris	Weeding	Applying fertilizer	Applying fungicide	Water carrying for spraying	Spraying insecticide	Pod plucking	Pod gathering/heaping	Pod breaking	Carting fermented beans to the house	Drying cocoa beans	Carrying dry cocoa beans for sale
5-11 years	1.4%	0.0%	8.5%	1.4%	2.8%	23.9%	1.4%	0.0%	22.5%	0.0%	18.3%	50.7%	11.3%	8.5%	25.4%	5.6%
12 - 13 years	4.2%	0.0%	4.2%	0.8%	3.3%	12.5%	0.8%	0.0%	13.3%	0.0%	21.7%	40.8%	17.5%	5.8%	35.0%	7.5%
14 - 17 years	5.0%	2.2%	7.9%	5.0%	5.8%	25.9%	3.6%	0.7%	30.9%	3.6%	31.7%	64.8%	20.9%	13.0%	29.5%	6.5%

Source: adult's and children's questionnaire Côte d'Ivoire[41]

Vigneri et al. (2016).



Source: adult's and children's questionnaire Côte d'Ivoire[43]

Vigneri et al. (2016).

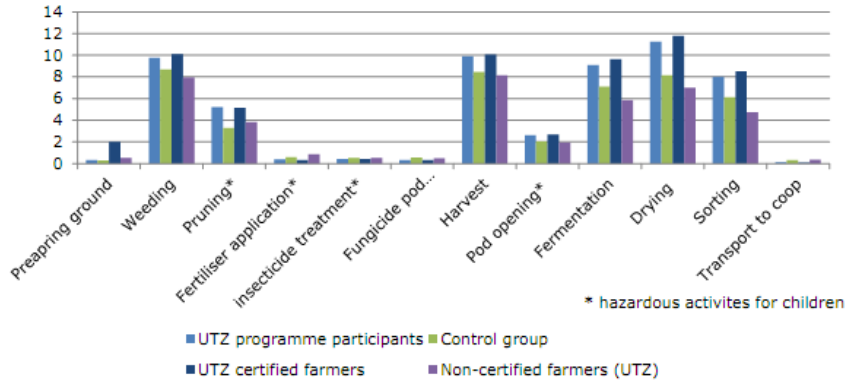


Figure 32 *Average hours spent by children per cocoa production activity in the year 2012.*

Activities performed by children (Ingram et al. 2014).

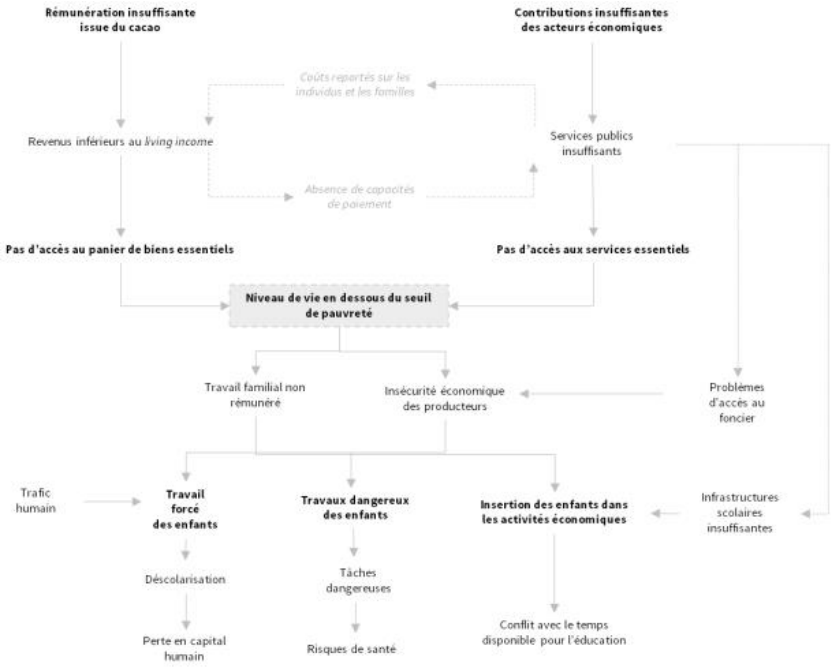


Figure 32. Chemins et boucles d'impacts lié au travail des enfants dans la filière cacao ivoirienne.
Source : BASIC

Poverty leads to child labour/trafficking (PFCE, 2016).

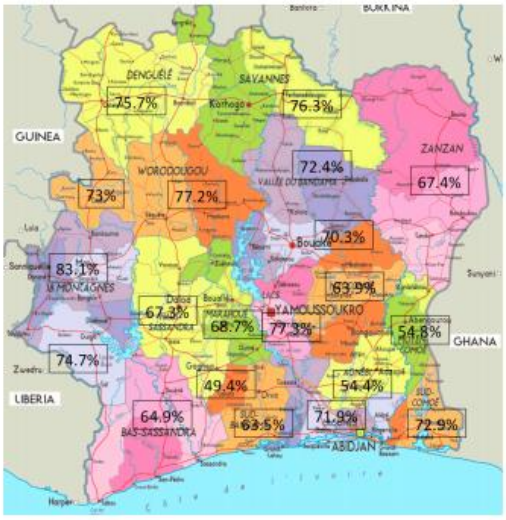


Figure 1: Incidences of child labour by region

Kapoor (2016).

Table 1: Estimates of Percentages of Children Working in Cocoa Production, 5-17 Years, Exposed to Hazardous Work Activities in the Cocoa Sector, in Côte d'Ivoire, 2008/09 and 2013/14

Percentage of children working in cocoa exposed to:	2008/09	2013/14	Per cent change
Number of children working in cocoa production	819,921	1,303,009	+58.9%
Land clearing (V1)	64.3%	44.4%	30.9%
Heavy loads (V2)	79.8%	57.2%	-28.3%
Agro-chemicals (V3)	15.2%	13.0%	-14.5%
Sharp tools (V4)	79.4%	71.2%	-10.3%
Long working hours (V5)	5.2%	3.1%	-40.4%
Night work (V6)	2.4%	2.3%	-4.2%
Exposed to one or more variables	96.5%	88.5%	-8.3%

Source: Tulane University (2013/14)

Kapoor (2016).

TABLE 4.14. Children's responses by age groups (continues)

	Indenié-Djuablin								Nawa							
	5-11 y.o.		12 - 13 y.o.		14 - 17 y.o.		Total		5-11 y.o.		12 - 13 y.o.		14 - 17 y.o.		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
N observations	20	25.0	27	33.8	33	41.3	80	100.0	17	19.3	30	34.1	41	46.6	88	100.0
Thinks cocoa is important in community	20	100.0	27	100.0	33	100.0	80	100.0	14	82.4	29	96.7	38	92.7	81	92.1
Wants to be cocoa farmer	13	65.0	23	85.2	25	78.1	61	77.2	1	5.9	9	30.0	14	34.2	24	27.3
Helps family with cocoa	5	25.0	10	37.0	20	60.6	35	43.8	7	43.8	12	40.0	34	82.9	53	60.9
Helps only during weekends or before/after school	7	63.6	5	41.7	6	28.6	18	40.9	11	91.7	8	57.1	4	12.9	23	40.4
Helps sometime each week	0	0.0	2	16.7	3	14.3	5	11.4	0	0.0	0	0.0	3	9.7	3	5.3
Helps only some months	4	36.4	5	41.7	12	57.1	21	47.7	1	8.3	4	28.6	9	29.0	14	24.6
Some tasks are tiring/annoying	4	21.1	10	37.0	17	53.1	31	39.7	7	41.2	11	36.7	32	80.0	50	57.5
Skipped school to work on cocoa	0	0.0	1	3.7	0	0.0	1	1.3	1	5.9	1	3.5	0	0.0	2	2.4
Cocoa tasks child helps with:																
Land clearing	0	0.0	0	0.0	1	3.0	1	1.3	0	0.0	2	6.7	1	2.4	3	3.4
Tree felling	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	2.4	1	1.1
Slashing bush	1	5.0	0	0.0	3	9.1	4	5.0	1	5.9	2	6.7	1	2.4	4	4.6
Burning bush	0	0.0	0	0.0	1	3.0	1	1.3	0	0.0	0	0.0	0	0.0	0	0.0
Clearing debris	0	0.0	0	0.0	1	3.0	1	1.3	1	5.9	1	3.3	1	2.4	3	3.4
Weeding	2	10.0	5	18.5	10	30.3	17	21.3	3	17.7	2	6.7	12	29.3	17	19.3
Applying fertilizer	0	0.0	0	0.0	1	3.0	1	1.3	1	5.9	0	0.0	2	4.9	3	3.4
Applying fungicide	0	0.0	0	0.0	1	3.0	1	1.3	0	0.0	0	0.0	0	0.0	0	0.0
Water carrying for spraying	0	0.0	1	3.7	2	6.1	3	3.8	1	5.9	3	10.0	18	43.9	22	25.0
Spraying insecticide	0	0.0	0	0.0	1	3.0	1	1.3	0	0.0	0	0.0	1	2.4	1	1.1
Pod plucking	0	0.0	2	7.4	5	15.2	7	8.8	1	5.9	3	10.0	19	46.3	23	26.1
Pod gathering/heaping	4	20.0	8	29.6	14	42.4	26	32.5	7	41.2	8	26.7	32	78.1	47	53.4
Pod breaking	0	0.0	3	11.1	4	12.1	7	8.8	0	0.0	1	3.3	2	4.9	3	3.4
Carting fermented beans to the house	0	0.0	2	7.4	2	6.1	4	5.0	0	0.0	2	6.7	9	22.0	11	12.5
Drying cocoa beans	0	0.0	3	11.1	3	9.1	6	7.5	3	17.7	8	26.7	13	31.7	24	27.3
Carrying dry cocoa beans for sale	0	0.0	0	0.0	1	3.0	1	1.3	0	0.0	1	3.3	0	0.0	1	1.1

Source: adult's and children's questionnaires combined, Côte d'Ivoire.

Vigneri et al. (2016).

Finance (credit)

Ghana

- The lack of credit is a significant problem in Ghana. Farmers are often unable to get loans from banks as farmers are seen as unreliable when it comes to paying back the loans. Often farmers perceive loans as a gift from the government, and thus do not repay (Baah & Anchirinah, 2010).
- One good thing about cocoa production is that many people are willing to lend money to cocoa farmers in the confident expectation of being repaid once the cocoa has been sold. However, loans from moneylenders tend to carry high interest rates (100% or more). It was reassuring to creditors that even if the farmer did not pay back the loan, the farm, which was usually used as collateral, could be sold to recoup the loan. Some farmers who were unable to make the repayment have lost their farms through such loans (Barrientos & Akyere, 2012).
- Financing is impo rtant for an enterprising cocoa sector. Apart from purchasing inputs, credit has been used by farmers to support their households during the off-season when they cannot sell cocoa. The need for credit and/or loans was a theme in ten of the twelve focus groups. As with the women's groups, the youth stated that credits and loans would greatly improve farmers' production of cocoa as it enables the purchase of agricultural inputs and tools such as pesticides, fertilisers, and cutlasses (Barrientos & Akyere, 2012).
- Loans ranged between GHS50 and GHS3,000. They use the loans for school fees, inputs and/or equipment for cocoa production, for hiring labour for cocoa production and for other unknown purposes, in order of importance (Waarts et al. 2013).
- For both males and female farmers, the main source of credit is that financed by relative and friends; however, female farmers rely more heavily on the informal networks (family, friends, other farmers, and moneylenders) while male farmers, especially those carrying out market oriented activities, have more access to formal credit from the public sector (FAO, 2012).
- Access to credit is an important factor enabling crop diversification (Nelson et al. 2013).

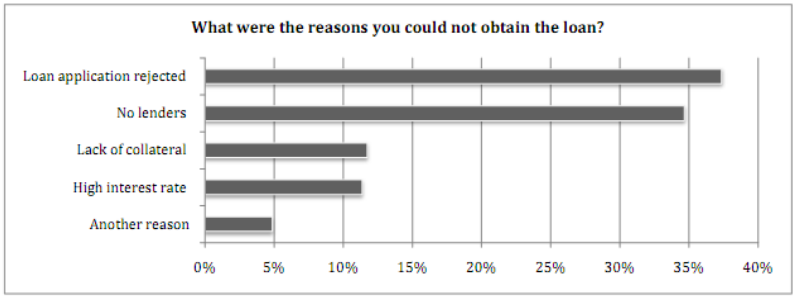
Table 15 Credit and savings (comparisons over time)

	Non-certified farmers			FT-certified farmers		
	2010	2012	Sig	2010	2012	Sig
N	*349*	*344*		*394*	*348*	
Credit ($)	105	341	**	64.1	146.1	*
Cash savings ($)	313	535	ns	288.9	324.3	ns

Sig = Significance of differences between groups: ns = not significant, *P≤0.05, **P≤0.01, *** P≤ 0.001

Nelson et al. (2013).

Figure 28: Problems Obtaining a Loan



Waarts et al. (2013).

Table 5.15: Summary statistics of credit from LBC

	Yes	Min. Amount	Max. Amount	Mean Amount	Std. Deviation
Do you receive input credit from the first LBC you sell your cocoa to? (Cedi)	22	180,000	5,280,000	1,629,090	1,255,510
Do you receive cash credit from the LBC you sell your cocoa to? (Cedi)	21	65,000	1,750,000	424,000	404,533

Credit from LBCs (old currency, 10000 old currency=1GHC new) (Barrientos & Akyere, 2012).

Table 5.14: Access to credit by main activity of head of household

Activity of HoH	If you needed to borrow some money would you be able to?		Total
	Yes	No	
Owner operator	124 (68.8%)	56 (31.2%)	180 (100%)
Caretaker operator	17 (77.3%)	5 (22.7%)	22 (100%)
Waged farm worker	2 (100%)	0 (0.0%)	2 (100%)
Business operator	7 (77.8%)	2 (22.2%)	9 (100%)
Total	150 (70.4%)	63 (29.6%)	213 (100%)

Ability of different farmer positions to get credit (Barrientos & Akyere, 2012).

Table 5.16: Sources of potential credit by main activity of respondent

Source of borrowing	Main activity of respondent				Total of owner and caretaker operators	Total number of respondents
	Owner operator		Caretaker operator			
	Yes	No	Yes	No		
Moneylender	9 (8.0%)	104 (92%)	2 (14%)	12 (86%)	127	135
Owner operator	3 (3%)	113 (97%)	2 (13%)	13 (87%)	131	139
Friend	26 (22%)	92 (78%)	3 (20%)	12 (80%)	133	140
Relative	10 (9%)	106 (91%)	1 (7%)	13 (93%)	130	138
Someone in community	12 (11%)	102 (89%)	2 (14%)	12 (86%)	128	136
Bank or financial inst.	36 (31%)	79 (69%)	2 (14%)	12 (86%)	129	137
Credit union	11 (10%)	104 (90%)	2 (13%)	13 (87%)	130	138
Solidarity association	2 (2%)	112 (98%)	0	14 (100%)	128	136
Susu scheme	0	114 100%)	0	14 (100%)	128	136
LBC purchasing clerk	41 (35%)	75 (65%)	6 (43%)	8 (57%)	130	137

Source of credit for different farmers (Barrientos & Akyere, 2012).

Côte d'Ivoire

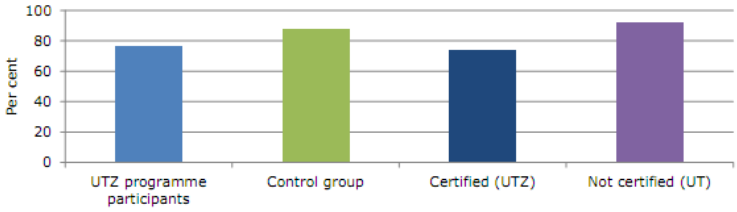
- Certified farmers are not more specialised in cocoa than uncertified farmers. Both farm groups tend to have diversified their income in rubber, palm oil and/or food crops (Lemeilleur et al. 2015).
- Because farmers lack access to credit from official institutions, farmers tend to borrow from fellow farmers instead (Tanno, 2012).
- Only 18% of respondents have a bank account. This figure seems reasonable compared to the average 20.7% access to formal accounts for adults in Sub-Saharan African rural areas.
- 75% of them acquired one in the last 10 years before the survey. The main reason given for not having a bank account is that they do not have enough money to put on the account. Farmers with no bank account would almost all like to have one account to save money and, to a lesser extent, to access credit. Indeed, 40% of farmers report that they are used to requesting credit. This credit usually comes from farmers' organizations (half of the cases) or relatives (30%). It is used to cover school and health expenditures. These two items are found to have similar importance in demographic studies as reasons for credit. 70% of farmers report that they save money, but for at least half of them, these savings are kept at home for emergencies than proper savings. 20% use relatives to keep their savings, and a small proportion (15%) use bank services. The main reasons reported for saving are for health expenditures (65%), the education of children (45%), family emergencies (26%) and various household expenditures (24%). An alternative to traditional banks is mobile banking, a widespread tool in Africa. 65% of farmers know about this tool and almost two-thirds of them have been using it. All of them say that they are satisfied with the service. This is higher than the 29% Sub-Saharan average. However, this means is more used as a way to transfer money safely. About 85% of farmers used the service to transfer money to their relatives, which is also in line with external studies (Balineau et al. 2017).
- The financing of cocoa through financial systems, either conventional banks or mobile money, thus remains largely inexistent. Less than 10% of farmers finance cocoa plots with credit (71 farmers) and less than 10% with savings (77 farmers). Interestingly, these ways of financing are mutually exclusive (i.e. only 9 farmers finance cocoa plots with both savings and credit). These ways of financing are not related to the banking system, either conventional or mobile, as 63% of credits are made through the cooperative, and 29% through relatives or

friends. Figures are similar for savings, as almost 50% of farmers who use savings to finance cocoa plots save money at home, 20% at relatives' or friends' homes and 20% at the bank (Balineau et al. 2017).

- The lack of capital or difficulty in accessing credit is the major constraint to diversification into rubber for 56 % of farmers surveyed in 2002 in south-western Côte d'Ivoire. Difficulties of access to land accounts for 20 %, the lack—or high cost—of the labour force for a further 14 % (Ruf & Schrotz, 2015).

Financing	*	• Most traitants prefinance cocoa (they receive finance from own network of international buyers). In some cases they could also offer loans. This does however a increase dependency towards traitants. • Farmers have limited access to the financial sector. • International buyers have access to cheaper finance than cooperatives or national companies. Banks tend not to provide loans to coops because they are not considered to be bankable (some consider certification as a first step to make them bankable). • For some other crops, such as rubber, farmers can get credit for planting and future income.

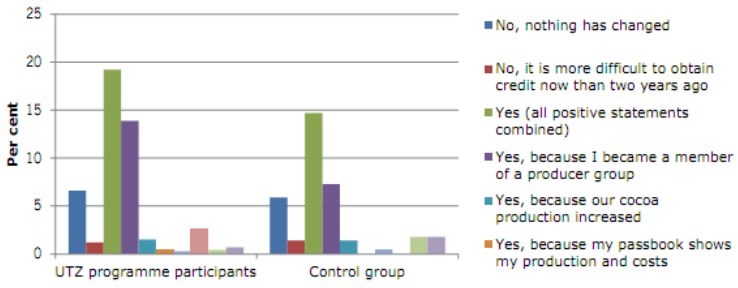
Blackmore & Heilbron (2015).



(N =263).

Figure 37 *Percentage of farmers taking credit in the last two years*

Ingram et al. (2013).



(N = 263).

Figure 38 *Changes in access to credit compared to two years ago.*

Ingram et al. (2013).

Training & Extension

Ghana

- The expected results from fertiliser application are often not met due to bad application practices (late application, wrong dosage for farm size etc.). The low yields lead to farmers being unable to pay back the LBCs who supplied fertiliser (Barrientos & Akyere, 2012).

-

Table 5.18 summarises responses from cocoa operator households about visits from an extension officer during the 2005/2006 seasons. Out of the sample of 217 respondents, only 21.2% could confirm that an extension officer visited them during season. Of those who were visited, about 45% received only one visit from an extension officer during the season.

Table 5.18: Visits by extension officer

Response	Frequency	%
Yes	46	21.2
No	149	68.7
Total	195	89.9
Missing system	22	10.1
Total	217	100.0

Rather old (2005-2006 season) (Barrientos & Akyere, 2012).

Table A3.9	Number of training events last year (*observation with >10 training events were changed to unknown because they are unrealistic according to the participants of the validation workshop)				
Topics in training	**Obs.**	**Mean**	**Sd.**	**Min**	**Max**
Cocoa production *(for instance new types of cocoa, farm cleaning/sanitation and farm maintenance)*	58	2.9	1.4	1	7
Health and safety *(for instance HIV/AIDS, child labour, safe agrochemical use, housekeeping)*	34	2.1	1.3	1	7
Management skills (for instance record keeping, economic decision making)	10	3.3	1.9	1	7
Chemical application (appropriate amount and type of chemicals to be used for farm activities)	39	3.1	1.5	1	7
Others/combination of topics	39	3.9	2.5	1	10
Environmental protection (not slashing close to rivers, uncontrolled burning, water pollution, water pollution, control of soil erosion)	20	2.9	1.7	1	7
Sustainability certification (UTZ, Rainforest Alliance, Fairtrade, Organic)	7	4.1	1.6	2	7

Topics of trainings (Waarts et al. 2013).

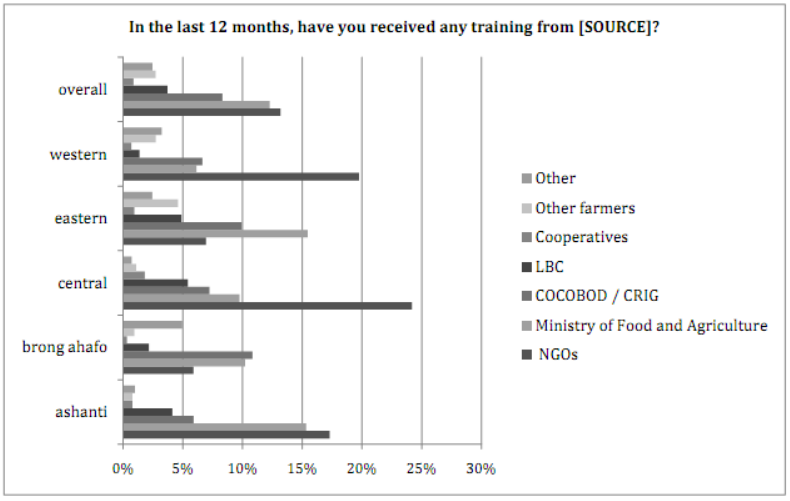
Table A3.10	Number of hours per training events (*observations with >3 hours were changed to unknown because they are unrealistic according to the participants of the validation workshop)				
Topics in training	**Obs.**	**Mean**	**Sd.**	**Min**	**Max**
Cocoa production *(for instance new types of cocoa, farm cleaning/sanitation and farm maintenance)*	55	2.2	0.8	1	3
Health and safety *(for instance HIV/AIDS, child labour, safe agrochemical use, housekeeping)*	33	1.8	0.7	1	3
Management skills (for instance record keeping, economic decision making)	9	2.0	0.7	1	3
Chemical application (appropriate amount and type of chemicals to be used for farm activities)	40	2.3	0.8	1	3
Others/ combination of topics	39	2.3	0.6	1	3
Environmental protection (not slashing close to rivers, uncontrolled burning, water pollution, water pollution, control of soil erosion)	20	1.9	0.9	0.15	3
Sustainability certification (UTZ, Rainforest Alliance, Fairtrade, Organic)	4	3.0	0.0	3	3

Waarts et al. (2013)

Table A3.11	Main providers of the training (the frequency of being mentioned, and total participants of the trainings)			
Topics in training	**COCOBOD**	**LBC**	**NGO**	**Total**
Cocoa production *(for instance new types of cocoa, farm cleaning/sanitation and farm maintenance)*	23	14	10	65
Health and safety *(for instance HIV/AIDS, child labour, safe agrochemical use, housekeeping)*	1	5	5	41
Management skills (for instance record keeping, economic decision making)	3	5	2	13
Chemical application (appropriate amount and type of chemicals to be used for farm activities)	17	7	9	46
Others/ combination of topics	20	11	1	55
Environmental protection (not slashing close to rivers, uncontrolled burning, water pollution, water pollution, control of soil erosion)	2	5	3	24
Sustainability certification (UTZ, Rainforest Alliance, Fairtrade, Organic)	2	1	2	8

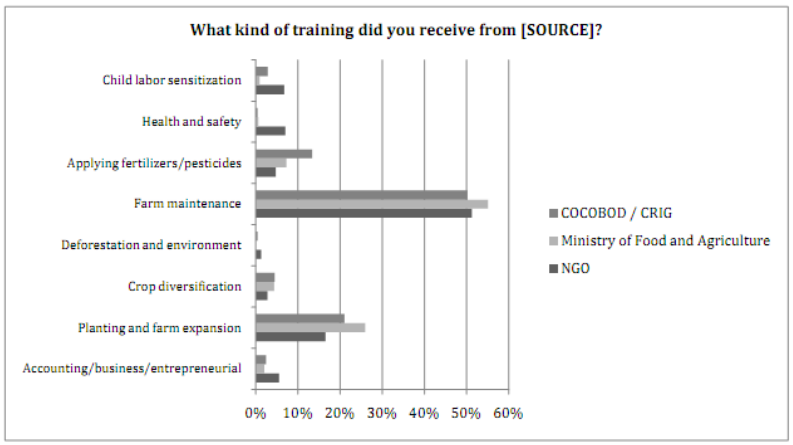
Provider of trainings (Waarts et al. 2013).

Figure 62: Farmer Training



Source of training (Waarts et al. 2013).

Figure 63: Type of Training



Type of training per provider (Waarts et al. 2013).

Table 6.4: Provision of farmer training per provider.

Provider of training	n	Percentage of trainings	Percentage of farmers
COCOBOD (CHED)	18	11,9%	17%
Cooperatives	101	66,9%	95,3%
NGOs	6	4%	5,7%
LBCs	26	17,2%	24,5%
Total:	151	100%	142%

Certified farmers in Ashanti (Steijn, 2016).

Côte d'Ivoire

- Intensive full sun production systems have traditionally been promoted through extension services (Smith & Dumont, 2014).
- Farmers who follow trainings have significant higher yields (506 kg/ha vs 492 kg/ha) (Maytak, 2014).

Table 10

Farmer participation in certification, training and other activities.

Type of activity	UTZ programme participants	Control group*
Certification training	37%	27%
Farmer Field Schools (*Champs ecole*)	53%	30%
Field Apprenticeship (*Champs d'apprentisage*)	46%	16%
Production or nursery programme	19%	15%
Community or social programme	19%	13%

Source: Producer interviews. Multiple responses possible.

Participation in trainings (Ingram et al. 2013).

Appendix 7. Farmers' Participation in Certification, Training and Other Activities, Study C

Type of activity	*CPQP participants*	*Control group*
Certification training	*37%*	*27%*
Farmer Field Schools (Champs ecole)	*53%*	*30%*
Field Apprenticeship (Champs d' apprentisage)	*46%*	*16%*
Production or nursery program	*19%*	*15%*
Community or social program	*19%*	*13%*

Training attendance (Maytak, 2014).

Good Agricultural Practices

Ghana

- Ghana has a problem of inadequate maintenance of farms in terms of controlling pests and diseases and low soil fertility. This is due to the low adoption of improved farm practices. For instance farmers on average weed their farms only 2 times a year instead of the recommended four times. Also, control of capsids and black pod disease is only done twice a year instead of the recommended 4 or 9 times a year, respectively (Aneani et al. 2011).
- Adoption rates of recommended technologies (Aneani et al. 2011):
    - Capsid control: 10,3%

  - Black pod control(fungicide): 7,5%
  - Weeding of farms: 3,7%
  - Planting of hybrid cocoa: 44%
  - Fertiliser application: 33%
- Farmers hardly spray and weed their farms because of the high cost of labour and inputs (Barrientos & Akyere, 2012).
- Farmers who attend trainings and lead farmers implement GAPs to a significantly higher extent compared to other farmers. Furthermore, men implement GAPs to a significant better extent than women, probably due to higher education levels in men (Waarts et al. 2013).
- Certified farmers who have cocoa as their primary source of income implement GAPs significantly better than farmers who rely more on other income sources (Steijn, 2016).
- There are a few reasons why farmers do not implement GAPs (also for **CdI)** (Oomes et al. 2016):
  - Farm size: smaller farms have less means to afford new farm technologies and have lower returns on investments. Larger farms are associated with a higher technology uptake.
  - Risk and uncertainty: technology may not lead to higher productivity, or investment might be risky due other factors, such as weather, pests, no timely availability of crucial inputs, and price fluctuations.
  - Land tenure: Farmers do not have secure land ownership.
  - Supply constraints: markets or governments do not provide inputs, or do not provide them at the right time or at an affordable price.
- Both education level and farm size are positively correlated with technology adoption rates (Oomes et al. 2016).

Table 6.6: Frequency and change of good agricultural practices before and after certification

	Pruning (n=106)		Pod removal (n=106)		Weeding (n=106)		Fertiliser (n=104)	
Frequency	Before	After	Before	After	Before	After	Before	After
Never	20	0	37	13	7	0	44	20
Once every 2 years	0	0	0	0	0	0	6	0
Once	30	17	8	8	18	0	36	45
Twice	21	31	14	9	45	43	10	12
3 times	14	25	12	11	31	53	3	15
4-10 times	11	10	18	34	4	7	4	11
11-25 times	13	3	3	2	1	1	1	1
"Every time"	8	20	14	29	0	2	N/A	N/A

	Change %	Change %	Change %	Change %
Increase	59,4	50,9	39,6	51,9
Decrease	2,8	0,0	1,9	5,8
No change	37,7	49,1	58,5	42,3

Differences between before and after certification for certified farmers in Ashanti (Steijn, 2016).

Table 6.2 Good Agricultural Practices (GAPs) help to increase cocoa production

Planting material	Use productive, high yield plants
	Propagation (multiplication) of plants in seed gardens and nurseries through seeds, grafting, cuttings, somatic embryogenesis, etc.
Tree husbandry	Shading (using shade trees in order to shelter plants from direct sunlight)
	Land tillage to improve soil structure
	Planting in a suitable pattern and density
	Irrigation and water management technologies
	Pruning and thinning (removal of unwanted branches from a cocoa tree)
Soil fertility	Stimulate soil organic matter through manure application
	Apply organic and inorganic fertilisers in the right way
	Liming to stimulate the soil nutrient absorption
Weed and Pest control	Manual and mechanical control of weeds
	Chemical or biological agents fighting insects, fungi and weeds
	Pest control: pests and diseases forecasting, Integrated Pest Management
Cocoa harvest, post-harvest and on-farm processing	Right time of harvesting
	Using the right tools for harvesting (not damaging the cocoa pods)
	Right fermentation process (length, turning of beans)
	Right drying process (direct sunlight, immediately after fermentation, right duration)

Source: Cocoa Sustainability Partnership (2013), ICCO (2000), ICCO (2009)

GAPs associated with increased cocoa production (also for *Cdl*) (Oomes et al. 2016).

Table 4: Farming Practices (Farmer Interviews)

In the last 12 months, did you [ACTIVITY], even if only once? (Main Farmer)						
ACTIVITY:	Ashanti	Brong Ahafo	Central	Eastern	Western	Total
Fell trees	53%	34%	53%	43%	59%	48%
Weed or clear with a cutlass	86%	80%	92%	92%	94%	90%
Prune trees	64%	59%	74%	71%	76%	70%
Apply fertilizers	26%	21%	22%	9%	39%	21%
Apply pesticides	45%	40%	42%	26%	48%	37%
Remove defective cocoa beans	83%	79%	87%	90%	87%	87%

Frequency of GAP in *Ghana* (Hainmueller et al. 2011).

Côte d'Ivoire

- Lowest implementation rates were found for: weeding, record keeping, soil conservation practices, fertiliser use, field buffer zones, crop protection products, waste management, dealing with diseased pods, inputs use, productivity, shade trees, pruning and soil and water management (certified farmers)(Ingram et al. 2013).
- Implementation of GAPs is associated with a higher production cost per kg. This is due to the need for farmers to spend more time on the farms for the GAPs. However, GAPs should also lead to a more efficient use of inputs (Ingram et al. 2014).
- Most certified farmers attribute their higher yields (467 kg/ha vs 315/ha) to the implementation of GAPs (Maytak, 2014).

Tableau 4 : Évolution des rendements moyens et des accroissements de production dans les plantations soumises à la réhabilitation, de 2005 à 2008

Année	Rendement réel (kg ha^{-1} an^{-1})			Accroissement de production (en %)		
	PP	GID	GID+	GID / PP	GID+ / PP	GID+ / GID
2005	425,0 b	628,0 a	-	47,5	-	-
2006	509,2 b	788,1 a	836,4 a	54,7	64,2	6,1
2007	578,0 c	800,8 b	1 084,9 a	38,5	87,7	35,6
2008	450,0 c	606,5 b	1 000,3 a	34,8	122,3	64,9

Source : Assiri (2010)
PP : Pratique paysanne d'entretien des vergers de cacaoyers ; GID : Réhabilitation basée sur des travaux d'entretien recommandés et la lutte intégrée contre les maladies et les insectes nuisibles du cacaoyer ;
GID+ : traitement GID + fertilisation minérale ; a, b, c : Sur une même ligne, les moyennes suivies de la même lettre ne sont pas statistiquement différentes (test de Bonferroni au seuil de 5 %).

Effects of GAPs on production (Assiri et al. 2012).

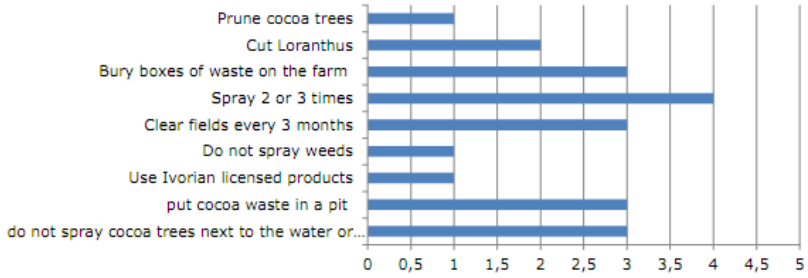


Figure 54 *GAP lessons learnt on protecting the environment.*

GAP lessons learned for certified farmers (Ingram et al. 2014).

Pruning

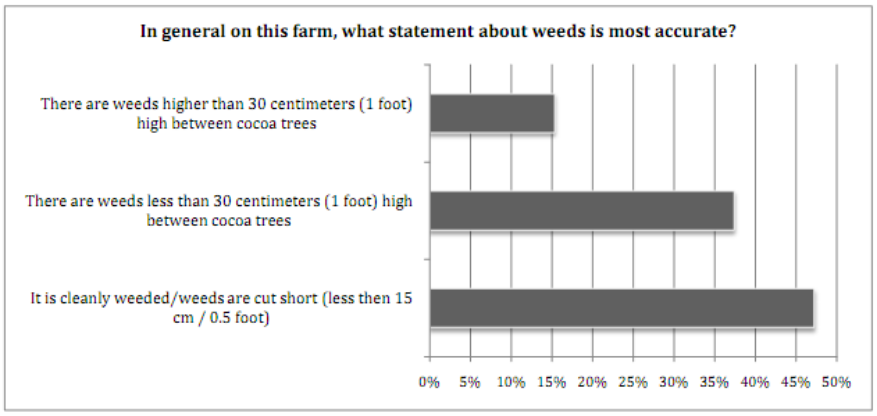
Ghana

- The majority of farmers stated they lacked the appropriate tools for pruning (machetes and long handled pruning knives). The lack of tools compels farmers to hire labour to climb the trees to remove mistletoes, at a high cost (Barrientos & Akyere, 2012).

Weeding

Ghana

- Weeding is associated with a high labour cost: GHC 4,- a day for males and GHC 3,- a day for females (Nelson et al. 2013).



Amount of weeds on farms (Hainmueller et al. 2011).

Côte d'Ivoire

- Weeding is generally done three times per year meaning in June (fruiting period), from November to February (harvest period), and April (onset of rain season), depending on the availability of manpower (Tondoh et al. 2015).

Tableau 7: Plantations désherbées (en %) en fonction de l'âge des vergers et du nombre de passages par an.

Age de la plantation	Nombre de passages par an				
	0	1	2	3	4
0 à 2 ans	13	2	32	45	8
3 à 5 ans	1	3	50	43	3
Plus de 6 ans	1	6	61	30	2

Relation between the age of the plantation and the annual weeding frequency (Deheuvels et al. 2009).

Fertiliser

Ghana

- Ghana has introduced the Hi-Tech program (fertiliser distribution through COCOBOD) as an attempt to increase fertiliser use. Fertiliser use in Ghana is low compared to Côte d'Ivoire (Baah & Anchinirah, 2010).
- The timely delivery of fertiliser is very important for effective use. Fertiliser needs to be applied before the rainy season so nutrients can be better absorbed by the soil. Late application could result in insignificant results. Furthermore, late delivery by Hi-tech results in farmers applying the fertiliser to other crops, or selling it on the black market to generate income (Steijn, 2016).
- The use of fertiliser is associated with an income increase of 30% (see figure below) (Hiscox & Goldstein, 2014).
- Yields did respond to fertilizer application in all regions, except at low levels of application. Low dosages (e.g. level 1) may not be sufficient to overcome the nutrient constraints limiting yields. Also, farmers who are not using any fertilizers might have fertilizerile fields, as farmers usually choose to use fertilizers only when they perceive that their soils are not fertilizerile enough to obtain acceptable yields. Nearly identical mean yields are obtained across regions at the four highest levels of fertilizer use. Farmers in the Brong Ahafo, Ashanti, and Eastern region that applied fertilizers at a use intensity of 5 (the interval containing the CRIG

recommended application level of 371 kg per ha) reported a mean yield of 619 kg per ha, which was 381 kg more than the mean yield of farmers that did not use fertilizer. In the Western Region, the yield difference between level 0 and level 5 producers was 239 kg/ha. At the highest levels of fertilizer use, yields in the other regions are comparable to or exceed those of Western region (Kolavali et al. 2016).

- Fertiliser use is profitable, though only at high cocoa prices if it is not subsidized. At an aggregate level, 44 percent of Farmer Field School (FFS) farmers in four major regions that applied fertilisers, the farmers who had applied on average 77 kg per ha against the recommended 371 kg per ha, had yields that were 161 kg per ha higher than those that did not apply fertilizers. The yield increases were even higher in Bia at 302 kg per ha. Those that applied fertilizers doubled their incomes by doing so. However, fertiliser use would have been profitable without subsidies only under the 2010 prices and not 2008 or 2009 (Kolavalli et al. 2016).

(0-17 years old).

TABLE 3.2. Socio-demographic characteristics of surveyed cocoa farm managers

	Ashanti				Western N.		Total
	Atwima	Adansi East	Offinso	Asante Akim Central	Sefwi-Wiawso	Juabeso-Bia	
N observations	75	74	87	83	356	242	917
% Men in sample	69	76	66	67	65	68	67
Age (mean)	52.91	47.7	57.61	50.54	47.38	47.26	49.08
Education (# years schooling) (mean)	6.23	7.38	6.66	7.34	6.11	6.14	6.39
Household size (mean)	4.85	4.24	3.93	4.67	4.53	4.14	4.38
Adult equivalent household size (mean)	3.32	2.51	2.36	2.83	2.83	2.64	2.75
Tot. person days in cocoa	326.47	137.82	148.57	201.78	210.6	133.04	187.05
HH tot. person days in cocoa	110.96	66.03	41.71	67.35	63.15	50.5	62.3
HH children days used in cocoa	30.99	22.18	16.61	21.88	17.9	16.78	19.26
Tot hired days in cocoa	215.51	71.8	106.86	134.43	147.45	82.53	124.75
% using fertilizer	43	62	41	34	32	32	36
% using fungicide	88	55	9	83	9	84	85
% using insecticide	97	89	91	98	95	85	92
Kg cocoa produced in 2014	1,988.02	1,112.06	697.49	568.15	1,247.10	1,646.19	1,288.52
Cocoa land size (ha; median)	3.63	1.55	1.81	1.55	2.07	1.81	1.94
Yields (kg./ha; median)	361.82	504.35	241.21	281.41	402.02	526.64	402.02

Source: adult's questionnaire, Ghana

Vigneri et al. (2016).

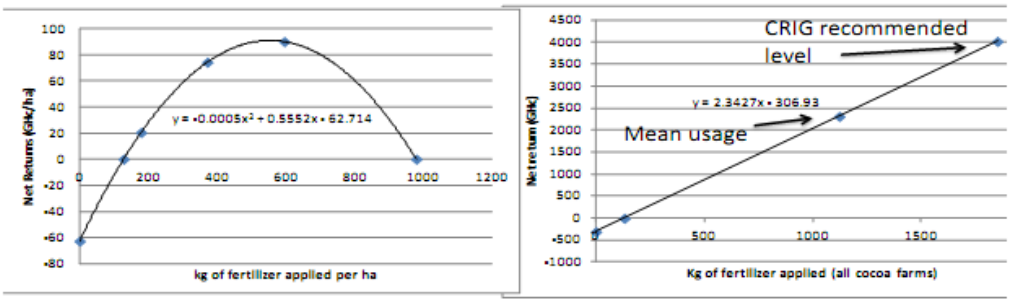
TABLE 3.9B Sharecropping as captured in the ICI Labour Study Survey Data

Variables	Unit measures	Owner	Abunu (1:2)	Abusa (1:3)
Sample size	N observations	819 (89%)	46 (5%)	15 (2%)
Yields	Kg cocoa/ha (median)	402.02	211.69	482.42
Labour productivity	Kg cocoa/labour days used	20.86	9.68	27.00
Hired labour productivity	Kg cocoa/hired labour days	32.23	18.04	93.58***
Hired person days/ha	(Hired persons * N days worked)/ha	74.88	54.43	57.01
HH person days/ha	(HH persons * N days worked)/ha	47.23	37.29	26.57
Child person days/ha	(HH children * N days worked)/ha	15.17	14.59	14.05
Child person days	HH children * N days worked	18.94	21.59	35.67***
% Hired labour	Hired labour/total labour	0.57	0.58	0.51
Fertilizer/ha	Kg/ha	123.94	49.73	141.94
Fungicide/ha	Kg/ha	2.41	1.06	0.26
Insecticide/ha	Lit/ha	4.53	5.46	5.34

*** suggests a 1% level of statistically significant difference in the t-test of difference in means between being Abusa sharecropper relative to being a land owner or Abunu sharecropper

Source: adult's questionnaire, Ghana

Differences between farmer types (Vigneri et al. 2016).



(a) (b)

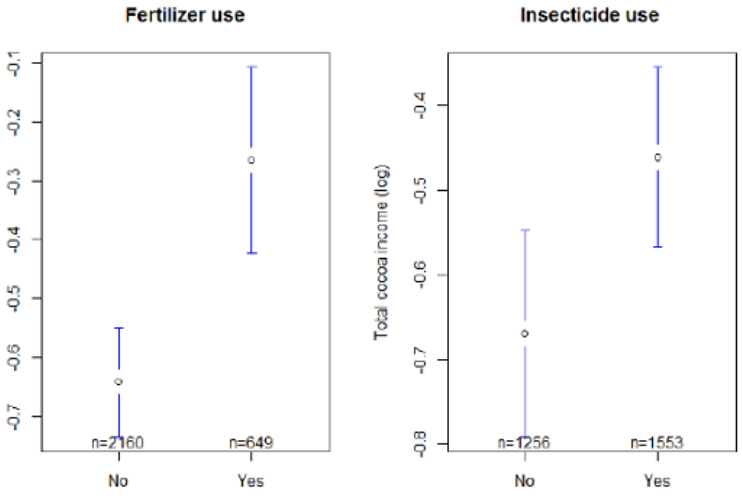
Relation between income and fertiliser application (Kolavalli et al. 2016).

Table 6.3: Yields and income by intensity typologies.

	Q1 extensive	Q2 extensive fertilizer, intensive pesticide	Q3 intensive fertilizer, extensive pesticide	Q4 intensive
Producer frequency Western region	24%	25%	14%	37%
Producer frequency other regions	54%	32%	5%	9%
Cocoa yield(KG/ha)	227	336	397	497
Mean farm size (ha)	4.2	2.8	3.5	3.3
Mean gross margin (GHc/ha)	519	787	852	1025
Mean producer income (GHc)	2013	2139	2934	3521

Kolavalli et al. (2016).

Figure 1: Key determinants of cocoa income



Hiscox & Goldstein (2014).

Table 1: Summary Statistics

Variable	*N*	*Mean*	*St. Dev.*	*Min*	*Max*
Female main farmer/head of household (1=yes)	2,809	0.18	0.39	0	1
Literate (1=yes)	2,711	0.50	0.50	0	1
Landowner (1=yes)	2,805	0.70	0.46	0	1
Total cocoa acreage farmed	2,809	5.54	9.53	0	200.00
Cocoa acreage less than 1 acre (1=yes)	2,809	0.30	0.46	0	1
Total income (past 12 months)	2,522	756.13	14,940.06	0	672,256
Total cocoa income (past 12 months)	2,809	645.94	14,209.05	0	672,256
Used fertilizer (past 12 months) (1=yes)	2,809	0.23	0.42	0	1
Used insecticide (past 12 months) (1=yes)	2,809	0.55	0.50	0	1
Used herbicide (past 12 months) (1=yes)	2,809	0.21	0.41	0	1
Used fungicide (past 12 months) (1=yes)	2,809	0.22	0.41	0	1
Used motorized mist blower (past 12 months) (1=yes)	2,809	0.34	0.47	0	1
Received training from any source (past 12 months)(1=yes)	2,809	0.34	0.47	0	1
Loan receipt (past 12 months) (1=yes)	2,801	0.14	0.35	0	1
Bank account? (1=yes)	2,801	0.31	0.46	0	1
Member of an organization (1=yes)	2,777	0.38	0.49	0	1
Leader in the organization? (1=yes; only among org. members)	778	0.43	0.50	0	1
Feel informed about cocoa prices in their region	2,708	0.75	0.43	0	1

Table showing the very low input among farmers (Hiscox & Goldstein, 2014).

Table 5.13: Summary statistics of producer price of cocoa in the surveyed area

	N	Min.	Max.	Mean	Mode	Std. Dev.
Price per bag (Cedis)	160	500,000.0	562,844.8	561,845.0	562,500.0	8,928.3
Premium from the LBC (Cedis/bag)	2	2,000.0	5,000.0	3,500.0	2,000.0	2,121.3
Cash bonus from LBC (Cedis/bag)	55	3,500.0	840,000.0	136,991.0	150,000.0	156,365.0
Cost per unit of seed pod (Cedis)	26	100.0	20,000.0	1,303.8	200.0	3,932.2
Cost per unit of seedlings (Cedis)	16	500.0	1,000.0	862.5	1,000.0	221.7
Cost per unit of insecticide (Cedis/can)	91	20,000.0	300,000.0	73,692.0	70,000.0	40,189.3
Cost per unit of fungicide (Cedis/can)	53	2,000.0	65,000.0	9,849.1	10,000.0	9,327.7
Cost per unit of fertiliser (Cedis/bag)	36	120,000.0	550,000.0	229,500.0	230,000.0	63,469.9
Daily wage for casual labour for weeding (Cedis)	36	12,000.0	80,000.0	30,722.0	25,000.0	12,260.5

Cost of several inputs (Barrientos & Akyere, 2012).

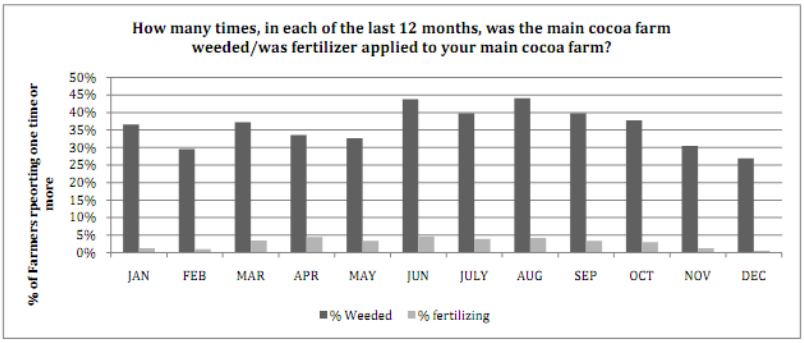
Table 6.6	Average cost per acre of the main inputs in GHS for all farmers				
Input	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
Fertiliser	145.0	45.5	61.7	0.9	558.0
Planting material	55.0	20.5	31.9	0.1	171.4
Insecticide	180.0	33.4	43.1	2.3	294.0
Herbicide	100.0	12.3	15.2	1.1	102.9
Fungicide	55.0	37.1	103.6	0.1	720.0

Cost of various inputs (Waarts et al. 2013).

Table A4.13e	Use of fertiliser per project group									
Fertiliser	Project group									Total
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Control Group Ashanti (1+3)	Control Group Eastern (2+6)	Control Group Western (4+5)	
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Fertiliser 1										
Ammonia									1	1
Asaasewura	3	2	6	9	11	1	2	3	1	47
Cocofed	8	2	8	6	7	1	2	2	3	39
Diegro			1							1
Don't know	1	1	1			1		2		6
Manure					1					1
NPK								1	1	2
Poultry droppings	2				1					3
Provided by the government		1				1				2
Sidalco	5	3	17	12	5	2	8	2	11	65
Sulphate ammonia							2			2
Total	19	9	33	27	25	6	14	10	26	169
Fertiliser 2										
Asaasewura		1	3		2				2	8
Cocofed				1						1
Don't know	1		1							2
Hybrid									1	1
NPK				1						1
Poultry droppings	1				1					2
Sidalco			1		1	1	1		4	8
Super grow			1							1
cocofeed			1		1					2
Total	2	1	7	2	5	1	1		7	26

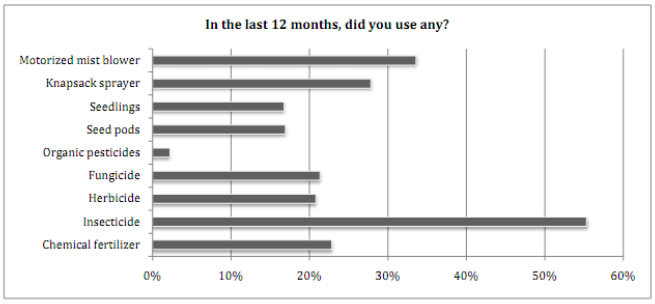
Type of fertiliser used (Waarts et al. 2013).

Figure 12: Monthly Weeding and Use of Fertilizer



Monthly frequency of weeding/fertiliser application (Hainmueller et al. 2011).

Figure 25: Use of Non-Labor Inputs



Hainmueller et al. (2011).

Table 38: Agro chemicals applied and cost per acre

Item	Qty/ acre	Cost (GHC)	Total cost (GHC)
Cocofeed (fertilizer)	3	29	87
Akatemaster (pesticide)	1	33	33
Champion fungicide	24	1.9	45.6
Fungikill (fungicides)	24	2.9	69.6
Sett Enhance (liquid fertilizer)	2	11	22
Pulmic Amazona (spraying machine)	1	65	
Solo motorized spraying machine	1	740	
Total			257.2

Cost per acre of various inputs (Nelson et al. 2013).

Table 5.2: Indicators of intensification within a decade

Indicators	2001-02	2005-06	2009-10
Observations.	435	512	786
Proportion of area under Amazon	0.34	0.44	0.48
Proportion of area under Hybrid	0.57	0.50	0.48
Proportion using Fertilizer	0.08	0.40	0.59
Average Kgs/ha fertilizer	3.32	37.44	112.63
% using Pesticide+Fungicide	0.82	0.73	0.86
Litres/ha Insecticide+Fungicide	2.37	1.36	2.61
Labour/ha (person days)	51.77	49.58	52.74

Source: Authors' estimates using Ghana Cocoa Farmers Survey (GCFS)

Use of various inputs (Kolavalli et al. 2016).

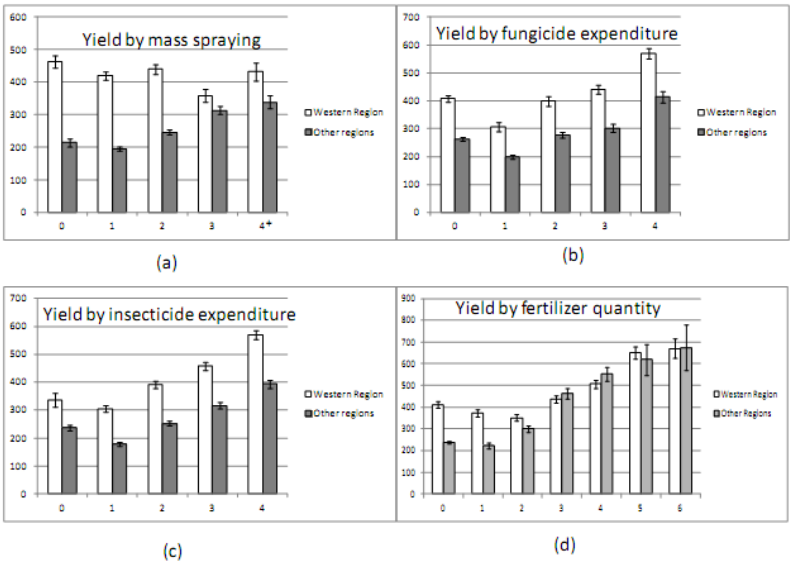
Table 5.3: Input application by technology types.

Year		T1: yields<=400	T2: yields]400-800]	T3: yields]800-1500]
2002	# Obs.	377	51	12
	kg fertilizer/ha	2.36	10.28	2.30
	Lab/ha	54.04	76.22	89.01
	Kgs Cocoa/Lab	6.62	21.94	20.52
2004	# Obs.	386	96	16
	kg fertilizer/ha	29.94	48.97	102.73
	Lab/ha	122.48	182.03	317.05
	Kgs Cocoa/Lab	4.70	9.30	10.76
2006	# Obs.	390	100	29
	kg fertilizer/ha	24.20	65.82	91.63
	Lab/ha	54.01	75.49	143.69
	Kgs Cocoa/Lab	10.42	17.92	17.61
2008	# Obs.	502	172	70
	kg fertilizer/ha	31.17	87.69	169.33
	Lab/ha	49.67	73.31	92.43
	Kgs Cocoa/Lab	10.80	29.83	28.07
2010	# Obs.	516	198	68
	kg fertilizer/ha	68.20	176.52	248.12
	Lab/ha	49.82	63.22	97.25
	Kgs Cocoa/Lab	13.08	22.49	29.72

Source: Authors' estimations using Ghana Cocoa Farmers Survey

Input use by yield category (Kolavalli et al. 2016).

Figure 6.1: Yield response to input applications



Yield responses to various inputs (Kolavalli et al. 2016).

Côte d'Ivoire

- Fertiliser use is low due to poor access and the lack of awareness, willingness and the lack of skills of farmers to apply it correctly (Molenaar & Heilbron, 2015).
- Current prices (2015) makes increasing fertiliser use unprofitable due to a low return on investments (Molenaar & Heilbron, 2015).
- Fertiliser cost is 18,750 CFA/ha (Ingram et al. 2014).
- Interesting lessons concern the use of chemical products: less than 20% of farmers use agrochemical products, which most of the time are paid for in cash. Reasons for not using chemical herbicides include mistrust (43% said that herbicide was bad for the ground and 15% that it was not useful) and the lack of means (34%). The lack of financial means is the

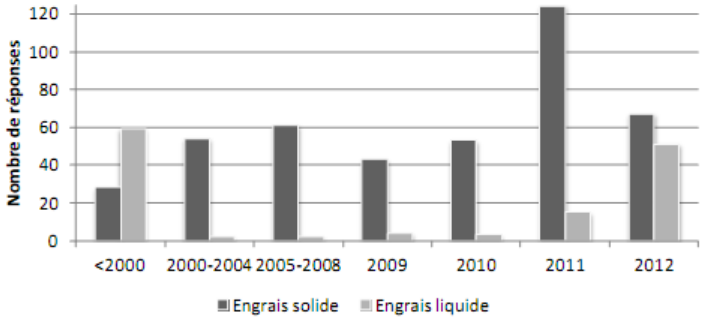
main reason for not using fertilizer (80%). Most farmers think fertilizer is indeed useful, but they cannot afford it. Among the non-users of organic fertilizer, 26% did not have the time to do it, 26% did not know about it or know how to use it, and 26% lack the financial means. In a nutshell, the lack of financial means and/or labor force remain the main barriers to the use of inputs (Balineau et al. 2017).

- Yields are statistically higher (+110 kg/ha) when farmers use chemical fertilizers. Not surprisingly, we can thus hypothesize – and this would require deeper analyses as our database does not allow time and fixed-effects to be controlled – that the key variables for yields are fertilizer use and the age of plots (and fertilizer use is statistically higher for farmers who have access to a bank account) (Balineau et al. 2017).
- The size of pods is not influenced by fertiliser application regardless of the cocoa variety planted (Criolo/forastero). The number of pods, on the other hand, increases greatly, especially for forastero. The increase in pods is caused by an increase in flowers preceeded by an improvement in fertility and minerals (caused by fertiliser). The number of beans in a pod does not increase after fertiliser application for Criollo. The effect on the mass of the pods is roughly identical for both varieties. Most reports on fertiliser application do not investigate the difference between these two varieties in CdI and Cameroon (Koulibaly et al. 2016).

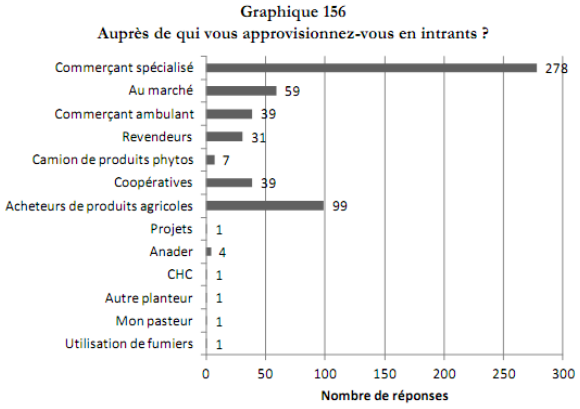
Tableau 12
Emploi d'engrais en cacaoculture

Emploi d'engrais en Cacaoculture	Planteurs de cacao	Engrais solide Nb de sacs/ha	Engrais liquide litres / ha
Nombre de réponses positives	593	454	91
Moyenne de ces réponses	-	3,1	1,5

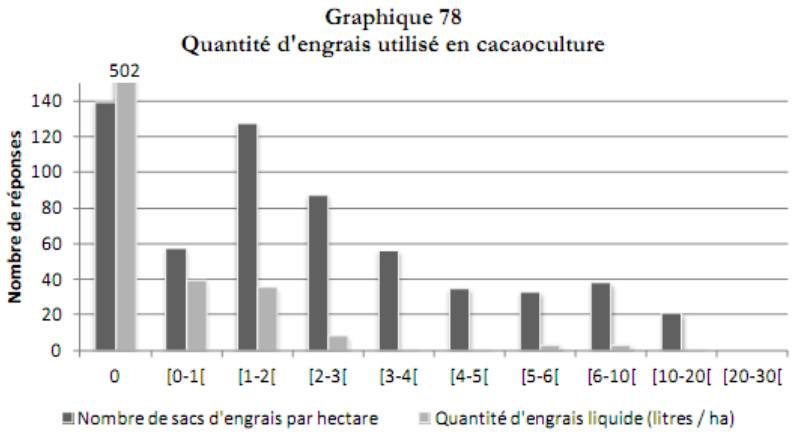
Graphique 79
Dernière année d'épandage des engrais en cacaoculture



Last year in which fertiliser was applied (Varlet & Kouamé, 2013).



Input providers (Varlet & Kouamé, 2013).



Fertiliser use in bags and litres (Varlet & Kouamé, 2013).

Table 9. Cost Items of Cocoa Production on the Main Cocoa Farm (USD/Ha/Year)

Cost Item per Ha	Mean	Median	St.Dev.	Min.	Max.	Number of respondents
Total labor costs	*236*	*179*	*182*	*1.3*	*1'453*	*720*
Fertilizers	*37*	*18*	*38*	*0.00*	*400*	*725*
Pesticides	*32*	*8*	*32*	*0.00*	*166*	*725*
Fungicides	*21*	*2.3*	*2*	*0.00*	*42*	*725*
Herbicides	*6*	*4.2*	*6*	*0.00*	*61*	*725*
Planting material	*0.2*	*2*	*0.00*	*0.00*	*30*	*725*
Total production costs	***314***	***183***	***256***	***70***	***1'533***	***720***

Source: Study C. Exchange rate is 500 FCFA/USD

Cost of inputs (Maytak, 2014).

	How many kg of rice can be bought by one kg of cocoa?	How many kg of cocoa are needed to buy one 100 cc motorcycle?	How many kg of cocoa are needed to buy one fertilzer bag
Indonesia	4,2	800	8
Ghana	1,5	2900	14
Côte d'Ivoire	1,1	5500	52

Figure 8 The real price of cocoa. Source: (MARS, 2009)

Appelman (2016).

Table 9 – Main reasons for not using agro-inputs and seedlings

	Main reasons for not using inputs (% cited)			
Inputs (nb of answers)	Lack of financial means	"not useful" or "bad for the field" (mistrust)	Lack of knowledge	Lack of time or workforce
Chemical fertilizer (523)	82	9	5	2
Organic fertilizer (530) (produced on-farm)	27	14	29	29
Organic fertilizer (637) (other)	82	8	8	1
Phyto-sanitary products (61)	80	11	5	3
Herbicide (512)	36	62	2	2
Seedlings (238)	50	29	0.5	21

1Reasons not to use inputs (Balineau et al. 2017).

Pesticide and fungicide use

Ghana

- There are price differences for inputs between regions, especially between Ashanti and Western Region. Traders buy inputs in Kumasi, Ashanti to sell in Western Region, when stocks run low, prices are increased. Especially insecticides have big price differences: Confidor (insecticide) costs 25Ghc /litre in Ashanti but sells at 30Ghc /litre in Western region; Sidalco and Akati Master, both insecticides, cost 15Ghc/litre in Ashanti region, but sell at 45Ghc and 34Ghc respectively in the Western region (Nelson et al. 2013).
- There are strong regional differences for the costs of fungicide and pesticide in both quantity and price. Some regions have more shade and higher humidity, and hence more pests and diseases. This counts for the Eastern Region in particular. Another reason for regional differences in quantity of pesticide/fungicide use is the intensity of production (high in Western Region)(Waarts et al. 2013).

- It is recommended that farmers spray their farms at least 4 times a year. Spraying should be provided by CODAPEC spraying gangs, however not all farmers benefit from this (see also COCOBOD operations) (Anang et al. 2011).
- Timing of pesticide application is critical to maximise its effectiveness in controlling mirids. The mirid population in West Africa, starts to build-up in July and reaches its peak between August and September while black pod occurrence increases from June with peaks in August and October. Consequently, it is recommended that cocoa farms in Ghana are sprayed between July and September. As indicated in this study, the majority of farmers had their farms sprayed between July and September but a significant proportion received their first spraying under CODAPEC in September when the population of Sahlbergella singularis would have been at its peak and therefore already caused damage to the crop. Surprisingly, some farmers had their farms sprayed in November. In these cases pod loss due to mirids would have already peaked before farms were sprayed (Kumi & Daymond, 2015).
-

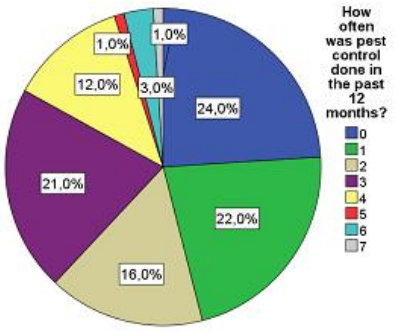


Figure 6.17: Annual frequency of pesticide spraying (n=96)

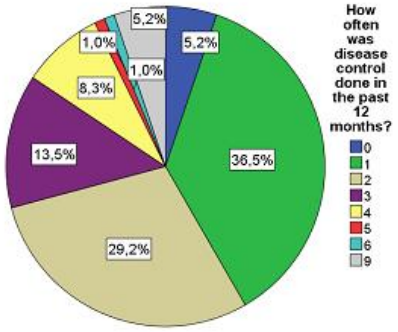


Figure 6.18: Annual frequency of fungicide spraying (n=96)

Annual frequency of spraying reported by certified farmers in Ashanti (Steijn, 2016).

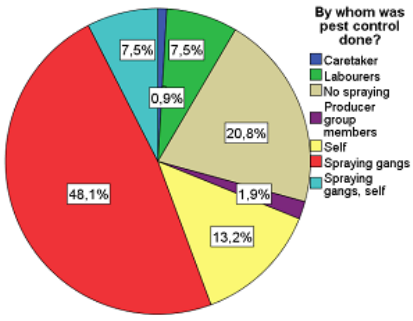


Figure 6.7: Spraying of pesticides (n=104)

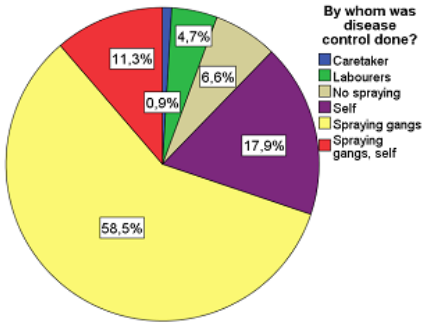


Figure 6.8: Spraying of fungicide (n=106)

Actor who performed spraying (certified farmers, Ashanti) (Steijn, 2016).

Table A4.13b	Use of insecticide per project group									
Insecticide	Project group									Total
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Control Group Ashanti (1+3)	Control Group Eastern (2+6)	Control Group Western (4+5)	
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Insectide 1										
Actara	1		5							6
Akate Master	14	10	17	10	16	1	12	6	17	103
Confidor	17	6	14	24	17	5	15	2	14	114
DDT							1			1
Don't know		2	1				2	1		6
Provided by the government		2				1				3
Semithox		1					1			2
Total	32	21	37	34	33	7	31	9	31	235
Insecticide 2										
Actara	2			2	1					5
Akate Master	7	2	7	15	8		9	2	6	56
Bossmate 2.5EC				1						1
Confidor	11	4	13	8	10	1	10	3	16	76
Don't know			1					1		2
Total	20	6	21	26	19	1	19	6	22	140
Insecticide 3										
Actara	3		3							6
Confidor	1		1							2
Don't know							1			1
Glyphosate							1			1
Petrol									1	1
Total	4		4				2		1	11

Insecticide brand used by farmers (Waarts et al. 2013).

Table A4.13d	Use of fungicide per project group									
Fungicide	Project group									Total
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Control Group Ashanti (1+3)	Control Group Eastern (2+6)	Control Group Western (4+5)	
	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Fungicide 1										
Akate Master				2			1			3
CODAPEC						1				1
Don't know	1	2	1	1	5		1	2	2	15
Funguran	3			1	3		2		1	1
Govt. provided	2									2
Kocide	1		1				1			3
NORDOX Copper fungicide								1		1
Nordox				2	2			2	2	8
Provided by the government		1				1				2
Redomil	3	2	1	4	4		1	2	3	2
Total	1	5	3	1	14	2	6	7	8	65
Fungicide 2										
Akate Master				1						1
Champion								1		1
Don't know	1									1
Funguran				1						1
Hybrid	1									1
Koude					1					1
Nordox			1	1						2
Redomil	1				1				2	4
Total	3		1	3	2			1	2	12
Fungicide 3										
Redomil				1						1
Total				1						1

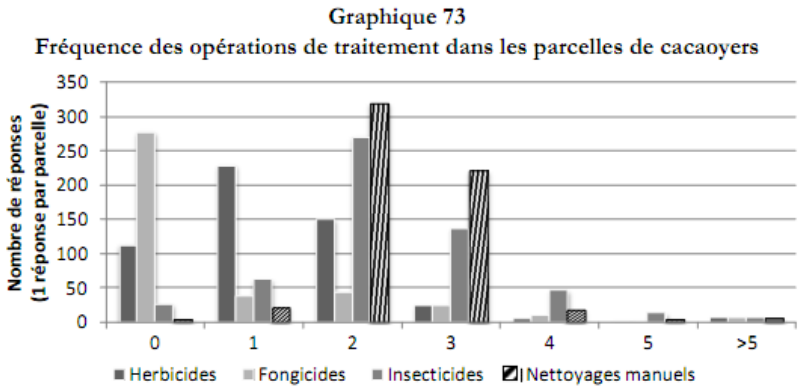
Fungicide brands used by farmers (Waarts et al. 2013).

- Annual plot upkeep is limited to one or two applications of biocides to control mirids and pod rot, along with two or three rounds for manual weeding, sucker removal or pruning. Farmers very rarely provide mineral fertilization (Koko et al. 2013).
- It is estimated that about 41% of farmers do not use pesticides or use them once, whereas 47% used pesticides twice (February and April) per year and none apply the third treatment. However relatively wealthier farmers representing approximately 23% regularly use pesticides; at least three times in the year. Generally, farmers seem to prefer the use of pesticides that are affordable and crucial for good cocoa production to inorganic fertilizers that are rather expensive (Tondoh et al. 2015).
- Interesting lessons concern the use of chemical products: less than 20% of farmers use agrochemical products, which most of the time are paid for in cash. Reasons for not using chemical herbicides include mistrust (43% said that herbicide was bad for the ground and 15% that it was not useful) and the lack of means (34%)(Balineau et al. 2017).

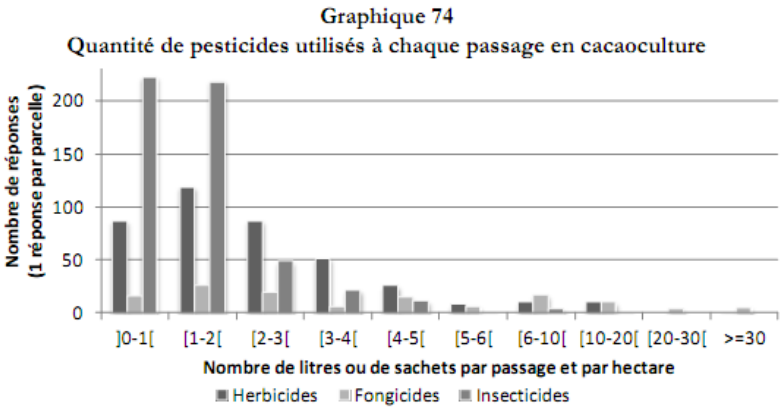
Table 9 – Main reasons for not using agro-inputs and seedlings

	Main reasons for not using inputs (% cited)			
Inputs (nb of answers)	Lack of financial means	"not useful" or "bad for the field" (mistrust)	Lack of knowledge	Lack of time or workforce
Chemical fertilizer (523)	82	9	5	2
Organic fertilizer (530) (produced on-farm)	27	14	29	29
Organic fertilizer (637) (other)	82	8	8	1
Phyto-sanitary products (61)	80	11	5	3
Herbicide (512)	36	62	2	2
Seedlings (238)	50	29	0.5	21

Balineau et al. (2017)



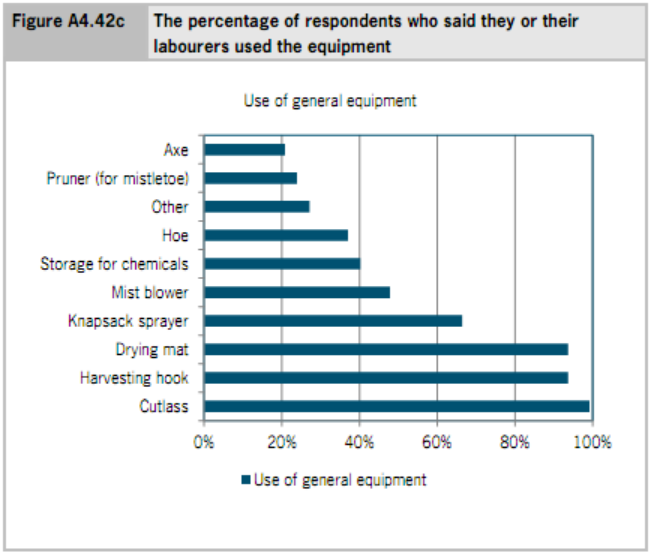
Annual frequency of input application (Varlet & Kouamé, 2013).



Quantity of inputs used per hectare (Varlet & Kouamé, 2013).

Tools & equipment

Ghana



Percentage of farmers that use x tool (Waarts et al. 2013).

Table A4.12b	Cost per item of the general equipment bought last year (in GHS)					
Equipment	**Obs.**	**Percentage**	**Mean**	**Std. Dev.**	**Min**	**Max**
Cutlass	362	94.0%	7.9	7.5	3	76.5
Harvesting hook	158	41.0%	9.3	40.1	0.7	500
Axe	12	3.1%	7.3	3.2	2	13
Hoe	46	11.9%	6.4	4.0	2	20
Drying mat	173	44.9%	91.0	125.2	1	900
Mist blower	24	6.2%	464.6	280.9	3	850
Pruner (for mistletoe)	11	2.9%	34.0	65.9	5	230
Knapsack sprayer	66	17.1%	33.6	17.3	12	90
Storage for chemicals	9	2.3%	108.0	142.8	3	400
Other	42	10.9%	11.2	30.2	0.5	200

Equipment purchased by farmers + mean cost (Waarts et al. 2013).

Côte d'Ivoire

Compte d'exploitation prévisionnel

Année 0 à 6	Dépenses			
	unité	Quantité	PU	Montant
1-Aquipements/ Investissements				
Machettes		10	2500	25 000
Limes		10	700	7000
Haches		3	2500	7500
Pioches		10	3000	30 000
Cordeau		2	5000	10 000
pulvérisateur		2	45000	90 000
Total				**194 500**

Cost of equipment (CNRA, 2014).

Age of cocoa trees

For Ghana and Côte d'Ivoire, unless indicated otherwise

Descriptives:

- The economic lifetime of a cocoa tree is between the 30 and 40 years and old age of farms is one of the main causes of low yields (Wessel & Quint-Wessel, 2015).
- There is no statistically significant difference between certified and non-certified farmers when it comes to the age of the cocoa tree (baseline: 18,2 yrs; certified farmers: 14,8 yrs) (**Ghana)** (Nelson et al. 2013).
- Mean age of trees in **Ghana** (Kolavalli et al. 2016)**:**
    - Ashanti: 19,98 yrs.
    - Brong-Ahafo: 21,79.
    - Western: 19,44 yrs.
    - Mean for Ghana: 20,29 yrs.
- Mean age of cocoa trees in **CdI** by ethic group(Tanno, 2012):
    - Bakwé: 25 yrs.
    - Burkinabé: 22 yrs.

- Baoulé: 22 yrs.
- Mean for CdI: 23,5 yrs

- Old plantations receive fewer inputs as the returns on investment are less. The loss of income of older plantations is often compensated for by other income activities (e.g. real estate) (Tanno, 2012).
- Mean age of cocoa trees in **CdI:** 23,58 (Vigneri et al. 2016).

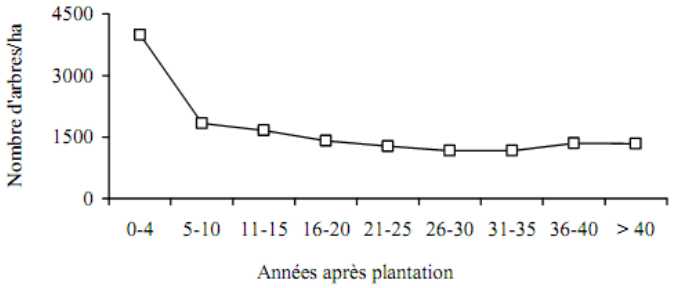


Figure 6: Evolution de la densité moyenne en fonction de l'âge de la plantation.

Tree density according to the age of the cocoa plantation *(CdI)* (Deheuvels et al. 2009)

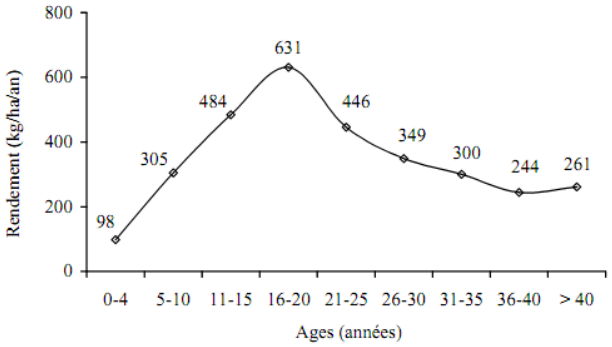


Figure 8: Rendements moyens par classe d'âge des cacaoyères.

Yield/ha according to the age of the trees *(CdI)* (Deheuvels et al. 2009).

Farm rehabilitation

For Ghana and Côte d'Ivoire, unless indicated otherwise

Descriptives:

- Trials in **CdI** have shown that planting of young trees among older cocoa trees (partial replanting) is more profitable than intercropping with banana or other shade trees. The main benefit is that farmers retain part of their income thanks to the old trees. The major drawback is the higher risk of diseases spreading from the old trees. Partial replanting is only more feasible when the majority of the cocoa trees are not old or low yielding (Wessel & Quint-Wessel, 2015). Same result has been found by Assiri et al. (2012) (see 'Tableau 7'

below). However, the potential success of this method of farm rehabilitation depends largely on the producer price of cocoa as the revenue from other farm products is lower.

- Farmers are generally not in favour of complete replanting due to the loss of income and the high cost of clearing and replanting farms. Therefore, most young farmers prefer to expand farmland in order to plant young trees in forestland. Forestland has benefit of having built up soil fertility and low amounts of weeds. Expanding farm land (if land is available) is therefore an economically sound decision compared to replanting or intensifying old farmers (Wessel & Quint-Wessel, 2015).
- Depending on the crop and the environment, there is an interval of 2–6 years from planting to first harvest. Intercropping of food crops with perennial crops during this period, such as plantain with young cocoa trees, rubber trees or coconut palms, increases food security and provides some income to farmers during the investment phase (Chap. 14). At the same time, these intercrops provide crucial ecological services to the young tree crop. Plantain trees create temporary shade for young cocoa seedlings at the stage when they need it most. Tillage and weeding of intercrops keeps the weed population in check which could otherwise increase mortality of cocoa tree seedlings (Ruf & Schrotz, 2015).
- Barry Callebaut and others have also started to inform farmers about the need to start planting new trees on their farms. The idea is to space out the replacement of trees over time in order to secure incomes generated by cocoa farming, while rejuvenating the farms. However, certain conditions have to be met in order to ensure that the replanting is successful. Indeed, replanting cannot work without good agricultural practices and a minimum level of fertilizer (Balineau et al. 2017).

Tableau 7 : Analyse comparative des comptes d'exploitation des techniques de replantation sous vieux cacaoyers et après jachères avec du matériel végétal amélioré

Indicateurs de rentabilité	Replantation sur jachère	Replantation sous vieille cacaoyère	Taux d'accroissement (%)
Rendement (kg ha^{-1})	454,0	491,8	8,3
Prix (F CFA kg^{-1})	885,0	885,0	
Autres produits (F CFA ha^{-1})	17 550,0	8 194,1	-53,3
Revenu monétaire brut	419 340,0	443 473,4	5,8
Charges de production	94 539,1	89 044,9	-5,8
Bénéfice net	324 800,9	354 428,5	9,1
Bénéfice net additionnel		29 627,6	
Taux moyen de rentabilité (%)		539,3	

Source : Kacou (2010).

Comparison between replanting on fallow land and partial replanting under old cocoa trees (CdI) (Assiri et al. 2012).

Bilan

	Cumul de 0 à 3 ans	4 ième année	5 ième année	6 ième année	7 ième année
Total dépenses	872 150	155 000	155 000	155 000	165 000
Total recettes	0	300 000	420 000	480 000	480 000
Bilan/année	-872 150	+145 000	+265 000	+325 000	+325 000
Bilan cumulé	**-872 150**	**-727 150**	**-462 150**	**-137 150**	**+187 850**

Cost benefit analysis of farm rehabilitation in CdI (CNRA, 2014).

Compte d'exploitation prévisionnel

Année 0 à 6	Dépenses				Année 0 à 6
	unité	Quantité	PU	Montant	Recettes
1-Aquipements/ Investissements					
Machettes		10	2500	25 000	A partir de la 4 ième année après plantation , on peut récolter. Le rendement va croissant à mesure que les années passent. Nous supposons un rendement de 500 Kg à l'hectare en 4 ième année, 700 Kg/Ha en 5 ième et 800 Kg/Ha à la 6 ième année. Nous supposons aussi que le Kg de cacao est vendu à 600 FCFA. C'est sur cette base de calcul que nous obtenons les recettes indiquées dans le tableau ci-contre.
Limes		10	700	7000	
Haches		3	2500	7500	
Pioches		10	3000	30 000	
Cordeau		2	5000	10 000	
pulvérisateur		2	45000	90 000	
Total				**194 500**	
2-Fonctionnement					
Location tronçonneuse	Forfait	1	30 000	30 000	
Abattage/ Andainage	H/J	20	1000	20 000	
Défrichage	m^2	10 000	2,5	25 000	
Piquetage/ trouaison	Trous	1334	50	66 700	
Achat plants	Plants	1360	200	272 000	
Plantation	Plants	1334	25	33 350	
Achat pesticides	Forfait	1	80 000	80 000	
Traitement	Appareil	100	200	20 000	
Entretien des cultures	m^2	10 000	4	40 000	
3-Commercialisation					
Récolte	H/J	15	1000	15 000	
écabossage et traitement	H/J	20	1000	20 000	
Sous-total				602 050	
4-Transport					
Imprévus(5%)				30 100	
Total				**632 150**	

Cost of cultivating 1 ha of land in CdI (CNRA, 2014). H/J=labour days, imprévus: unforeseen costs, tronçonneuse: chainsaw.

Planting material

Ghana:

Descriptives:

- Tetteh Quershie is the oldest variety still in use in Ghana. It was named after the Ghanaian agriculturalist who introduced cocoa to Ghana. The pods introduced by Tetteh Quarshie are of the Amelonado variety, which is a Forastero sub specie (Kuapa Kokoo, 2017).
- New introductions were made in 1944 from Upper Amazon Forastero materials collected by F. J. Pound into the West African Cocoa Research Institute headquarters in Tafo, Ghana and Ibadan in Nigeria. Due to the precocity of these materials, they were widely distributed for replanting of cut out plantations and by late 1950s, some 11 selected Upper Amazon types have been used to produce second and third generations of Amazon known as “F3 Amazon” or “Mixed Amazon” distributed to farmers. By 1961, some 60,000 ha in Ghana and an estimated 21 million seedlings had been distributed by the government of the Western Region to plant some 9,500 ha. Several hybrid varieties involving crosses with local Amelonado, Trinitario, and some Criollo materials were also developed from these materials in Ghana (Addae, 2014).
- Rapid growth and high yields are expected in Amazon progenies. The characters concerned are tolerance of infection with the "swollen-shoot" viruses (Series IV varieties), resistance to "black-pod" disease (Series V), and tolerance of drought (Series VI) (Glendinning, 1967).
- The new hybrid varieties that have been developed by CRIG are crosses of Amelonado and upper Amazon clones which are propagated by Seed Production Units of COCOBOD using mass hand pollination techniques (Kolavalli et al. 2016).
- Adoption rates of new hybrid seeds are low in Ghana. Only 44% of farmers use recommended hybrid seeds when (re)planting farms. This is mainly due to the high costs of hybrid seedlings and the lack of availability of seedlings during the planting season (May-September) (Aneani et al. 2011).
- Without supplemental nutrients, the hybrids rapidly deplete the soil. Moreover, the trees tend to age quickly due to the physiological stress of producing higher yields (Daniëls et al. 2012).
- 57% of farmers in Ghana used hybrid varieties in 2002. The main benefit of hybrid varieties is that they produce more fruit per pod and trees start growing pods after 3 years instead of 5 years. The main downside of hybrids is that they require more care, including more harvesting rounds which can interfere with other activities such as the production of other crops or trading responsibilities (Asante-Poku & Angelucci, 2013).
- Around 37% of farmers in Ghana have adopted hybrid seeds. The major downside of the hybrid seeds is that they deplete soil nutrients faster if not accompanied by fertiliser. Furthermore, the hybrid seeds tend to have shorter production cycles because of the physiological stresses of higher yields (Victor et al. 2010).
- The planting of Upper Amazon hybrid seeds leads to a yield increase of 42%. The success of the Upper Amazon hybrid is highly dependent on the conditions under which is it is grown, including weather. The Upper Amazon hybrid is more resistant to CSSVD (Wessel & Quint-Wessel, 2015).

- The availability of seedlings is important for farmers especially if trees are contaminated by CSSVD, which leads to a significant loss of trees. If (affordable) seedlings are unavailable, farmers are more likely to move out of cocoa as they can't replant their old farms (Steijn, 2016).
- Around 49% of farmers in the Western, Brong-Ahafo, and Ashanti region use hybrid seeds (Kolavalli et al. 2016).
- The magnitude of the coefficient on hybrid cocoa was more than four times that of the Amazonian variety. In other words: for the representative cocoa farmer, the marginal product of another land unit is 242 kg/ha for Amazon cocoa and 1344 kg/ha for hybrid cocoa (Kolavalli et al. 2016).

Table 3.8 provides summary statistics on the farm characteristics and cocoa labour productivity by yield level.

TABLE 3.8 Yields, Labour and Non-Labour Use by Yield Ranges (Technology level)

Indicator	T1: yields ≤ 400	T2: yields >400-850	T3: yields >850-2000
	Ashanti		
Sample size	194 (60.82%)	79 (24.76%)	40 (12.54%)
Land (ha; median)	2.07	2.07	1.30
Kg fertilizer/ha	52.87	129.11	321.82
Ltr fertilizer/ha	0.37	0.9	1.82
Kg cocoa/labour	8.81	18.62	29.9
Share land (ha) under TQ	0.14	0.17	0.09
Share land (ha) under Amazon	0.2	0.25	0.36
Share land (ha) under Hybrid	0.67	0.58	0.54
Share land (ha) no shade	0.06	0.01	-
Share land (ha) light shade	0.19	0.19	0.17
Share land (ha) moderate shade	0.39	0.41	0.33
Share land (ha) heavy shade	0.36	0.39	0.5
	Western N.		
Sample size	260 (43.48%)	199 (33.28%)	121 (20.23%)
Land (ha; median)	2.20	2.20	1.43
Kg fertilizer/ha	72.06	92.36	156.1
Ltr fertilizer/ha	0.11	0.23	0.3
Kg cocoa/labour	8.64	23.06	41.96
Share land (ha) under TQ	0.13	0.16	0.11
Share land (ha) under Amazon	0.16	0.15	0.17
Share land (ha) under Hybrid	0.7	0.7	0.72
Share land (ha) no shade	0.05	0.02	0.01
Share land (ha) light shade	0.18	0.16	0.15
Share land (ha) moderate shade	0.39	0.45	0.35
Share land (ha) heavy shade	0.38	0.37	0.49

** Including Nnoboa groups.*
***Source**: adult's questionnaire, Ghana*

Input figures by yield category (Vigneri et al. 2016).

Côte d'Ivoire

Descriptives:

- The Amelonado type named "French Cocoa" is known to produce small, "heavy" beans. The Amelonado type was found in Abengourou, Aboisso and Gagnoa regions and represents less than 10 % of farms surveyed in these regions. In reality, French Cocoa also included some Trinitario germplasm with a pod shape similar to that of Amelonado. The Trinitario type with a red pod was not wellknown to farmers (Pokou et al. 2009).
- Most farms surveyed were composed of trees with pods similar to Upper Amazon Forasteros (UA). This type of cocoa was named "Ghana" (Pokou et al. 2009).
- Farmers appreciated Upper Amazon because of their high yield and low susceptibility to black pod rot compared with Amelonado (cacao Francais). Those farmers who knew the current improved varieties found them better than non-selected Upper Amazon in production and resistance to black pod rot as reported in Abengourou region (Pokou et al. 2009).

- To maintain its position as world leader in cocoa beans production, the “Centre National de Recherche Agronomique (CNRA)” of Côte d’ Ivoire has been entrusted to renew the orchard with a new hybrid. This new hybrid is called “cocoa Mercedes” and it is selected because of its main characteristics: the precocity of its production (18 months instead of 5 years for the traditional cocoa) and the productivity (3 tons per hectare per year instead of 0.3 tons for traditional cocoa). It had been massively introduced over the last five years in the fields by farmers because the seeds were free (Yapo et al. 2012).
- Replanting with selected planting material causes an increase in production costs linked to the higher input requirement (i.e. more fertiliser, pesticides and the seeds themselves) (Assiri et al. 2012).
- Hybrid cocoa is better resistant against black pod rot (same as is the case for Amazonia)(Traoré et al. 2009).
- In CdI, the hybrid known as ‘cacao Mercédes’ is distributed for free by the CCC and Nestlé. This hybrid can produce pods after 18 months instead of the regular three years for Forastero and is known to produce more pods. This hybrid is seen as the future of cocoa in CdI (PFCE, 2016).
- They clearly show that the first to purchase the selected oil palm and rubber planting material are the upper middle class investors. Among the smallholders, if there is no active project support, the early adopters are retirees with pensions. Indeed, these retirees can fund the purchase of planting material themselves. Barrett et al. (2000) ask some relevant questions:
    - If non-farm activities are typically correlated to the gross household income, should they be viewed as the key diversification process to escape poverty?
    - Or, conversely, does this correlation suggest that the individual who starts off poor in terms of land and savings can never marshal enough investment for non-farm activities?

  On the one hand, the history of cocoa and coffee is replete with success stories; it epitomizes the process of crystallization of working capital. The cocoa tree then becomes a source of new income, enabling diversification into rental housing or transport businesses with the purchase of taxis or other vehicles to transport people or agricultural produce. On the other hand, the example of barriers to investment in selected hybrid palm and clonal rubber planting materials also shows the divide between these two processes: people leaving agriculture to try to diversify their activities and income from urban activities that is used to diversify agriculture.

Table 1.2 Distribution of farmers by access to planting material in Côte d'Ivoire (Data collected in 2006)

Planting material	Cocoa	Coffee	Oil palm	Rubber
Unselected planting material (%)	75	48	7	21
Planting material which is supposedly selected (informal source, e.g., local nursery) (%)	3	4	16	36
Selected planting material supplied by a recognized institution (%)	21	46	76	40
Planting material whose source is unknown because the plantation was inherited or purchased (%)	1	1	1	0

Sources Surveys conducted on 1045 farms by CIRAD and A&C-Vie in 2006 on behalf of the European Union

Ruf & Schrotz, 2015).

Tableau 6 : Rentabilité économique des techniques de replantation en fonction du matériel végétal

Techniques de replantation / Indicateurs de rentabilité	Replantation avec du matériel végétal non amélioré	Replantation avec des hybrides du CNRA	Taux d'accroissement (%)
Replantation après jachère naturelle :			
rendement (kg ha^{-1})	372	454	22,0
prix (F CFA kg^{-1})	875,7	875,7	
autres produits	10 121,9	17 550,0	73,4
revenu monétaire brut	335 871,1	415 104,2	23,6
charges de production	62 967,0	94 534,1	50,1
bénéfice net	272 904,1	320 570,1	22,2
bénéfice net additionnel		47 666,0	
taux moyen de rentabilité (%)		151,0	
Replantation sous les vieux cacaoyers :			
rendement (kg ha^{-1})	390,6	491,8	25,9
prix (F CFA kg^{-1})	864,2	864,2	0,0
autres produits	5 245,4	8 194,1	56,2
revenu monétaire brut	342 801,9	433 207,7	26,4
charges de production	80 193,5	89 044,9	11,0
bénéfice net	262 608,4	344 162,8	31,1
bénéfice net additionnel		81 554,4	
taux moyen de rentabilité (%)		921,4	

Source : Kacou (2010).

Difference between replanting with unselected material and hybrids from CNRA (Assiri et al. 2012).

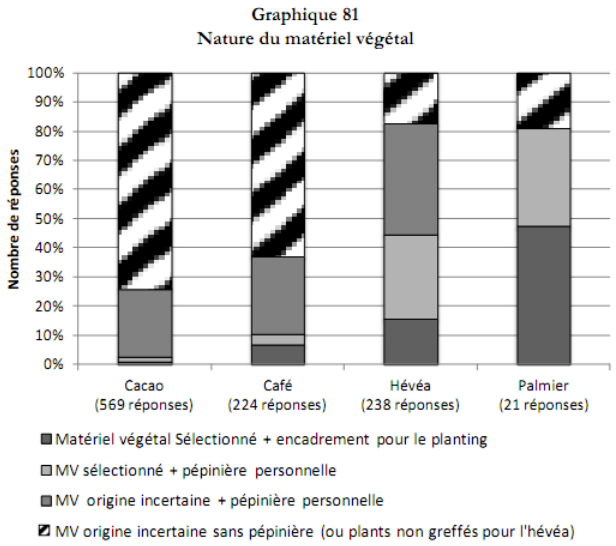
Tableau 4: Variétés de cacaoyers plantées (% des superficies) en fonction des zones productrices de cacao.

Zones de production de cacao	Variété sélectionnée	« Tout venant » non sélectionné	*Amelonado*	Variétés en mélange
Est, Sud-Est	15 a	44 c	11 a	30
Centre-Ouest	5 b	64 a	3 b	28
Sud-Ouest, Ouest	7 b	56 b	8 a	29
Moyenne (pondérée)	10	52	8	30

Tableau 5: Modes de mise en place des plantations (% des superficies) en fonction des variétés de cacaoyer.

Modes d'installation des plantations	Variété sélectionnée	« Tout venant » non sélectionné	*Amelonado*	Variétés en mélange
Pépinière en sachets	**60**	13	6	9
Pépinière pleine terre	1	11	6	6
Semis direct	21	**50**	**75**	**50**
Mélange des modes d'installation	19	26	14	35

Used planting by region and by method of planting in CdI (Deheuvels et al. 2009).



Type and origin of planting method used by farmers around the Taï National park (Varlet & Kouamé, 2013).

Production method (agro forestry/ zero shade)

Definitions (Ruf 2011):

- Agro forestry: a cocoa farm which has more than 15 mature timber trees per hectare (and possibly as many as 60–80), usually giant trees more than 15 m tall, which are native to the natural tropical forest. These cocoa agroforests represent a wide range ofbiodiversity, including fruit trees, shrubs and other plants, generating at least three levels of canopy storage, one below that ofcocoa and, more importantly, one or two above.
- Full sun exposure: The full sun system often has only one level of canopy storage: cocoa trees. Almost all the large natural forest trees have been felled or burned. However, it may include some limited yam moulds below the cocoa trees and a few banana and fruit trees, such as avocado (less than 10) isolated in an ocean ofmore than 1000 cocoa trees per hectare. This forms two levels ofcanopy storage in some parts ofthe cocoa farm, which can then be interpreted as a 'simple agrosystem.' A light-shade version may include up to 5–6 trees per hectare emerging above the cocoa. This may still be far from a complex agroforest but turns the system into what can be defined as a 'simple agroforest' or 'light agroforest.' However, biodiversity is poor and there is no real canopy above the cocoa. The landscape appears homogeneous and monotonous, like a monoculture system.

For Ghana and Côte d'Ivoire unless otherwise indicated

Descriptives:

- Agroecologists argue that keeping shade trees on cocoa farms is important because of the ecological services provided. However, most smallholder farmers have started to remove shade trees in recent years in favour of full sun cocoa production (Ruf, 2011).
- Full sun exposure cocoa production has enormous potential yields. Experimental trials in the 1950s showed that yields could triple in full sun cocoa farms and even quadruple if accompanied by fertiliser. However, other researches have shown that over a period of 80 years, shaded agroforestry hybrid cocoa farms have the higher net returns. The period of 80

years is, however, very unrealistic. Furthermore, the unshaded hybrid production system is most profitable over a period of 20-25 years due to an earlier peak yield (Ruf, 2011).

- Smallholder farmers appear to abandon agroforestry due to personal experiences in cocoa farming, and not due to ignorance of the benefits of shade trees. Smallholder farmers noticed that new hybrid planting material does not need shade to be productive. The farmers know they can obtain higher yields for a period of 10-20 years by removing shade trees. Although this period may seem short and unsustainable, farmers prefer fast returns on their investments in cocoa. Advancement in technology (i.e. new hybrids) is stated as the most important reason for abandoning agroforestry in **Ghana** (Ruf, 2011).
- Most farmers that have adopted hybrid planting material see more downsides in having shade trees than benefits. The downsides of keeping shade trees relate to increased damage by pests (e.g. squirrels) and the spreading of diseases such as black pod (Ruf, 2011).
- Tree removal is often caused by adoption of new hybrid seeds leading to an increase in cocoa productivity. However, studies show that shade trees have social and economic value in the long term as they reduce household vulnerability to climatic stress, price fluctuations, pest and disease infestations, and food insecurity (Smith-Dumont et al. 2014).
- Shade trees on cocoa farms can support rural communities by meeting household demands in timber, firewood, and fuels, and by enabling income divarication that can help avoid the risks of relying solely on cocoa as an income (Smith-Dumont et al. 2014).
- Agroforestry can increase and sustain cocoa production through eco-physiological, economic, and environmental interactions. Benefits include: better soil fertility, greater resilience to climatic change and protection against pests and diseases (Smith-Dumont et al. 2014).
- It appears that the used planting material is the most important determinant in considering full-sun versus agroforestry. In **Ghana,** 90% of farmers removed shade trees due to their perception that new hybrids were intolerant of shade. In the Western part of **CdI**, however, shade trees are still valued as most of the cocoa trees are not of hybrid origin (Smith-Dumont et al. 2014).
- Insect pests usually cause greater damage in light/no shaded cocoa plantations. This can be countered by increasing pesticide use (Wessel & Quint-Wessel, 2015).
- The availability of hybrids has resulted in many farmers turning to full sun cocoa production. However, no shade also results in the need for more frequent weeding and more frequent fertiliser application. Most farmers do not have the knowledge or financial means to adopt farming practices required for full sun cocoa resulting in early deterioration and early death of cocoa trees in **Ghana** and **CdI** (Wessel & Quint-Wessel, 2015).
- Shade trees have a negative influence on cocoa output due to competition at the mean level of shade. Each shade tree can decrease output by an estimated 2.34 kg. A regular cocoa farmers has around 46 shade trees, resulting in a loss of 108 kg in cocoa output. The CRIG in **Ghana** recommends 12 to 18 shade trees per hectare, but the majority of farmers have less than 10 shade trees/ha (Kolavalli et al. 2016).
- **CdI** has a rich diversity when it comes to different trees on the cocoa plantations. Most farmers (95%) value integrating shade trees on their farms regardless of certification. Farmers value a select group of tree species for their contribution to their livelihoods, and to soil fertility and pest and disease interactions (Smith-Dumont et al. 2014).

- The life cycle of cocoa trees in an agroforestry system often exceeds 50 years, which is longer than the 20-30 years of cocoa trees in mono culture (Jagoret et al. 2014).
- By planting multiple plant species the same plot in an orderly fashion, farmers can reduce the number of 'technical interventions' (i.e. fertiliser, fungicide and pesticide use and pruning) for a number of years. Farmers do not risk losing their farm to pests and diseases during periods of financial turmoil when investments are difficult (Jagoret et al. 2014).
- In addition to ecological functions, agroforestry systems can also fulfil household needs. Besides cocoa, agroforestry can supply goods for both consumption (e.g. fruits) and marketing (e.g. timber). These additional goods can fill the income gaps outside the cocoa seasons or when cocoa prices decline (Jagoret et al. (2014).

Table 4 Number of trees per hectare of cocoa farm observed per quadrate, according to the type of cocoa plant material (2005)

	Average number of trees per hectare		Average year of plantation
	Cocoa trees	Forest trees >10 m high	
Amelonado "Tetteh Quarshie"	992	50	1970
Amazonian	1095	4.7	1989
Hybrid and hybrid descendents	1493	3.4	1991
Probability of error	0.035	0.000	0.000

Amount of trees per hectare for different types of seedlings (Ghana) (Ruf, 2011).

Table 3: Percent of shade tree cover on cocoa farms per acre

Respondents status	**Average number of trees per acre**	**Average shade tree cover/acre %**
Utz Certified	1.54	25.67
Rainforest Alliance	1.60	26.67
Conventional	1.37	22.83

Use of shade trees under different certification standards (Ghana) (Addae, 2014).

Table 4. Effect of intercropping on the yield of cocoa beans

Treatment	Yield (kg/ha)											
	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	Cumulative	% Increase/ Depression in yield relative to sole cocoa
Sole cocoa	7.5	91	300	265	412	566	215	278	386	458	2978.5 (±622)	
Cocoa/plantain	3.1	134	517	480	730	750	576	435	750	403	4778.1 (±557)	+60.4
Cocoa/cassava	1.3	82	284	203	280	412	282	409	378	465	2796.3 (±379)	-6.1
Cocoa/ maize	3.1	76	525	389	674	591	420	520	559	412	4169.1 (±314)	+40.0
Cocoa/cassava/plantain	0.6	208	480	370	575	585	360	375	462	485	3900.6 (±882)	+31.0
Cocoa/cassava/maize	13.0	113	433	396	585	581	326	593	507	537	4084.0 (±517)	+37.1
Cocoa/plantain/maize	1.9	153	505	398	575	765	436	441	634	477	4385.9 (±513)	+47.3
Cocoa/plantain/cassava/ Maize	14.9	221	535	370	530	435	344	433	510	442	3834.9 (±301)	+28.8
F test	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	
CV (%)		**87.3**	**47.7**	**36.8**	**44.0**	**40.6**	**48.8**	**34.9**	**38.4**	**28.3**	**27.9**	

ns – Not significant at 5% probability; values in parenthesis are the standard error of mean

Impact of intercropping on yields using different food crops (Ghana) (Aneani et al. 2012).

Tableau 22
Raisons pour conserver ou abattre les arbres d'ombrage

Pourquoi conservez-vous les arbres d'ombrage ?	Nombre de réponses	Pourquoi ne conservez-vous pas les arbres d'ombrages ?	Nombre de réponses
Ne sait pas	4	Ne sait pas	3
Ombrage	50	Favoriser le développement des cacaoyers	69
Protéger le cacaoyer	49	Pour la réussite du cacao	45
Protéger les plants	12	L'ombre gène	42
A cause de la SODEFOR	9	Aération	17
Trop de travail pour les abattre	8	Les arbres gênent	12
Pas de moyen pour les abattre	7	Croissance des plants	11
Bon pour le cacao	5	Croissance Cacaoyer	9
Ils servent comme tuteurs d'igname	5	Pour réussir l'hévéa	9
Pour la pluie	5	Entretenir la plantation	8
Le père qui l'a laissé	4	Pourriture brune	8
Il ne faut pas tout couper	3	Les exploitants forestiers les ont coupés	7
Entretenir le sol	2	Arbres déjà abattus	6
Pour éviter de casser les cacaoyers en les abattant	2	Pour éviter que leur chute détruise les cacaoyers	6
Pour les vendre aux exploitants	2	Éviter les bêtes et insectes	5
Pour protéger le sol	2	Trop d'ombre	5
Sert de médicament	2	Imitation des autres planteurs	4
Champ école	1	Pour planter cacao	4
Conseil Anader	1	L'ombre provoque l'humidité	3
Conseil des techniciens agricoles	1	Le cacaoyer ne réussit pas sous tous les arbres	2
En souvenir de la forêt	1	Conseil des techniciens agricoles	1
Envie de les garder	1	Conseil SATMACI	1
Ils appellent la pluie, servent de médicament de palu et de sauce	1	Danger pendant les tornades	1
Par ordre des agriculteurs	1	Éviter que la Sodefor vienne voir la parcelle	1
Pour montrer aux enfants	1	L'ombre de ces arbres favorise la pourriture et leurs branches tombent sur les cacaoyers	1
Un besoin	1	Pour éloigner les animaux sauvages	1
		Pour la réussite du café	1
		Pour planter du riz	1
		Pour planter hévéa	1
		Pour plus de sécurité	1
		Si c'est cacao je laisse/ mais si hévéa j'abats tout car présence de maladies	1

Reasons for farmers to keep or to cut shade trees on their farms (Varlet & Kouamé, 2013).

Irrigation

Ghana

- Only one source mentioned irrigation, and then in the context of irrigation being absent from 94% of the farms. The other 6% had drainage channels (Hainmueller et al. 2011).

Cocoa quality

Ghana

- Ghana has stringent quality standards that are enforced by the COCOBOD subsidiary Quality Control Company (QCC).LBCs or purchasing clerks can deduct kg's from bags when they think the quality is sub-standard, making the produce worth less. The most often cited reason to reject beans is the moisture content of beans (insufficient drying). The amount of farmers that have kg's deducted from their bags is low. The amount of kg's deducted is used as a proxy to measure quality (Waarts et al. 2013).

Harvest/post-harvest/Seasons

For Ghana and Côte d'Ivoire unless indicated otherwise

- The main cropping season in the country is October-February/March while there is also a smaller/light mid-crop cycle, which occurs from around April/May to mid-September. In order to maximize foreign currency earnings, the Ghana COCOBOD also introduced an extended duration for harvesting and marketing in the longer crop seasons for the main crop (October to May) and limited the duration for the light crop season (June-September) as the light crop beans are typically smaller in volume in comparison to the main crop variety, although the same type of bean quality is cultivated (Asante-Poku& Angelucci, 2013).
- Cocoa harvesting is labour intensive and requires that farmers carefully cut the pods from the tree so as to prevent damaging the entire tree. Pods also have to be cut open carefully to avoid damaging the beans. Although mechanized systems have been developed to ease the labour burden, this often damages the beans and hence is not very popular among farmers. After the pulp and seeds have been removed, they are put together to ferment in a process called sweating, which is important for the development of the bitter taste of the beans. The fermented pulp is left to trickle away leaving the seeds; in **Ghana** however, the Cocoa research institute has started distilling the liquefied pulp into alcohol. The fermented seeds are then dried, typically on raised bamboo mats, to reduce the moisture content to about 7.5% of its original moisture content (Asante-Poku & Angelucci, 2013).
- Ripe pods may be found throughout the continuous growing season; however, most countries have two peak production harvests per year. Changes in weather patterns can dramatically affect harvest times and yields, causing fluctuations from year to year. Farmers remove pods from the trees using long-handled steel tools. Pods are collected and split open with a sturdy stick or machete, and the beans inside are removed. A farmer can expect 20 to 50 beans per pod, depending on the variety of cocoa. Approximately 400 beans are required to make one pound of chocolate (WCF, 2014).
- Farmers pack the fresh beans into boxes or heap them into piles covered with mats or banana leaves. The layer of pulp that naturally surrounds the beans heats up and ferments the beans. Fermentation lasts three to seven days, and it is the critical step that produces the familiar chocolate flavor. The beans then dry for several days in the sun or under solar dryers (WCF, 2014).

- For one hectare of cocoa, the harvesting, drying, fermenting and selling of beans takes 17 to 18 days. Certified farmers are asked to harvest at least once a month or every 15 days, which is impossible without hiring additional labour (Ruf, 2011).
- The busiest months for maintaining a cocoa farm are August to November, during which farmers spend as many as 34 hours per week on cocoa. The least busy months are January to May, during which they might spend 15 hours per week on their cocoa farms (Kolavalli et al. 2016).
- Cocoa beans are normally fermented and dried on the farm or in the producer's village. After the cocoa pods are harvested and split, the pulp-covered beans are removed. Thereafter, they are stored in boxes or baskets or heaped into piles and covered with mats, or with banana or plantain leaves. The pulp layer heats up and ferments the beans. This process, which may the cocoa beans. After their fermentation, the beans are dried in the village. The drying stops the fermentation process and enhances the storability of the beans. Sometimes, the drying process is undertaken mechanically, but sun drying is considered the best as it produces a aeration that may be missed during mechanical drying, the acetic acid present in the beans does not escape fully, resulting in more acidic cocoa products (Gayi & Tsowou, 2015).

1) Adopt a common set of relevant indicators for the food security and nutrition impact area

Figure 5. Number of months per year where resources are not sufficient enough for food

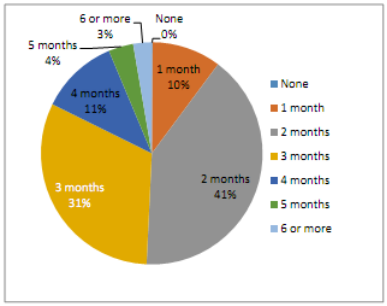
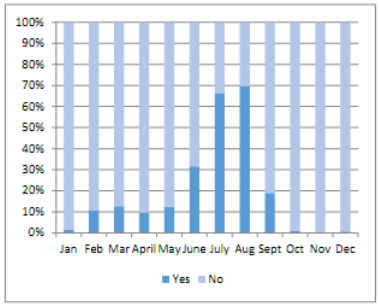


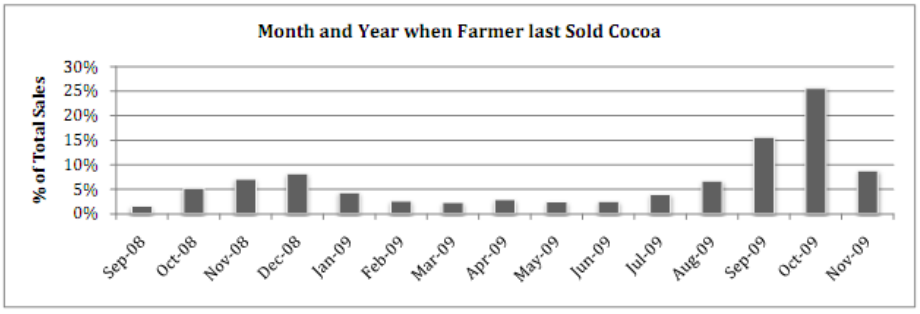
Figure 6. Percent of farmers without enough resources for food, by month



Source: Study B

Maytak (2014).

Figure 18: Timing of Cocoa Sales



Hainmueller et al. (2011).

Table 2 : Harvest seasons in selected cocoa producing countries		
Country	**Main crop**	**Mid-crop**
Brazil	Oct-Mar	Jun-Sep
Cameroon	Sep-Feb	May-Aug
Costa Rica	Jul-Feb	Mar-Jun
Côte d'Ivoire	Oct-Mar	May-Aug
Ecuador	Mar-Jun	Dec-Jan
Ghana	Sep-Mar	May-Aug
Indonesia	Sep-Dec	Mar-Jul
Nigeria	Sep-Mar	Jun-Aug
Papua New Guinea	Apr-Jul	Oct-Dec
Togo	Oct-Mar	Apr-Sep

Source: ICCO, at: http://www.icco.org/faq/58-cocoa-harvesting/131-what-time-of-year-is-cocoa-harvested.html (accessed 23 April 2015).

Gayi & Tsowou (2015).

Diseases and pests

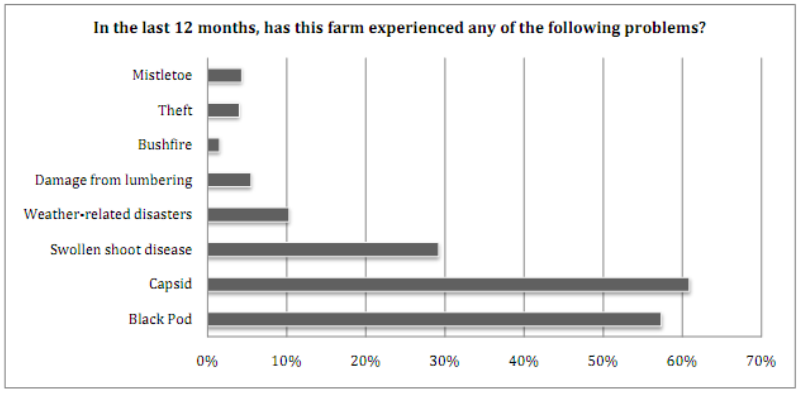
Ghana

Hainmueller et al. (2011).

Region	% of crop lost due to diseases
Ashanti	33
Brong Ahafo	37
Central	28
Eastern	32
Western	37
Mean for Ghana	33,4

- The major pests in **West-Africa** are: Cocoa Swollen Shoot Virus Disease (CSSVD), mistletoe, capsids (insects) and black pod (Barrientos & Akyere, 2012).
- There is a high incidence of pests and diseases in Ghana. This is mostly caused by inadequate farm management as farmers cannot afford pesticides/fungicides, spraying equipment and labour. This is also because CODAPEC spraying gangs do not reach their mandate of 4 sprayings per farm per year (Anang et al. 2011).
- Yields in Ghana are lower compared to Côte d'Ivoire. This is attributed to factors including a high incidence of pests and diseases (Kumi & Daymond, 2015).

Figure 15: Problems with Cocoa Crop



Hainmueller et al. (2011).

Table 6: Ranking of constraints by farmers

Constraints	Overall rank	(T)	TWS Rank score of constraints 1	2	3	4	5	6
Adjustment of scale when weighing	3	229	13	17	25	18	7	0
Long distances in transporting beans from farms	2	218		7	25	36	9	12
Pest and diseases	1	130	50	19	4	5	2	0
Theft of beans during drying	6	380		1	3	5	17	34 20
High labor cost	4	336	8	10	5	12	13	32
High cost of other inputs	5	375	1	6	5	19	23	26

W = 0.46, F_{cal} =23.60, F_{tab}= 2.15 at 5% significance level

Pests and diseases ranked as #1 constraint by farmers (Anang et al. 2011).

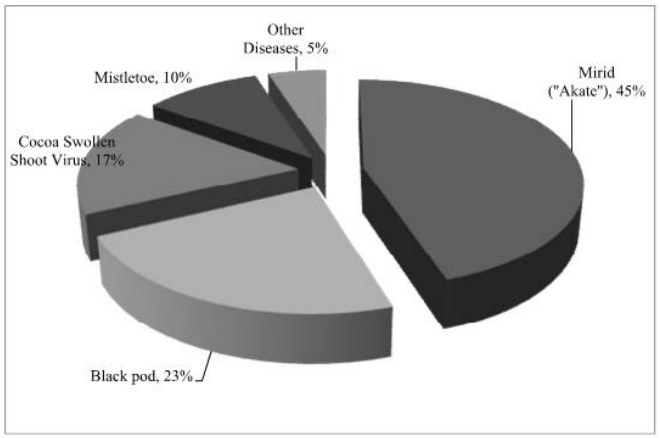


Fig. 4. Farmers' perception of the most economically important pests and diseases (n=150)

Kumi & Daymond (2015).

Côte d'Ivoire

- CSSVD is a significant cause of loss in yield, but also loss of trees. The sole way to combat CSSVD is to uproot infected trees and replant the with new Upper Amazon Hybrid seeds that

are resistant to the virus. The problem is that CSSVD can spread rapidly and that symptomless trees may still carry the virus (also for **Ghana**) (Wessel & Quint-Wessel, 2015).

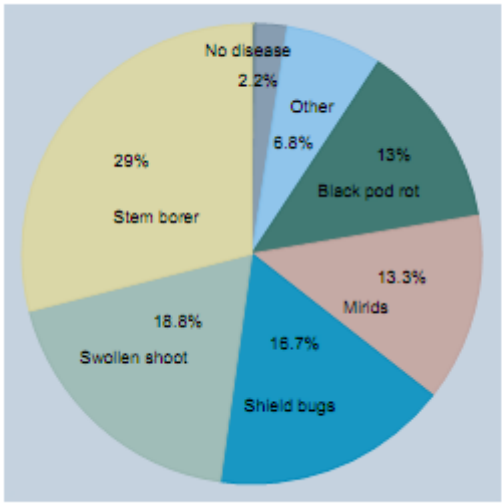
- The most important insect pests are mirids that feed on young twigs and flush leaves in the canopy. Mirids are found mostly in lightly shaded or zero-shade plantations. Shade management can limit pest outbreaks to some extent, but additional spraying is still required. Spraying is something most farmers cannot afford (also for **Ghana)**(Wessel & Quint-Wessel, 2015).
- The mirid population in **West Africa**, starts to build-up in July and reaches its peak between August and September while black pod occurrence increases from June with peaks in August and October (Kumi & Daymond, 2015).
- Swollen shoot leads to a loss of revenue from cocoa of 20% in the cocoa producing areas of Cote d'Ivoire. The impact of CSSVD is greater in the center-west of the country where losses reach 32% (CNRA, 2016).

Table 6.3 Each country has its own challenges[37]

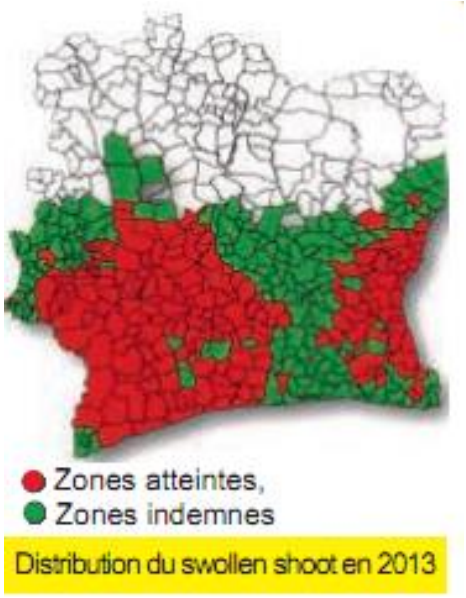
Cocoa origin	Annual Pest/disease loss	Annual soil fertility loss	Other challenges
Côte d'Ivoire	24%	28%	• Lack of sector support • High tax rates • Limited land for further expansion • High % of aging cocoa trees
Ghana	29%	25%	• Limited land for further expansion • High % of aging cocoa trees
Indonesia	49%	15%	• Poorly flavoured beans • Low rates of postharvest fermentation • Major losses from Cocoa Pod Borer
Cameroon	50%	23%	• Sector neglected in favour of oil and gas industry
Nigeria	50%	23%	• High % of aging cocoa trees • Major losses from Black Pod

Oomes et al. (2016).

Figure 24 – Main pests and diseases (% of plots concerned)



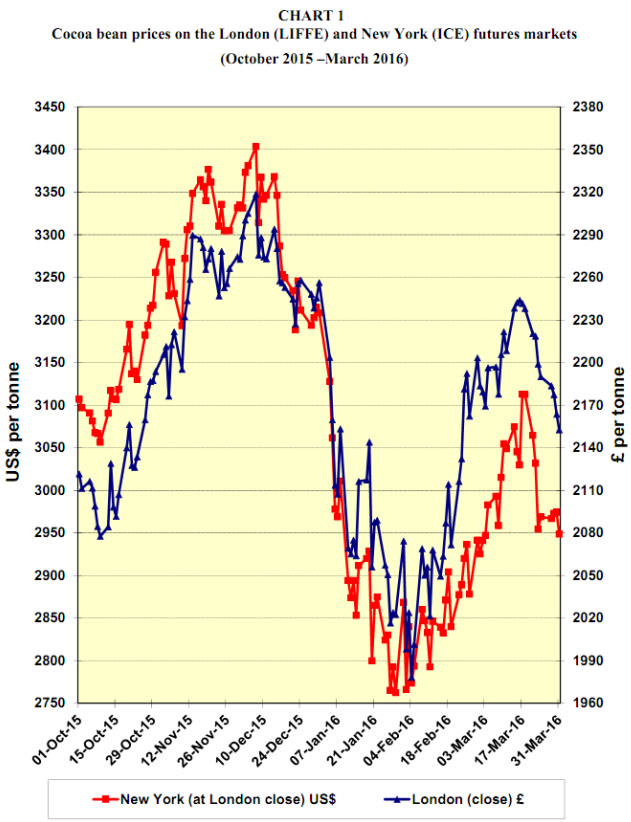
Balineau et al. (2017).



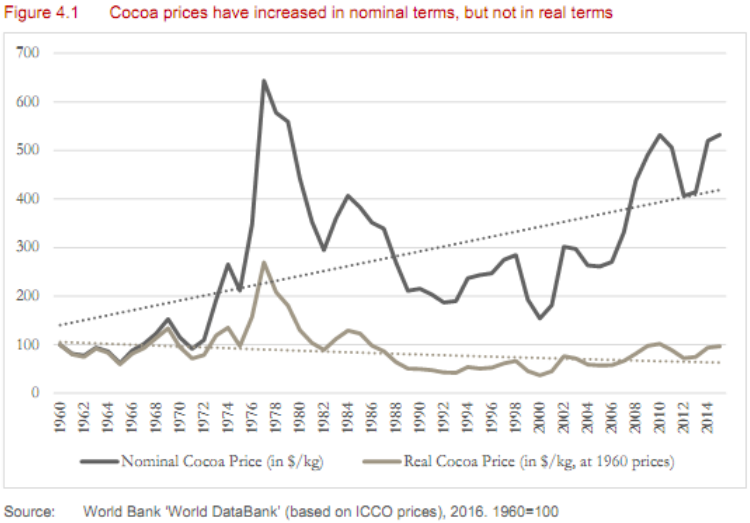
Zones affected by CSSVD (CNRA, 2016).

Cocoa Marketing

Prices (world)



World cocoa price on the New York and London futures market (ICCO, 2016).



Nominal and real world cocoa price (Oomes et al. 2016).

Prices (producer)

Ghana

Descriptives:

- The Producer Price Review Committee (PPRC) sets the annual producer price for cocoa at the beginning of the cocoa season in October (Asante-Poku & Angelucci, 2013).
- The PPRC consists of a variety of stakeholders that set the producer price based on the Gross FOB price (estimated based on the world cocoa price, the projected crop size and the projected exchange rate between the Ghana Cedi and the US $), and the net FOB price (Gross FOB price minus costs of e.g. CODAPEC) (see figure below). The producer price is typically between 70 and 80% of the Net FOB price (Steijn, 2016).
- The setting of a fixed price has pros and cons. The major benefit is that farmers are protected from price volatility on the world market. One downside is that world prices may increase, leading to the smuggling of cocoa to neighbouring Togo or Côte d'Ivoire for a higher price. Furthermore, a large part of the gross and net FOB price is withheld from farmers to pay for COCOBOD programs such as spraying (CODAPEC) and fertiliser distribution (Hi-Tech). These programs are considered unequitable as all farmers pay indirectly for the supplies through the producer price, but not all farmers receive the supplies (not at all or not on time) due to distribution constraints experienced by COCOBOD (Steijn, 2016).
- Another major downside of a fixed producer price is caused by inflation. The producer price is not adjusted for inflation and thus loses value over time when countries experience a high monthly inflation rate. The inflation rate is 1.14% in **Ghana** and 1.89% in **Côte d'Ivoire.** This results in an average loss in the producer price of 1.13% in **Ghana** and 1.85% in **Côte d'Ivoire**. The real value of the producer is therefore lower (Oomes et al. 2016).
- The producer price is seen as a key aspect by cocoa farmers to make cocoa more sustainable and make it attractive to future farmers. One way of raising the producer price is to increase local demand for cocoa (and chocolate) (Barrientos & Akyere, 2012).
- Another way to increase the producer price is to abandon programs such as CODAPEC and Hi-Tech. Kolavalli et al. (2016) have calculated the costs and benefits for farmers of abandoning these programs (see tables below). The authors conclude that abandoning these programs would be beneficial for farmers even though productivity may be reduced. However, the reduction in productivity would be offset by the increase in producer price.
- 93% of COCOBOD funds goes into supporting increased production and productivity in the short and long term. The total expenditure on behalf of farmers in 2011, when the share of industry costs peaked, amounted to more than 450 Ghanaian cedis (GHC) per ha (US$ 231). While some public goods are necessary, it is important to consider whether productivity objectives would be more effectively met, at least in the long run, by giving producers 20–25 percent higher prices. The draft strategy states that industry costs will be capped at 10 percent of the export prices, much higher than observed in recent years (Kolavalli et al. 2016).
- A benefit of giving farmers a higher price may be that farmers would become able to use higher amounts of inputs as they would become more freely available. Evidence now suggests that farmers experience supply constraints, despite fertiliser being available at

discount prices, only a third of the recommended CRIG amount is supplied nationally (Kolavalli et al. 2016).

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Table 5.4: World price, net FOB price, and producer price of cocoa for the last six growing seasons (Ministry of Finance, 2011, 2014: Ghana Business News, 2012, 2013: Government of Ghana, 2015: www.tradingeconimics.com, 2016: www.xe.com, 2016).

Season:	2010/2011	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016
World price per tonne (USD)	2908,-	2667,-	2407,-	2802,-	3103,-	3074,-
Exchange rate (USD to GHC)	1,43	1,63	1,89	2,18	3,20	3,83
Net FOB price per tonne (GHC)	Unknown	4131,-	4325,-	4284,-	7263,-	9081,-
% of net FOB given as producer price	Unknown	76,04%	78,42%	79,17%	76%	74%
Producer price per tonne (GHC)	3125,-	3280,-	3392,-	3392,-	5520,-	6720,-

World price (mid-october), exchange rate (mid-october) and other indicators for the producer price (2010-2016) (Steijn, 2016).

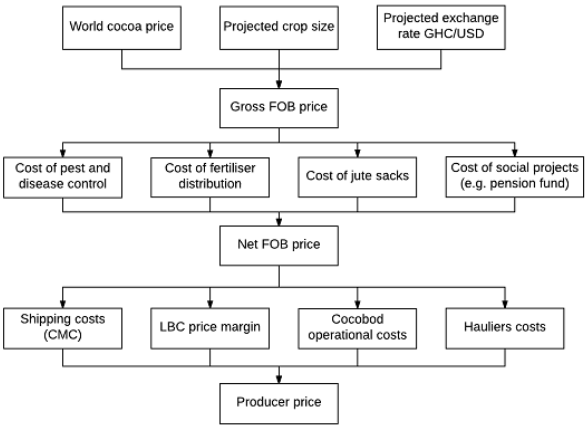


Figure 5.1: Producer price setting process (Ghana Cocoa Board, 2011)

Calculating of producer price by Producer Price Review Committee (Steijn, 2016).

Table 5.3: Producer Price Review Committee members

Minister of Finance	COCOBOD Chief Executive
Governor of the Bank of Ghana	Managing Director Quality Control Company
Managing Director Cocoa Marketing Company	Managing Director of LBCs
President of Cocoa Hauliers Association	Chief farmer of Ghana Cocoa Coffee Sheanut Farmers Association

Steijn (2016).

Table 3.3: Derivation of net FOB price in 2013/14 cocoa season

Projected Gross FOB value (GH¢) from the projected crop of 830,000 tons sold at projected FOB price of $ 2,130 per ton and projected exchange rate of 2.08 GH¢ to USD		3,677,232,000.00
FOB Price (GH¢/Ton)		**4,430.40**
Industry		
Disease and Pests Control Cost (GH¢)	41,157,996.05	
Jute Sacks and Related items cost (GH¢)	42,025,000.00	
Cocoa Fertilizer Application/Hi-Tech (GH¢)	36,054,500.00	
Child Labor program (GHS)	2,000,000.00	
Total		121,237,496.05
Net FOB Value (GH¢)		3,555,994,503.95
Net FOB Price (GH¢/Ton)		**4,284.33**

Source: COCOBOD (2013)

Calculation of Net FOB price from the Gross FOB price (Kolavalli et al. 2016).

Table 6. 7: Producer prices without various components of industry costs

Price/program scenario	2007/08	2008/09	2009/10	2010/11
	----------(GHc/t)----------			
Status quo producer price	950	1,632	2,208	3,200
Producer price ex budgeted CODAPEC cost	1,018	1,720	2,373	3,315
Producer price ex realized CODAPEC cost	1,074	1,766	2,373	3,315
Producer price ex budgeted liquid fertilizer cost	954	1,644	2,229	3,245
Producer price ex realized liquid fertilizer cost	954	1,638	2,244	3,290
Producer price ex budgeted dry fertilizer cost	1,002	1,692	2,258	3,309
Producer price ex realized dry fertilizer cost	1,015	1,749	2,392	3,418

Source: Authors' estimations

Producer price in different scenarios (Kolavalli et al. 2016).

Table 6.8: Predicted net returns and production under the four policy scenarios.

	Price of	Price of	Bia district		STCP trainees		Bia district		STCP trainees	
Policy scenarios	cocoa	fertilizer	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive	Extensive	Intensive
2009/2010	GHc/kg	GHc/kg	----------GHc----------				----------kg----------			
0 Status quo	**2.208**	**0.500**	**3,653**	**6,220**	**1,747**	**3,379**	**1,726**	**3,244**	**836**	**1,784**
1 Eliminate liquid fertilizer	**2.244**	**0.500**	**3,715**	**6,337**	**1,777**	**3,444**	**1,726**	**3,244**	**836**	**1,784**
Change in status quo	*0.036*	*0.000*	*62*	*117*	*30*	*64*	*0*	*0*	*0*	*0*
2 Eliminate mass spraying	**2.373**	**0.500**	**3,682**	**6,512**	**1,761**	**3,509**	**1,615**	**3,138**	**784**	**1,715**
Change in status quo	*0.165*	*0.000*	*28*	*291*	*14*	*130*	*-112*	*-106*	*-52*	*-69*
3 Eliminate fertilizer subsidy	**2.428**	**1.538**	**4,033**	**7,134**	**1,931**	**3,353**	**1,726**	**4,267**	**836**	**1,455**
Change in status quo	*0.220*	*1.038*	*380*	*913*	*184*	*-26*	*0*	*1,024*	*0*	*-329*
4 Liberalize input markets	**2.593**	**1.538**	**4,037**	**7,570**	**1,933**	**3,413**	**1,615**	**4,161**	**784**	**1,385**
Change in status quo	*0.385*	*1.038*	*384*	*1,350*	*187*	*34*	*-112*	*917*	*-52*	*-399*
% change in status quo	*17%*	*208%*	*11%*	*22%*	*11%*	*1%*	*-6%*	*28%*	*-6%*	*-22%*
2010/2011										
0 Status quo	**3.200**	**0.600**	**5,366**	**9,326**	**2,577**	**5,073**	**1,726**	**3,244**	**836**	**1,784**
1 Eliminate liquid fertilizer	**3.290**	**0.600**	**5,521**	**9,618**	**2,652**	**5,233**	**1,726**	**3,244**	**836**	**1,784**
Change in status quo	*0.090*	*0.000*	*155*	*292*	*75*	*161*	*0*	*0*	*0*	*0*
2 Eliminate mass spraying	**3.315**	**0.600**	**5,203**	**9,355**	**2,500**	**5,048**	**1,615**	**3,138**	**784**	**1,715**
Change in status quo	*0.115*	*0.000*	*-163*	*29*	*-77*	*-24*	*-112*	*-106*	*-52*	*-69*
3 Eliminate fertilizer subsidy	**3.508**	**1.387**	**5,897**	**12,022**	**2,834**	**5,163**	**1,726**	**4,267**	**836**	**1,951**
Change in status quo	*0.308*	*0.787*	*532*	*2,696*	*258*	*91*	*0*	*1,024*	*0*	*167*
4 Liberalize input markets	**3.623**	**1.387**	**5,700**	**12,136**	**2,741**	**5,139**	**1,615**	**4,161**	**784**	**1,924**
Change in status quo	*0.423*	*0.787*	*334*	*2,810*	*165*	*66*	*-112*	*917*	*-52*	*140*
% change in status quo	*13%*	*131%*	*6%*	*30%*	*6%*	*1%*	*-6%*	*28%*	*-6%*	*8%*

Source: Authors' estimations using enterprise budgets and regression analysis.

Note: Predicted output is based on regression models of producers were grouped into extensive and intensive categories depending on whether they had adopted fertilizers in their production system. Elimination of fertilizer subsidy assumes competitive and unlimited supply at the given price by the private sector. Fertilizer use in Bia district under liberal assumption occurs at the CRIG recommended rate of 371

Net return and production figures under different policy scenarios (Kolavalli et al. 2016).

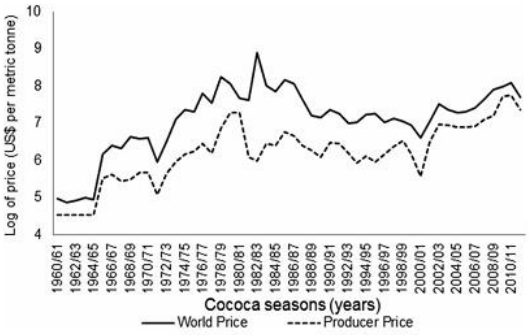
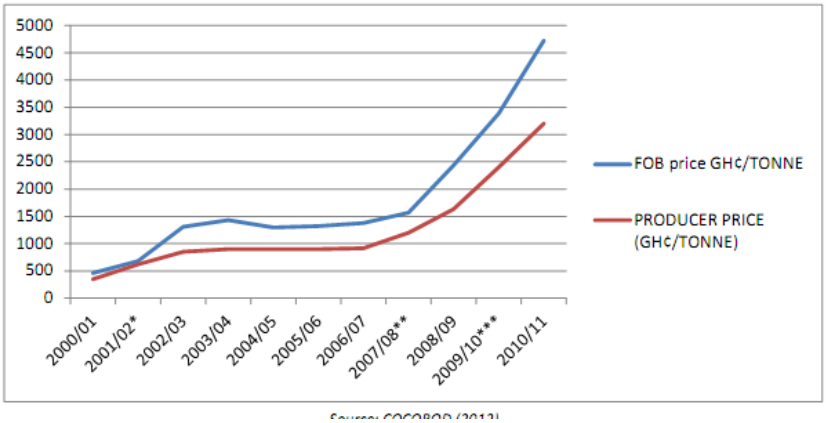


Figure 1. Time profile producer and world prices in US$ per metric tonne, 1960–2011.

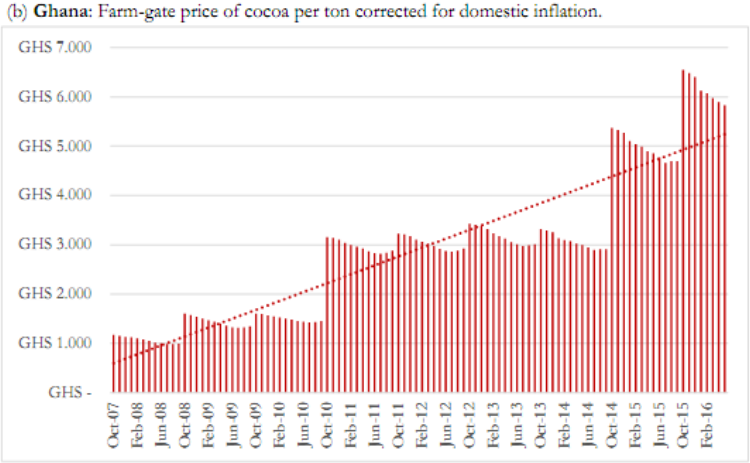
Evolution of world- and producer prices (Quarmine et al. 2014).

Figure 5: Producer prices fixed by the COCOBOD versus FOB prices (GHc/tonne)



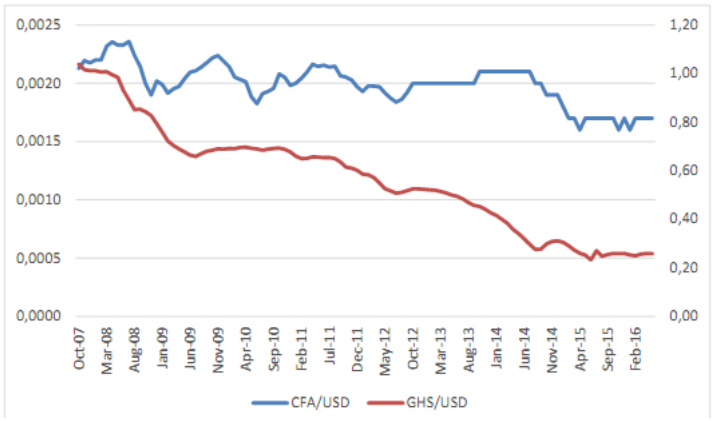
Diffrence between FOB price and producer price (Asante-Poku & Angelucci, 2013).

(b) **Ghana**: Farm-gate price of cocoa per ton corrected for domestic inflation.



Oomes et al. (2016).

Figure 5.2 CFA franc/US dollar and Ghanaian cedi/US dollar exchange rate



The CFA is more stable than the GHC due to the linking of the CFA to the Euro (Oomes et al. 2016).

Côte d'Ivoire

Descriptives

- Most recent figure on producer price/kg is 1000,- CFA for the 2015/2016 season (PFCE, 2016).
- Producer price was 725 CFA/kg in 2012/2013 (Oxfam, 2013), and 850 CFA/kg in 2013/2014 (Blackmore & Heilbron, 2015).
- The producer price is a very important factor in how far certain investments can be profitable (e.g. replanting of plantations, application of fertiliser/pesticide etc.) see also 'income' (Assiri et al. 2012).
- The producer price is usually higher in Ghana compared to Côte d'Ivoire (Oxfam, 2013).
- Producer prices in countries with a regulated price system (i.e. Ghana & CdI) respond slower to changes on the cocoa futures market. The respond time depends on the timing of the review committees setting a new price, which is once a year. Countries with an unregulated cocoa price respond to changes in the futures market a lot faster, but still show a lagged response (see table 4.1 below) (Oomes et al. 2016).
- Farm gate prices are relatively lower in regulated cocoa markets compared to liberal cocoa markets. This is due to the fact that marketing boards take a share of FOB price (around 30% in Ghana and 40% in CdI). Furthermore, both countries suffer from a lack of efficiency and transparency (e.g. input distribution in Ghana). In CdI there are indications that, instead of the farmers, it is mostly the elite that benefits from the 2011 reforms, where export licenses are allocated to influential friends/relatives (Oomes et al. 2016).
- The risk of erosion of the producer price due to changing exchange rates is less in CdI compared to Ghana. Appreciation of the Cedi erodes the producer price, in CdI on the other hand, the CFA is fixed to the Euro and therefore has a fixed exchange rate effectively reducing the downsides of a fixed produce price caused by inflation. The effectiveness of price stabilisation depends on exchange rates and inflation and is therefore more effective in CdI than in Ghana. The real farmgate price is therefore higher in CdI (see figure 5.3 below) (Oomes et al. 2016)

Value Distribution	Sells	Buys	Value Added	Profit	final sale
Farmers income weighted	$ 1.874	$ 664	$ 1.210	$ 1.210	6,6%
Inland Transport	$ 1.971	$ 1.874	$ 97	?	0,5%
Taxes/MarketingBoard	$ 2.745	$ 1.971	$ 774	?	4,2%
International Transport	$ 2.793	$ 2.745	$ 48	?	0,3%
Costs port of arrival	$ 2.993	$ 2.793	$ 201	?	1,1%
International Traders	$ 3.038	$ 2.993	$ 45	$ 15	0,2%
Processors & Grinders	$ 4.434	$ 3.038	$ 1.395	$ 211	7,6%
Manufacturer*	$ 10.858	$ 4.434	$ 6.425	$ 870	35,2%
Retail& Taxes	$ 18.917	$ 10.858	$ 8.058	$ 473	44,2%

Value distribution in the cocoa supply chain (Hütz-Adams & Fountain, 2015).

Figure 4 True price of 1 kg cocoa beans

True price for Ivorian cocoa (Fobelets & de Groot Ruiz, 2016).

Table 4.1 Farm-gate prices show a lagged response to changes in the price of cocoa futures

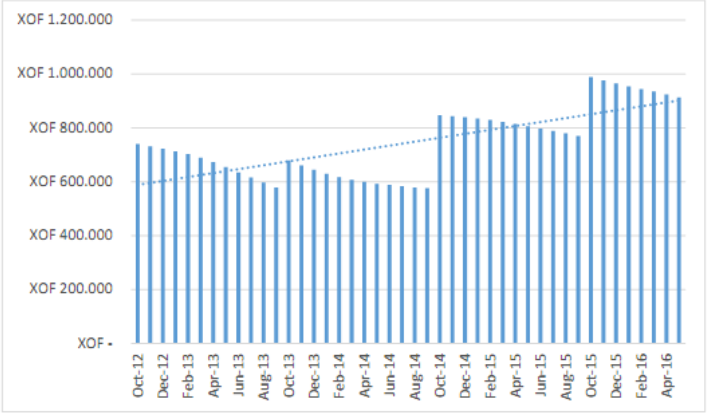
	Amount of the price increase*	Time lag**			
		25%	50%	75%	95%
Cameroon	£ 98.5	5 days	14 days	30 days	73 days
Côte d'Ivoire	£ 44.4	41 days	100 days	199 days	404 days
Nigeria	£ 81.4	8 days	15 days	28 days	59 days
Brazil	$ 84.1	< 0 days	2 days	11 days	35 days
Indonesia	$ 98.6	4 days	12 days	26 days	61 days

Source: ICCO (2013)
* Note: Increase of the long-run Equilibrium Price at farm-gate after a permanent, overnight price shock of 100 (£ or $) per tonne on the (London or New York) cocoa futures market.
** Note: Time required by the farm-gate price to register X% of the total increase due to an overnight permanent price shock on the futures market (i.e. 100% indicates that the long-run equilibrium has been restored)

Time lag between changes on the world market and changes in producer price (Oomes et al. 2016).

Figure 5.3 The real value of annually fixed farm-gate prices decreases during the year due to national inflation

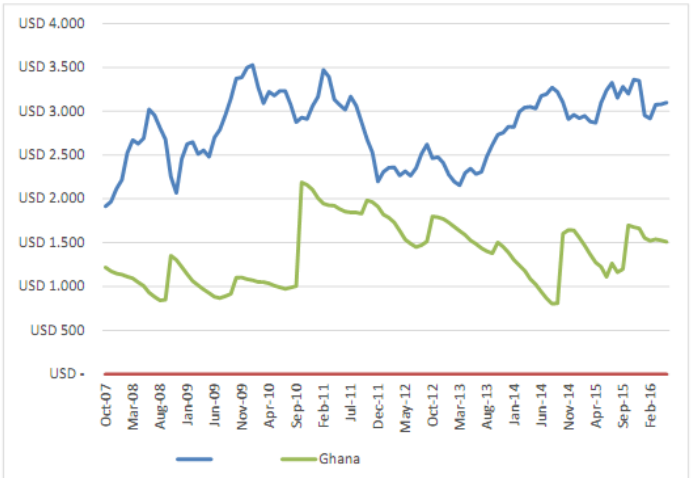
(a) **Côte d'Ivoire**: Farm-gate price of cocoa per ton corrected for domestic inflation.



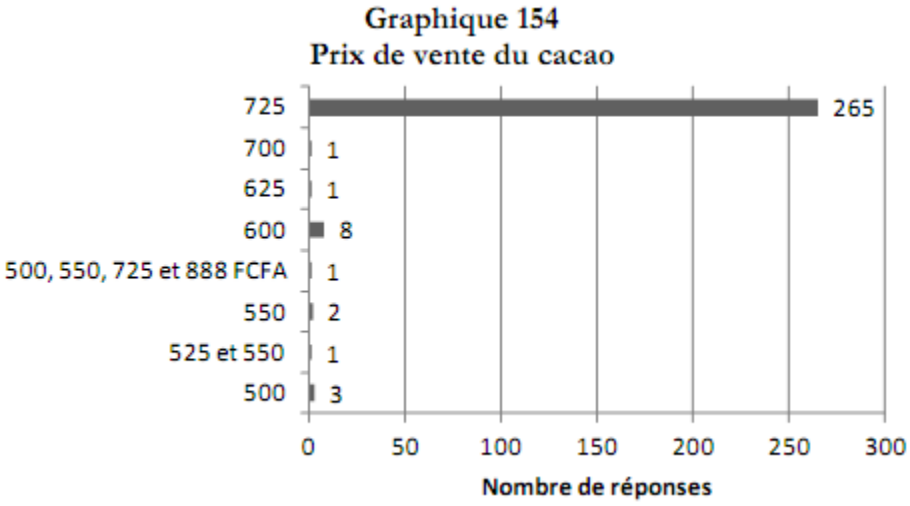
Sources: Le Conseil du Café-Cacao (2013, 2014, 2015), Bloomberg (2013), IRIN (2012), Institut National de la Statistique (2016

Producer price corrected for inflation (Oomes et al. 2016).

Figure 5.3 (a) Real farm-gate price in USD of a metric ton cocoa in Côte d'Ivoire and Ghana and the world market price



Oomes et al. (2016).

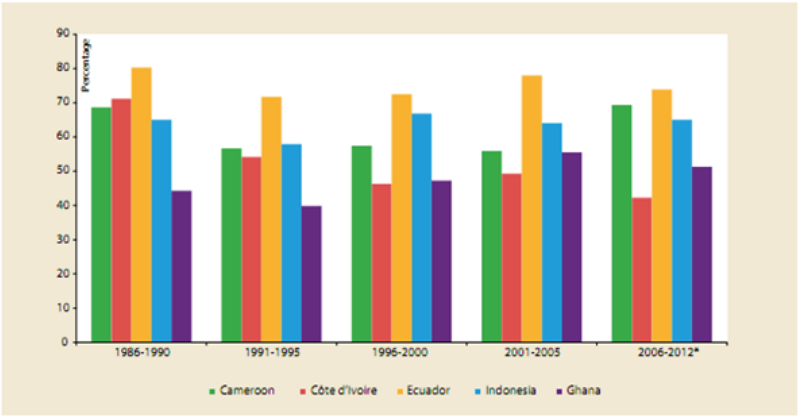


Not all farmers claimed to have received the full 725 producer price in 2013 (Varlet & Kouamé, 2013).

Ghana	The farm-gate price is fixed annually by a multi-stakeholder committee (PPRC). Price stabilisation fund	FoB price	Annual protection against world market price volatility	Lower than prices in unregulated systems	Low farm-gate price
			Annual protection against exchange rate volatility	No exchange rate gains due to significant exchange rate depreciation	Price stability during one year
				Not adjusted for inflation	
				No price differentiation for quality High taxes (and lack of efficiency on expenditures)	
Côte d'Ivoire	The minimum farm-gate price is fixed by the multi-stakeholder Conseil du Café-Cacao (CCC). Price stabilisation fund	CIF price	Annual protection against world market price volatility	Lower than prices in unregulated systems (but higher than Ghana)	Low farm-gate price
			Annual protection against exchange rate volatility (but less important because of peg to Euro)	Not adjusted for exchange rate depreciation (but less relevant because of peg to Euro)	Price stability during one year
				Not adjusted for inflation	
				No price differentiation for quality High taxes (lack of transparency on how taxes are used)	

Pros and cons of a fixed producer price (Oomes et al. 2016).

Figure 11: Cocoa producer prices as a percentage of the world price in selected countries, 1986–2012



Source: Based on data from UNCTADstat, FAOStat and ICCO database.
* *Cameroon:* 2006–2010, Côte d'Ivoire: 2006–2009; Ghana: 2006–2011; Ecuador and Indonesia: 2006–2012.

Gayi & Tsowou (2015).

Buyer structures

Ghana

- There is almost no competition among Ghanaian cocoa farmers as buyers are readily available and prices are fixed; rather competition is more important among LBCs that have to reach a threshold volume to be able to export. The observation was made that "A lack of competition along cocoa supply chain means that farmers capture very little share of the retail price of final cocoa products". However, this argument was countered that competition could actually make farmers more vulnerable; farmers who are mainly based in remote areas where trade information flow (prices, etc), where a limited number of buyers are willing to travel to, could also be taken advantage of and not benefit if market competition exists. However, the price uniformity allows that farmers all over the country benefit equally (that is if transportation costs are not taken into account). However, in Ghana, farmers have the advantage that there are a large number of LBCs to choose from and as such farmers tend to choose LBCs that offer cash and credit facilities (Asante-Poku & Angelucci, 2013).
- LBCs are the key players in the internal marketing system of Ghana. LBCs are active in all cocoa producing regions, except the Volta Region where only PBC is active. There around 3000 buying societies or centres (villages, hamlets, cottages, etc.) where farmers bring their produce for weighing and selling.
- Given the fact that LBCs operate on tight margins, they do not normally pay a premium over and above the minimum price, even though that was one of the objectives of the liberalisation of the internal marketing of cocoa. However they may give a number of inducements to attract and retain farmers, such as credit facilities, extension services or gifts (such as boots or equipment). Nevertheless, some LBCs try to pay a bonus at the end of year to farmers inaddition to any bonus paid by COCOBOD. Armajaro, which is an international company, can pay because of its higher efficiency and different financing structure. Kuapa Kokoo can pay a premium because of its Fairtrade advantage. It also provides community support (such as wells) (Barrientos & Akyere, 2012).
- The most reported issue with LBCs (purchasing clerks) by farmers is suspected cheating by adjusting scales used to weigh cocoa bags. The farmers report that cheating by LBCs can make a difference from 2 to 10kg per bag of 62,5kg. Farmers often noticed that the weighing stone, used to calibrate the scales, was absent. However, farmers often do not report this because they are bribed by the LBCs (Barrientos & Akyere, 2012).
- The main benefit of having multiple LBCs available is that a farmer can switch when he/she feels cheated (Barrientos & Akyere, 2012).
- Famers choose between LBCs based on speedy payment times and access to additional services. Most farmers are paid on spot for their cocoa (Blackmore & Heilbron, 2015).
- A possible issue arises when farmers are indebted to an LBC. The farmers needs to repay the debt before he/she can sell all cocoa to another LBC. This may result in a farmer selling to multiple LBCs or selling all their cocoa to a less-preferred LBC (Waarts et al. 2013).
- The avaliability of multiple buyers offers the option to choose among those that can provide cash aswell as credit. In their analysis, non-cash constrained farmers do not seem to benefit from selling to different buyers while the provision of additional resources to farmers seems to matter to cash-constrained farmers in their choice of LBCs. They showed that access to full

payment and possibly credit advances enhances the production potential of those who are financially constrained (Anang et al. 2011).

- Next to scale adjustments, farmers also complain that PC's underpay the bonus. Furthermore, illiterate farmers are more likely to be cheated by PC's. Experienced and educated farmers, however, are less likely to be cheated as they can estimate the weight of their bags to a greater extent (Baah et al. 2012).
- PC's claim they are forced to cheat farmers to pay for the cost of additional drying, labour for loading trucks and the cost of hiring security at the sheds. These costs are not covered through LBCs in form of the PC's commission fee. The adjusting of scales pays for the extra operational costs PC's face (Baah et al. 2012).

Table 3 : Main marketing constraints of cocoa farmers.

CONSTRAINT	FREQUENCY	PERCENT
Scale adjustment	206	68.7
Under payment for cocoa beans	13	4.3
Delay by PC in paying farmers	20	6.7
Cheating on bonus payment	31	10.3

Source: Survey data, 2010

- **Baah et al. (2012).**

Box 2: Summary of factors shaping farmers' decision to sell to a buyer

Several factors beyond availability of cash influence a producers' decision about where to sell. In the focus group discussions the following factors emerged most strongly:

- Good inter-personal relationship skills of the purchasing clerk
- A perception of fairer weighing
- Kin relationships (e.g. the PC is a relative or the cocoa farmers relatives have traditionally sold to the buyer in question)
- Good experiences with the buyer in terms of their offer of material incentives or ability to provide support in a time of crisis and access to inputs
- Lack of knowledge of what other LBCs may offer
- Willingness to experiment with other buyers
- Indebtedness to a buyer or desire to spread risk (Ryan, 2011).

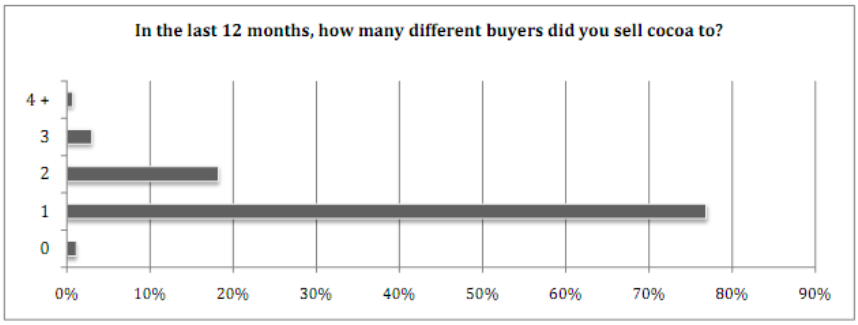
Vigneri & Santos (2007).

Table 6 : Why farmers sell to particular LBC.

Reason	Number of farmers	Percent
It is the only LBC	39	13.0
They pay promptly	190	63.5
The PC does not cheat	19	6.4
I trust them	52	17.3
Total	299	100.0

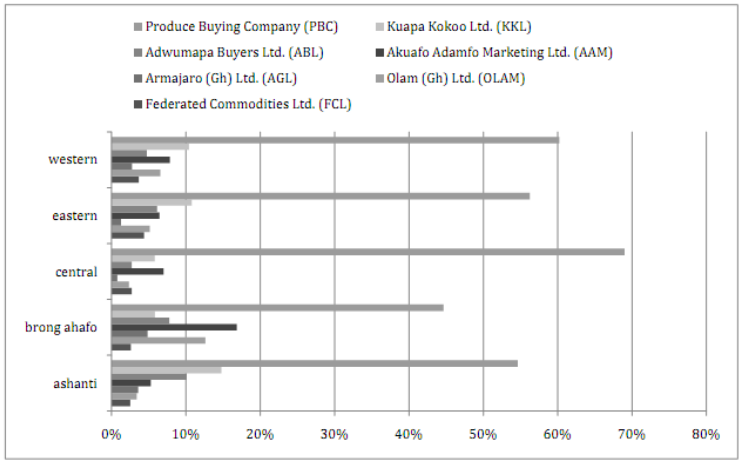
Baah et al. (2012).

Figure 16: Number of Buyers



Hainmueller et al. (2011).

Figure 17: Buying by Specific LBCs



Market share of LBCs by region (Hainmueller et al. 2011).

Table 2: Farmers' assessment of the introduction of Licensed Buying Companies

Response	Frequency	%
Happy	73	91.2
Unhappy	7	8.8
Total	80	100.0

Table 3: Benefits farmers enjoyed before and after privatization

Before privatization	After privatization
Scholarships for farmers' wards	Prompt payment
Provision of inputs to farmers	Provision of inputs to farmers
Bonuses to farmers	Bonuses to farmers
	Provision of loans to farmers by LBCs
	Provision of incentives to farmers
	Shorter distance to sell produce
	Scholarships for farmers' wards
	Education on how to produce by LBCs

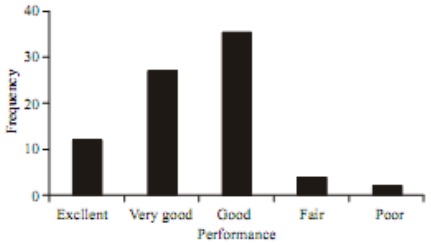


Fig.1: Farmers Assessment of the Performance of LBCs

Anang et al. (2011).

Table 6: Ranking of constraints by farmers

Constraints	Overall rank	(T)	TWS Rank score of constraints 1	2	3	4	5	6
Adjustment of scale when weighing	3	229	13	17	25	18	7	0
Long distances in transporting beans from farms	2	218		7	25	36	9	12
Pest and diseases	1	130	50	19	4	5	2	0
Theft of beans during drying	6	380		1	3	5	17	34 20
High labor cost	4	336	8	10	5	12	13	32
High cost of other inputs	5	375	1	6	5	19	23	26

W = 0.46, F_{cal} =23.60, F_{tab}= 2.15 at 5% significance level

Farmer constraints (Anang et al. 2011).

Côte d'Ivoire

- A pisteur is a small trader of cocoa beans. In some cases, he is an independent entity and works for himself, but most of the time he is attached to a traitant and acts as its representative in a given zone. Although a pisteur usually manages only one zone, he can sometimes extend his operations to other zones as well that are managed by other pisteurs. A pisteur must obtain a license from the CCC to collect cocoa beans from farmers in a given area. Pisteurs work on commission, based on the quantity of cocoa they delivered. The Pisteur keeps in contact with the communities through the pick-up trucks drivers or collectors who are appointed as representatives of the pisteur in a given community or geographical area (FLA, 2016).
- A traitant is a large cocoa bean trader licensed by the Coffee and Cocoa Council (CCC) to source cocoa from farmers in a region for which the traitant holds a license. Traitants are different from cooperatives or farmers' associations, as they do not have formal farmer members. They buy cocoa beans from farmers (any farmer) and sell to the exporters. The

assessed traitant provides cocoa beans to various exporters and implements certification programs (UTZ/Rainforest Alliance). Each traitant is free to organize its supply chain to suit its business needs and business model (FLA, 2016).

- Most of the time, the collector is a farmer, living in the same community or area and is trusted by the fellow farmers. The collector works on a commission basis. In some cases, the pisteur provides a pickup truck to the collector to transport the beans to the pisteur's bush warehouse. All communities may not necessarily have a collector, depending on the volume of business in the community, and the needs and preferences of the pisteur. Collectors must obtain the same license from the CCC as a pisteur (FLA, 2016).
- Cocoa beans are sold to pisteurs or cooperatives. The pisteurs are usually experienced and know when and where to buy the beans. Since 2011, all pisteurs are required to buy for the minimum price which was set 1000 CFA/kg for the 2015/2016 season (PFCE, 2016).
- Currently the traitants play a key role in the provision of credit, inputs and fertilizer as well as some international buyers work directly with cooperatives on fertilizer use (Blackmore & Heilbron, 2015).

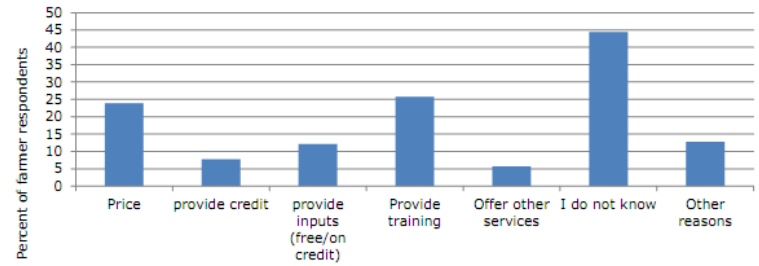


Figure 63 *Reasons why cooperatives sell to specific trader, according to farmers.*

Ingram et al. (2014).

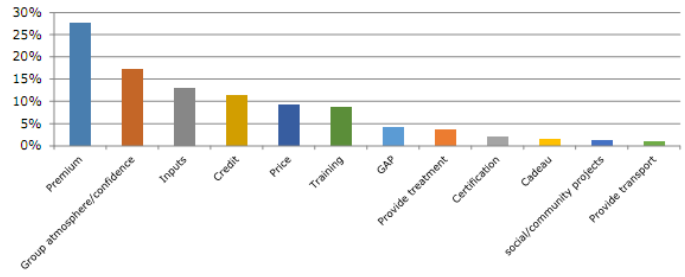
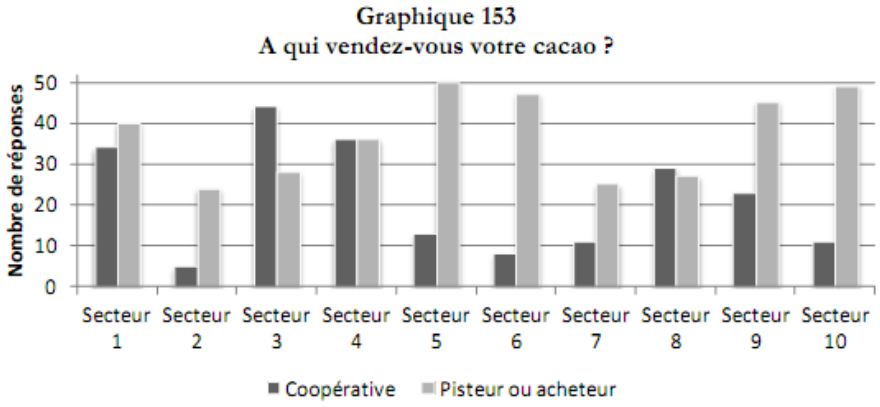


Figure 66 *Reasons why farmers sell to cooperatives.*

Ingram et al. (2014).



Cocoa is either sold to cooperatives or pisteurs (Varlet & Kouamé, 2013).

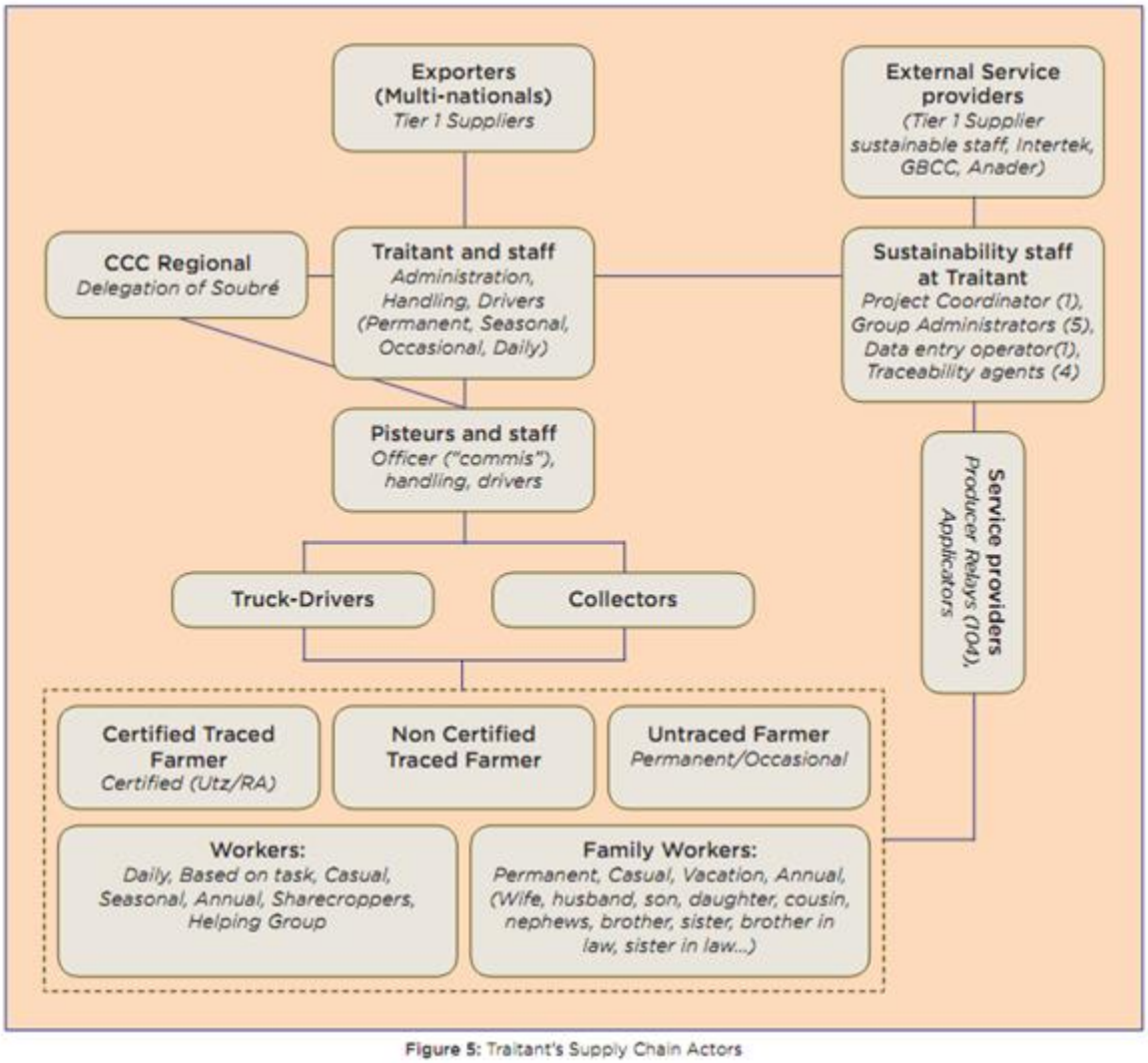


Figure 5: Traitant's Supply Chain Actors

FLA (2016).

Other competing crops

Diversification background

(From Ruf & Schrotz, 2015)

Economic diversification reflects an individual's strategy for an improved balance between expected income, risks and various constraints. It is thus a process of adjustment to changes in the relative costs of land, labour and capital; in profitability; in market risks as well as in political, climatic and environmental risks; and in uncertainties of the various strategies for increasing household incomes. Economic diversification comes about through the adoption of additional activities such as the inclusion of new crops or livestock into farming systems. In addition to various forms of agricultural diversification, farmers can also diversify through non-agricultural activities, such as 'vertical' diversification through the processing of agricultural products. However, this book is devoted primarily to 'horizontal' diversification, i.e., crop diversification. It covers major tropical perennial crops: cocoa, coffee, rubber, oil palm and coconut, as well as fruit and timber trees.

On the one hand, reducing the dependency of households and regional economies on a single crop or activity reduces—or can reduce—their vulnerability to ecological and market risks in the sense of 'not putting all eggs in one basket'. On the other hand, economic theory reminds us of what policymakers have long known: specialization has its advantages in terms of technical and economic efficiency. This is the case if the activity generates economies of scale and if producers have access to a secure national or international market. Moreover, excessive diversification may increase the cost of marketing small quantities of produce, especially in remote locations. Such economic realities set limits to farm diversification.

The distinction between diversification and conversion relates to the scale at which we analyse the process. If farmers find that they would be better off by allocating some of their labour or capital to a new crop, they have several options to do so. For example, instead of filling gaps in an old cocoa plantation with new cocoa seedlings, they can introduce an additional crop (banana, fruit, timber or rubber). If they do not slowly phase out the old cocoa trees, the result will be a plot-level diversification, an intercropping system that can last two or three decades. Alternatively, they could decide to cut down the old cocoa trees when rubber trees or fruit trees are nearing the start of production, or even to cut down the old cocoa trees at the outset to make a rubber or teak plantation. The result is then a plot-level monoculture with diversification at the household and farm levels through a mosaic of monospecific plots. Finally, different farmers in the same village or landscape may specialize in different crops. In this case, households and farms are specialized, but diversification takes place at the landscape level. In this scenario, the risks of specialization are reduced at the regional level, but they remain high at the household level.

According to economists, investment decisions—including choices about farming or diversifying crops—are mainly driven by current and expected prices and incomes. However, market forces cannot explain all diversification decisions. For instance, in cocoa-growing areas in Côte d'Ivoire, environmental degradation due to deforestation has greatly reduced the possibility of replanting cocoa trees. Thus, ecological change in these areas has clearly been identified as a factor not only in farm abandonment and migration but also in diversification into alternative crops.

Malézieux and Moustier (2005) identify three main determinants of diversification: public policy, markets and ecological change such as the emergence of a crop disease. Any one of these factors can shift the relative profitability of a crop—or even trigger a collapse in income—and thus force diversification and changes in agricultural activities. Nevertheless, analyses of agricultural frontiers and post-forest dynamics have led to a more structural and interdependent vision of diversification.

Sudden rises in agricultural prices and incentive-based economic policies contribute to the growth of production in the form of the agricultural frontier. This is the basis for migrations and massive clearing of forests. This unbridled expansion leads to ecological changes. The environmental degradation that results can, in turn, drive innovation such as diversification under certain conditions. In this scenario, the degradation of natural resources (soil degradation, microclimate change, increased pests and diseases) is attributed to the expansion of tree crop monocultures into forest areas. These degradations trigger, after a certain period, a structural change in the economy previously based on monoculture and it evolves towards a more diversified economy. The changes in the other two determinants of diversification—markets and public policy—interact with these ecological drivers, often moving in the same direction. The rapid growth in the production of a crop can contribute to a further fall in prices of the commodity, and thus also encourage diversification.

Among the most important of any farmer's objectives is that of increasing his income at a limited level of risk. There are innumerable cases of farmers adopting a new crop because of its more favourable price. Thus, the 'cocoa boom' of the 1970s in Côte d'Ivoire can be seen as a diversification at the national level from coffee cultivation to cocoa, not only influenced to a great extent by a decline in world coffee prices compared to those of cocoa, but also by guaranteed procurement prices which encouraged the adoption of cocoa. Closely related to their goal of maintaining or increasing revenue, farmers also seek to reduce risk. Volatility in international markets—partly stemming from boom-and-bust cycles—is one of the risks of producing a commodity like cocoa, coffee, rubber, palm oil, clove or pepper. Fluctuations in farm-gate prices are also linked to national policies, especially taxation policies.

the farmers have to gain a certain amount of confidence in a new sector and a new market. This is one of the reasons why Ivorian and Ghanaian cocoa farmers continued growing the crop for decades, even after enduring long periods of very low prices. Despite all the vicissitudes, they retained confidence in an established market, and thus in a relatively safe capital and farm heritage. They knew that the price will go up 'one day'. Indeed, it was only after observing this behaviour that economists invented the concept of 'expected price' to explain why producers can maintain their investments when prices are low. This behaviour also reveals that farmers consider a crop they have been cultivating for over a century as a safe haven. To overcome this perception, the new sector has to convince them that there is a long-term, assured market for the new crop before they begin to diversify to it. It is for this reason that rubber took several decades to emerge as a real alternative to cocoa in countries such as Côte d'Ivoire and Ghana.

Thus, the diversification of cocoa cultivation towards rubber production observed in West Africa, especially in Côte d'Ivoire, reveals in particular the risks of replanting cocoa in a degraded environment. Diversification is also a response to a production risk which has attained structural levels. Farmers often consider these risks to be more important than those related to markets. For

instance, in south-western Côte d'Ivoire, the spread of rubber production across the landscape stems in part from soil degradation and the difficulties of replanting cocoa on land which, once the forest has disappeared, is no longer suitable for this crop

Crop diversification usually leads to a better distribution of income and labour over the year. It also helps reduce constraints of peak labour demands such as during harvests. In diversified systems that associate coconut and cocoa in Vanuatu, work schedules are complementary in their distribution during the year, except in September when harvest periods of both crops coincides. Similarly, in cropping systems in southern Ghana, the combination of different perennial crops (cocoa, oil palm or orange) and annual crops allows farmers to obtain a more regular income while spreading their activities over the entire year. When the diversification crop is sufficiently profitable, a farmer can even hire outside labour to meet peak workloads. In Côte d'Ivoire and Ghana, even small cocoa farmers who diversify into rubber cultivation tend to hire workers to tap rubber, while family labour is mainly used to manage cocoa.

Finally, farmers are influenced in their crop choices by the behaviour of neighbours. This principle of imitation is particularly applicable to tree crops, with innovators taking a risk that is proportional to the length of the unproductive stage. The majority of farmers wait for the results and then copy the innovators once they are successful. This imitation effect amplifies the impact of government projects when they perform well, with imitators of the direct project beneficiaries also adopting the crop.

If the desire for an increase in income was the sole driver of diversification, farmers would diversify when the prices of their current crops dropped below those of other crops. But the reality is not always so simple. There are often long delays in product diversification to B (a new crop) away from A (the existing crop) even when the B/A price ratio overwhelmingly favours B. As already mentioned above, this can be the result of the interactions between several other factors such as:

- farmers' habits;
- farmers' trust in the market for A;
- the time needed to gain confidence in the market for B;
- beliefs that prices can be very different in the future;
- current earnings and savings.

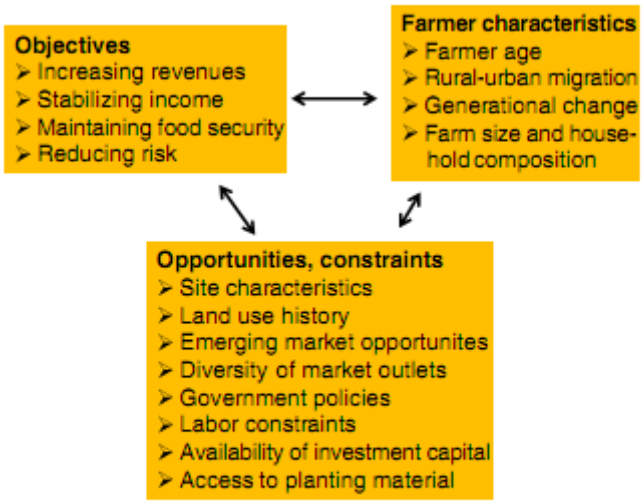


Fig. 2 Objectives, opportunities/constraints, and farmer characteristics influencing diversification in tropical tree crop systems

Schrotz & Ruf (2013).

Ghana:

Crop	Importance/size/times mentioned	Source	Note
Maize Cassava Yams Plantain Sorghum	Largest 2nd largest 3rd largest 4th largest 5th largest	Wiggins & Leturque (2011)	Food crops in general, not specific for cocoa farmers
Plantain Cassava Banana Cocoyam Maize Groundnut Ginger Okro Pineapple Rice Yam Coffee Oil palm Citrus Coconut Teak	1.2 ha 0.8 ha 0.8 ha 1.1 ha 1.1 ha 0.2 ha 1.2 ha 0.9 ha 1.0 ha 1.2 ha 0.4 ha 1.2 ha 2.2 ha 1.6 ha 4.0 ha 0.8 ha	Aneani et al. (2011) (Very relevant source)	Research into determinants for crop diversification in Ghana (mean farm sizes)
Plantain Cassava Cocoyam Maize Yam Coconut	1st 2nd 3rd 4th 5th 6th	Schouten (2016)	Most planted crops besides cocoa, certified farmers
Research mentions three different crops:	Best crops for intercropping: 1st: Plantain	Ameyaw et al. (2011)	CRIG research into effect of intercropping with different crops. Not clear whether CRIG

Plantain, cassava and maize	2nd: Plantain + maize 3rd: Maize 4th: Cassava + maize		actively promotes the crops mentioned.
Plantain Cassava Yam	1st 2nd 3rd	Asamoah et al. (2013)	94.3% have cocoa as first income source, 2.6% have plantain, cassava or yam as primary income source
Plantain Maize Cassava Oil palm Rice Cocoyam	1st 2nd 3rd 4th 5th 6th	Steijn (2016)	Frequency of alternative crop mentioned by farmers, no info on size/percentage of income the crop represents
Foodstuffs (plantain, cassava, cocoyam, yam)	Most important crops next to cocoa	Kumi & Daymond (2016)	Only crops mentioned, unclear what size/importance the crops have for the farmers

Descriptives

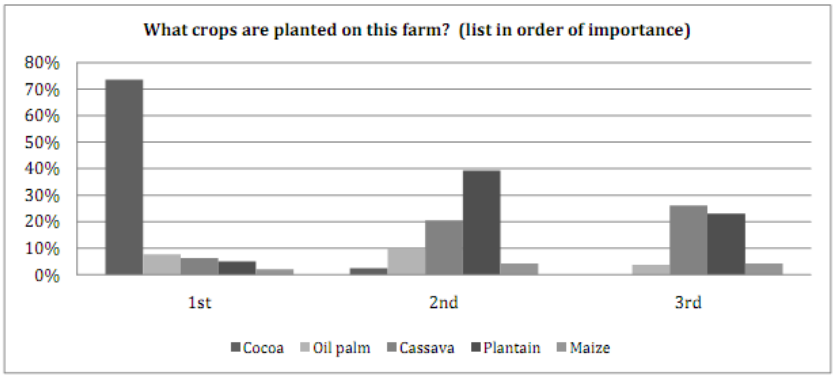
- Size of the landholding is positively associated with crop diversification (larger landholding have more diversified crops)(Wiggins & Leturque, 2011).
- Increasing population and urbanisation will lead likely lead to increase in food demand and an increase in food prices. Making a shift from cocoa to food crops a likely scenario in the future (Wessel & Quint-Wessel, 2015).
- Agricultural diversification helps avoid risks related to irregular rainfaill, pests and diseases and volatile cocoa revenue (seasonary crop). Crop diversification and livestock can provide households with a more steady income (Aneani et al. 2011).
- Aneani et al. (2011) define agricultural diversification as: 'the growing of new and/or different crops in addition to an existing one, or engaging in off- and non-farm activities using farm resources'. Farm resources include: land, capital, paid labour, or management skills used for agricultural purposes.
- Aneani et al. (2011) make a distinction between horizontal and vertical diversification:
    - Horizontal diversification involves the cultivation of additional crops/livestock as opposed to one or two major crops/livestock.
    - Vertical diversification refers to the upstream and downstream activities of a particular crop or crops/livestock. The downstream activities or downward linkages involve the provision of services and other inputs for the production of the crop/livestock whilst the upstream activities or upward linkages entail processing, storage, marketing, etc. of the crop/livestock. This implies that cocoa farmers diversify their cocoa production when they cultivate additional crops or rear livestock alongside cocoa.
- The ICCO (2010) uses similar definitions for horizontal and vertical diversification:
    - Horizontal diversification refers to efforts made by commodity producers to move into or to mix the existing crop with other crops, horticulture, fisheries, and livestock. In such an approach, farmers would still be involved in the existing activity or they could move out of it completely. Mixed farming can improve biodiversity, replenish soil nutrients and reduce production risks associated with declining yields, droughts and pest infestations.

    - Vertical diversification involves graduating to a higher value-adding activity by going further downstream in the value chain. This can generate large multiplier effects, creating off-farm employment opportunities in downstream and upstream economic sectors.

- Crop diversification is usually employed during the replanting of cocoa farms. The crops provide shades for the young cocoa trees, while simultaneously providing the household with an income and food security. While intercropping on a cocoa field is one way of producing food crops, other farmers use seperate fields for food crops (Aneani et al. 2011).
- Aneani et al. (2011) argue that the age of the cocoa farm, access to credit, and the region where the farm is located are determinants for crop diversification. Other crops can compensate for the lower productivity of older cocoa trees. Credit is needed as capital to be able to diversify incomes.
- Other determinants are market availability, land availability and size, land suitability and rights, infrastructure, labour requirements of certain crops, water and other resources (Aneani et al. 2011).
- As the profitability of cocoa declines relative to the other crops due to, for instance, a fall in cocoa yield or price, the farmer is expected to divert resources into the production of those crops. According to this reasoning the establishment of oil palm, plantain, cassava and maize farms has been seen as evidence that cocoa farming is not attractive. However, not all the crops are alternatives to each other. These crops differ in terms of their revenue generation capability and cost of production. However, the diversification or conversion of cocoa to another tree crop is also a slow process since both crops are fixed assets from which an income can be derived for over 20 years. therefore unless the benefits of the other tree crops are higher for longer period of time, the farmer will not convert his cocoa farm into that activity (Aneani et al. 2011).
- Credit is an important factor in crop diversification as capital is needed for the establishment of new cocoa farms that are intercropped and/or for the purchasing of extra land, agrochemicals, seeds, labour, and equipment. If a farmer does not have access to these inputs due to a lack of credit, then he is less likely to diversify (Aneani et al. 2011).
- The growing region is also a determinant in crop diversification where farmers in the Western Region are less likely to diversify in other crops than farmers in other regions. This is likely due to cocoa trees in the Western Region being relatively younger and therefore still have good yields. Furthermore, relatively old trees and bushfires lead to more crop diversification in the Brong Ahafo and Central regions compared to the Volta Region. Regional crop diversification strategies are highly influenced by comparative advantages between regions. In this case, diversification strategies are influenced by technical factors such as weather, soil suitability and available water (Aneani et al. 2011).
- Schouten (2016) reports that household size is positively correlated the amount of food crops grown and the amount of cocoa bags sold. Members of larger households are also less likely to skip meals, meaning that food security was higher in larger households. Note: This is a small scale master thesis conducted in the Ashanti Region in three UTZ Certified communities.
- In 2012, 22% of farmers obtained all food required from their own production, while 62% obtained half of their food requirements from their own production. Farmers in the Western Region diversify their crops less often due to land availability constraints. Food prices are also higher in the Western Region, where food vendors buy food in Ashanti to sell in the Western

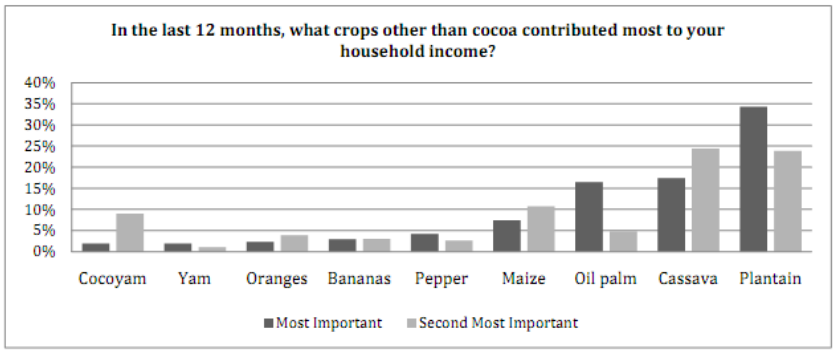
Region with profit. Farmers in the Western Region are more prone to food insecurity as most land is devoted to cocoa production, decreasing the amount of food crops (Nelson et al. 2013).

Figure 9: Most Important Crops



Hainmueller et al. (2011)

Figure 21: Most Important Other Crops

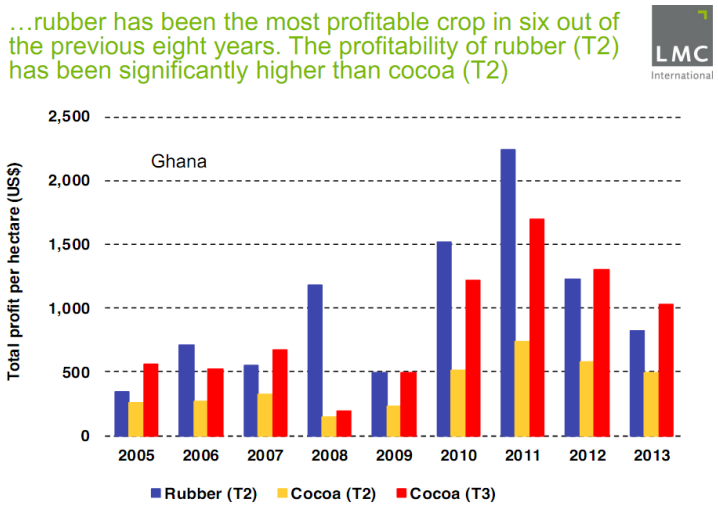


Hainmueller et al. (2011).

Table 7. Results of the multinomial logistic regression model of cocoa farming diversification.

Variable	Model 1: Diversification into one crop				Model 2: Diversification into two crops				Model 3: Diversification into three or more crops			
	B	Std error	Sig.	Exp(B)	B	Std error	Sig.	Exp (B)	B	Std error	Sig.	Exp(B)
Intercept	0.490	1.294	0.705		0.609	1.305	0.641		-3.362	2.134	0.115	
Age of cocoa farm	0.050	0.028	0.072	1.051	0.046	0.027	0.090	1.047	0.091	0.032	0.005***	1.095
Adult family labour	-0.142	0.115	0.215	0.868	0.056	0.096	0.558	1.058	-0.051	0.119	0.667	0.950
Gender	-0.451	0.739	0.541	0.637	-0.814	0.750	0.278	0.443	-0.207	0.906	0.819	0.813
Access to credit	0.254	0.716	0.723	1.289	1.210	0.737	0.101	3.353	1.761	0.864	0.042**	5.819
Eastern	0.977	1.095	0.372	2.656	0.560	1.106	0.612	1.751	1.225	1.747	0.483	3.403
Ashanti	0.395	1.031	0.701	1.485	-0.029	1.044	0.978	0.971	0.132	1.659	0.937	1.141
Brong-Ahafo	0.342	1.362	0.802	1.407	1.723	1.173	0.142	5.603	4.003	1.783	0.025**	54.752
Central	1.702	1.148	0.138	5.486	0.961	1.152	0.404	2.614	3.971	1.780	0.026**	53.054
Western	-0.688	1.175	0.558	0.503	-3.359	1.558	0.031**	0.035	-19.991	0.000	-	2.080E-9
Tenure (owner)	-0.751	0.583	0.198	0.472	-1.027	0.612	0.093	0.358	-0.328	0.744	0.659	0.720
Tenure ('abunu')	-20.338	0.000	-	1.471E-9	-1.362	1.592	0.392	0.256	-0.993	1.796	0.581	0.371

Determinants for crop diversification in Ghana (Aneani et al. 2011).



Rubber is usually more profitable than cocoa (LMC, 2014).

Côte d'Ivoire

Crop	Importance/size/times mentioned	Source	Note
Rice, maize, yam	Only three crops mentioned	Tanno (2012)	Source compares different ethnic groups in CdI, does not focus on diversification. No numbers
Rubber	Farmers convert part of their cocoa farm to rubber	Tanno (2012)	No numbers
Rubber, foodstuff, palm oil	Three most important crop types for diversification	Lemeilleur et al. (2015)	No numbers
Yam Cassava Plantain	1st 2nd 3rd	Traoré et al. (2009)	Most important sources of starch in CdI. Nothing known on who produces it.
Musa Yam Cassava	1st 2nd 3rd	Smith-Dumont et al. (2014)	Musa is either banana or plantain or both…?
Rubber, palm oil, cashew, banana	Mentioned as successful diversification strategies	ICCO (2010)	Nothing known on how many farmers, acres etc
Palm wine	196$ revenue per farmer in 1997	Ruf (2014)	Research diversification into palm wine during the 90's
Cereals Rice and maize	For subsistence For commericial purpose	Tanno (2012)	No numbers

Descriptives

- The cocoa–fruit tree intercropping system that uses fruit trees at a reasonable density for shading purposes as farmers will not promote trees that provide them with little or no returns: this systems is currently in use in degraded areas of Côte d'Ivoire and widespread in the southwestern part of the country where fruit trees are dominant in cocoa fields (Tondoh et al. 2015).
- The lack of capital or difficulty in accessing credit is the major constraint to diversification into rubber for 56 % of farmers surveyed in 2002 in south-western Côte d'Ivoire. Difficulties of access to land accounts for 20 %, the lack—or high cost—of the labour force for a further

14 %. Shortage of land is due in part to the high proportion offlood-prone areas not conducive to rubber cultivation. Land issues also hinder the adoption of crops other than cocoa. In some cases, such as in the Tabou region, the autochthons deny the right to immigrants— even to those who have been there for a long time—to plant rubber on the basis that the right to use the land was granted only to grow cocoa (Ruf & Schrotz, 2015).

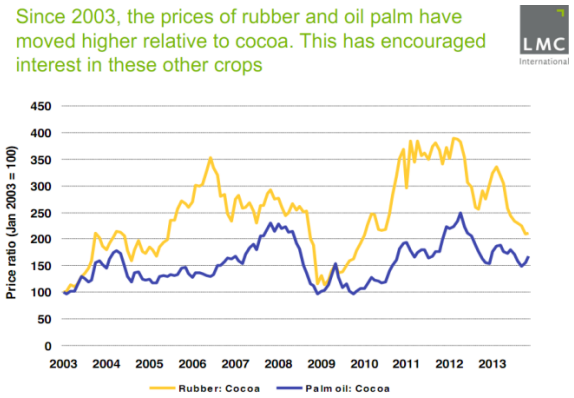
- The maintenance of cocoa plots requires working in between the cocoa crop seasons. Indeed, since cocoa is a seasonal crop, farmers are often working on other activities in order to generate income during the off-season. Hence, farmers are not implementing many good agricultural practices during this period, which could boost their productivity: pruning, weeding, sanitary harvest (Balineau et al. 2017).
- In southern Côte d'Ivoire, diversification from coffee to cocoa and then to rubber often took place at the change of generations. The farmers of the 1950s and 1960s tended to cultivate coffee rather than cocoa. Starting in the 1970s, they started abandoning their old coffee farms to migrate westward to forested areas where cocoa was the preferred crop. They were followed by their sons and nephews in the 1980s who also became cocoa farmers before turning to rubber in the 2000s. In addition to generational change, replanting and partial diversification of cocoa-growing regions to rubber were also driven by land issues (Ruf & Schrotz, 2015).
- One of the advantages of growing rubber is that it generates continuous income throughout the year. In addition, it remains productive for about 30 years. Its regular income turns the farmer into a 'salary earner' and is one of the reasons for the widespread adoption of rubber cultivation by Ivorian cocoa farmers. In 2002, 54 % of farmers who adopted rubber in south-western Côte d'Ivoire stated that they did so mainly to benefit from a continuous income over the year, while only 15 % mentioned increased income as a reason. It should be noted, however, that this survey was undertaken when rubber prices were relatively low. On the other hand, cocoa retains the advantage of entering production earlier than rubber (3–4 years instead of 6–7 years). The life of a plantation is 30 years, subject to a careful tapping of rubber trees. In Côte d'Ivoire, cases of indiscriminate tapping of trees have been observed. This can bring down the tree's economically useful life considerably (Ruf & Schrotz, 2015).
- Crops that offer a range of marketing outlets are more attractive to farmers. One of the attractions of oil palm is that the fruits can either be sold to local factories, to units in the informal sector or processed at home for the sale of oil or for home consumption. In addition, in Africa, the palm trees felled during replanting generate income from the sale of palm wine. This income can cover an unforeseen family emergency or pay for replanting (Chaps. 2 and 4). In 2011, a wild palm tree sold for between 500 and 1000 FCFA in Côte d'Ivoire and a hybrid palm fetched between 2000 and 3000 FCFA. For an oil palm plantation of 150 hybrid palms per hectare, felling generates a capital of 300,000–450,000 FCFA per hectare (450–700 euros per hectare). The coconut is another crop that generates value through its multiple uses, such as food and building material (Ruf & Schrotz, 2015).
- Farmers in Côte d'Ivoire also routinely interplant food crops with young cocoa trees. Against the advice of extension services, farmers also interplant food crops with young rubber trees. Research has meanwhile shown that the farmers are right in doing so. The use of food crops, instead of the recommended cover crops, in association with young tree crops generates revenue without having any negative effect on subsequent yields of the tree crops. Food

crops can also play an important role towards the end of a rotation of perennial crops as and when gaps appear in the aging canopy, for example, of coconut trees (Ruf & Schrotz, 2015).

- A constraint for crop diversification is land tenureship. A large portion of farmers in **Ghana** and **Côte d'Ivoire** are sharecroppers and hence do not have security of land tenure to make large scale investments on the farm and therefore often rely on small scale food crop farming for direct subsistence needs. Rural remoteness and the high price of transportation are further constraints for large scale food crop production in combination with cocoa (ICCO, 2010).
- The smallholder nature of cocoa is another constraint to crop diversification. The low returns lead to farmers having limited options in crop diversification. Lack of credit, knowledge (education), land tenure, land size, and lack of market access exacerbate the situation (ICCO, 2010).
- The low cocoa prices often discouraged farmers to remain in cocoa, moving to other more stable and more profitable cash crops such as rubber or palm oil (see figures below) (Lemeilleur et al. 2015).
- Higher rubber prices are the most important incentive to switch from cocoa to rubber. There are also a few other reasons for this switch, namely (LMC, 2014):
    - It's easier for absentee landholders to manage sharecropping arrangements.
    - A more flow of cash income.
    - Rubber is more profitable than palm oil.
    - The switch to rubber is usually at the end of the economic life time of a cocoa tree.
- Weather conditions are important factors in agriculture. Farmers often adapt their diversification strategies to the rainy or dry season. Especially during the dry season, farmers tend to have a more diversified income from, for instance, labour or trading (Tanno, 2012).
- Tanno (2012) argues that there are several factors that influence crop diversification strategies, these include:
    - Water availability (irrigation, amount of rainfall, humidity of the area).
    - The size of the plantations
    - The intensity of production (intensive, extensive, dispersed).
    - The principal subsistence source (roots, fruit trees, fishing, livestock).
    - Financial crises: farmers sooner opt for food crops for subsistence when export cash crops revenues decrease. In this case, cash crops cannot provide a steady, sufficient income in which case crop diversification is needed to maintain food security.
- The selling of food crops is necessarily a product of farmers producing more than they need, but rather caused by technological inability to preserve food for the long term. Farmers therefore choose to sell part of their produce for cash as they cannot preserve surplus production. The cash revenue is later used to buy food when their own production cannot fulfil household needs (Tanno, 2012).
- The commercialisation of food crops is done by women most of the times. The food crop sold depends on the diversity available at markets. There are differences between ethnic groups where the Baoulés usually sell yams, the Burkinabés usually sell rice or maize, and Bakwés usually sell plantain (Tanno, 2012).
- The main advantages given by farmers growing cocoa are the traditional aspect mentioned by 61% of farmers and the profitability aspect mentioned by 56% of them. Compared to

coffee and rubber, the economic aspect applies to all the crops as an important driver for growing a specific crop. The traditional aspect is very specific to cocoa and coffee, while the profitability aspect is the strongest for rubber. While the maintenance of the farm is clearly perceived as a disadvantage in cocoa farming for 72% of farmers and for 43% in the case of coffee farming, only 22% of farmers have this perception towards rubber farming. Rubber farming could thus be a threat to cocoa in the long run, when the "tradition" of cocoa might not be relevant for the new generation, particularly when price differentials are high (Balineau et al. 2017).

- In 2013-2014, 19% of the farmers said that they grew rubber, but only 2.2% (16 farmers) harvested it in 2013-2014. Indeed, rubber trees need six years of growth before being tapped for rubber and, on average, farmers started growing rubber trees three years before the survey. 50% of these farmers started growing it from one to five years before the survey. Rubber provided an estimated income of CFA 1,394,550. Among cocoa farmers who do not grow rubber yet, about 57% would be interested in growing rubber trees. The main reason for not having done so yet is the lack of money and lack of land. As a result, rubber could possibly be a threat for cocoa farming. The price per kilo is attractive. A high portion of farmers planted it recently and will therefore soon start to harvest it. We do not know if these farmers replaced some cocoa with rubber, nor what is the share of rubber trees planted on their farms compared to cocoa trees, but in the long run, rubber could be a substitute for cocoa farming given the high return. However, over the past few years, rubber has been through a rough patch, with a huge fall in prices which may have slowed down the trend (Balineau et al. 2017).
- Nearly 15% of the farmers said that they grew coffee. Almost all of them are already harvesting it. Only 2.9% of them says that they had planted new coffee trees during the 2013-2014 crop season. These numbers reveal that a very small proportion of the total number of cocoa farmers are planting new coffee trees or renewing their coffee farms. When asking farmers when they started growing coffee, on average, they started about 24 years before the survey took place i.e. around the same period as cocoa farming. The estimated gross coffee income is CFA 340,387. Also, 14% of the farmers growing coffee want to stop it. Turning to farmers not growing coffee, only 13% are interested in doing so. As a result of these observations, coffee farming does not seem very damaging for cocoa farming. It may be more of a supplement to farmers' revenues than a substitute (Barry Callebaut, 2017).
- Farmers in Côte d'Ivoire also routinely interplant food crops with young cocoa trees. Against the advice of extension services, farmers also interplant food crops with young rubber trees. Research has meanwhile shown that the farmers are right in doing so. The use of food crops, instead of the recommended cover crops, in association with young tree crops generates revenue without having any negative effect on subsequent yields of the tree crops. Food crops can also play an important role towards the end of a rotation of perennial crops as and when gaps appear in the aging canopy, for example, of coconut trees (Ruf & Schrotz, 2015).



Both rubber and palm oil have been more profitable in recent years, but are also more volatile (LMC, 2014).

Table 1.1 Mechanisms of diversification and partial conversion from coffee to cocoa in the centre-west of Côte d'Ivoire in 1980

Starting point	Impact of migration	Result
Old coffee farms	Increasing population and land scarcity	Old coffee farms turned into productive cocoa farms
Old and abandoned coffee farms	Partially sold to migrants	Clearing of coffee plots and complete replanting with cocoa with the technical and financial support of extension services
		Progressive underplanting of cocoa below coffee trees and progressive cutting of old coffee trees
Old coffee farms, still producing but with low yields	Partially sold to migrants	Progressive replanting of cocoa trees –some attempts to rehabilitate coffee trees by cutting down the shade trees (forest trees which had been retained at the clearing stage)
	Partially ceded to sons	

Source Ruf 1981

Ruf & Schrotz (2015).

Rank	Commodity	Production (Int $1000)	Flag	Production (MT)	Flag
1	Cocoa, beans	1713505	*	1650000	F
2	Yams	1099946	*	5674696	
3	Cashew nuts, with shell	393891	*	450000	
4	Plantains	325593	*	1577043	
5	Meat, game	313325	*	144000	F
6	Rubber, natural	292822	*	256000	
7	Cassava	252004	*	2412371	
8	Rice, paddy	190227	*	1513846	
9	Oil, palm	181754	*	417770	
10	Cotton lint	160094	*	112016	
11	Okra	85858	*	134260	
12	Maize, green	82764	*	200000	F
13	Maize	78280	*	654738	
14	Bananas	67591	*	240000	
15	Meat indigenous, cattle	64976	*	24053	Fc
16	Sugar cane	61298	*	1866748	
17	Coffee, green	53718	*	50000	F
18	Kola nuts	47845	*	79821	F
19	Meat indigenous, chicken	47515	*	33358	Fc
20	Cottonseed	44225	*	140000	F

FAOSTAT (http://faostat.fao.org/site/339/default.aspx)

TABLEAU 9. POURCENTAGE DE PRODUCTION ET DE CONSOMMATIONS DES PRINCIPAUX ALIMENTS PAR LES MÉNAGES SUR LA BASE DE 23 MÉNAGES DANS 2 COMMUNAUTÉS

TYPE DE PRODUIT	POURCENTAGE DE PRODUCTION DES MÉNAGES	POURCENTAGE DE CONSOMMATION DES MÉNAGES*
Banane plantain	100%	100%
Manioc	100%	80%
Igname	5%	80%
Maïs	80%	80%
Riz	2%	60%

**sur la base des interviews utilisant la méthode du rappel des 7 jours*

Manioc= cassava, Igname= yam, Riz= Rice. Middle column is the percentage of households that produce the crop, third column is the percentage of households that consume the crop. Source: FLA (2015).

Table 11 – Average production per crop, and gross income estimations

Crops	Price (CFA)/kg (2012-13)	N° of farmers producing	Kg	Gross income (price*kg)
Cocoa	725	684	2,247	1,629,005
Coffee	620	94	549	340,387
Rubber	1,200	16	1,162	1,394,550

Note: To get the estimations of gross income for each crop, we multiply the production declared by farmers by prices. Estimates are different from those provided in Table 5, but are, however, quite similar.

Income from various cash crop in Cote d'Ivoire (Barry Callebaut, 2017).

Table 10 – Advantages and disadvantages of specific crops

	Advantages in planting specific crops (% cited)			
Crop	Tradition	Profitability	Maintenance	Knowledge
Cocoa	**61%**	**56%**	1%	27%
Coffee	**58%**	**42%**	10%	12%
Rubber	4%	**71%**	2%	0%
	Disadvantage for planting specific crops (% cited)			
Crop	None	Profitability	Maintenance	Lack of Knowledge
Cocoa	7%	4%	**72%**	2%
Coffee	10%	17%	**43%**	7%
Rubber	**46%**	1%	22%	17%

Advantages and disadvantages of crops according to respondents in CdI (Barry Callebaut, 2017).

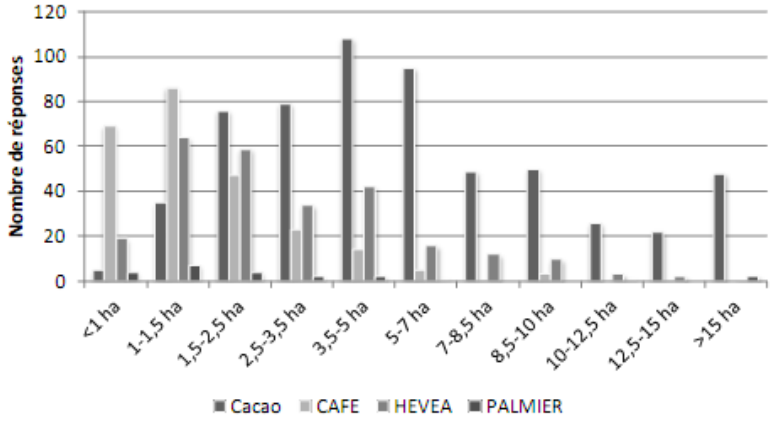
TABLEAU 7. MODES ET ACTEURS DE TRANSFORMATION ET DE CONSERVATION DES PRINCIPAUX PRODUITS VIVRIERS

PRINCIPAUX PRODUITS	MODE DE CONSERVATION	MODE DE TRANSFORMATION EN VUE DE LA COMMERCIALISATION	HOMME	FEMME
Manioc	Poudre, pâte, séché, enfoui dans le sol, immergé dans l'eau,...	Attiéké, Placali, Kongondé, Attoukpou,		X
Banane	Séchée, poudre	Alloko, Ships, Dokloun		X
Maïs	Séché et égrainé, en épi dans les greniers ou accroché dans la cuisine	Dokloun		X
Riz	Séché en pardi ou décortiqué		X	X
Igname	En buttes, en fosses, en tas, sur plateforme, sur claies.	-	X	X
Haricot	Séché et ensaché	-		X
Arachide	Séché, transformé en pâte	Pâte		X
Aubergine	Séché	-		X
Tomate	-	-		
Piment	Séché, poudre	Poudre		X
Gombo	Séché	Poudre de gombo (Djoumblé)		X
Palmier		Huile de palme, savon traditionnel, koutoukou, vin de palme	X	X

Product, conservation method, transformation before commercialisation and division of labour between male/female (FLA, 2015).

Graphique 32

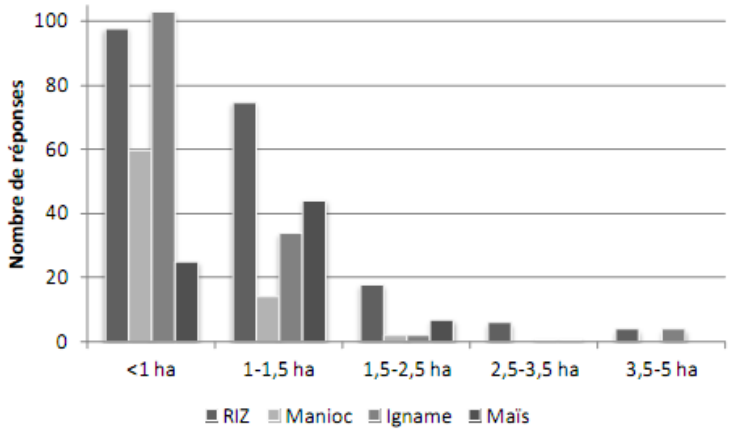
Répartition des planteurs par surfaces plantées en cultures pérennes



Hévéa=rubber. Source: Varlet & Kouame (2013).

Graphique 36

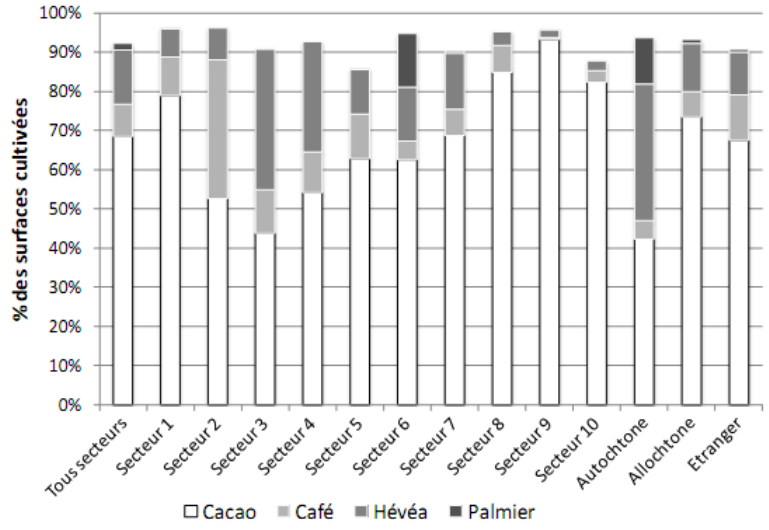
Répartition des planteurs par surfaces de cultures vivrières en production



Source: Varlet & Kouamé (2013).

Graphique 38

Variations des cultures pérennes selon les secteurs et selon l'origine du planteur



Look at left bar for "all sectors". Varlet & Kouamé (2013).

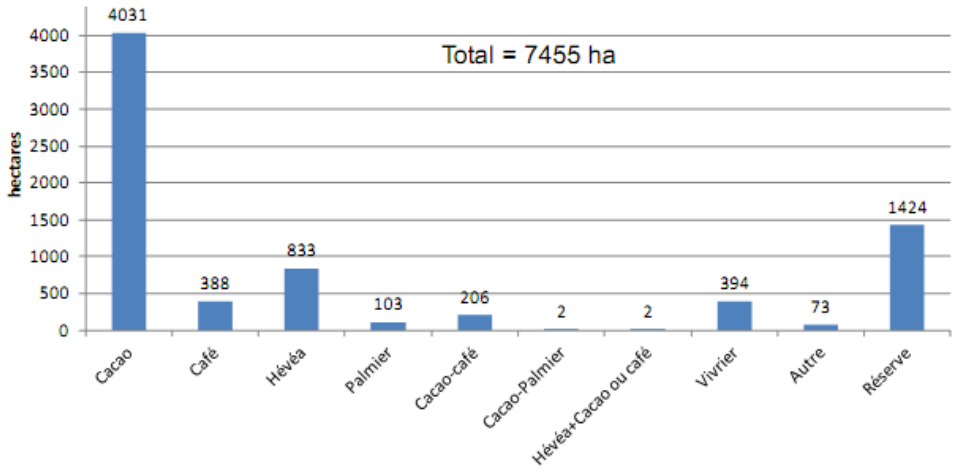
Tableau 6

Répartition des parcelles par type de cultures

Culture	Nombre de parcelles déclarées
Cacao	706
Café	241
Hévéa	295
Palmier	24
Cacao-café	35
Cacao-Palmier	2
Hévéa+Cacao ou café	4
Riz	191
Igname	116
Maïs	99
Manioc	49
Autres vivriers	9
Cola	1
Teck	2
Autres	51
Total	**1825**

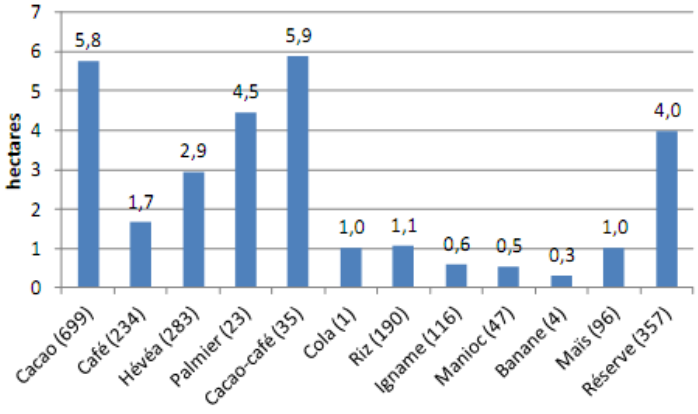
Number of plots dedicated to a certain crop (Varlet & Kouame, 2013). (Autres viviers=other food crops)

Graphique 46
Superficie cumulée de l'ensemble des parcelles ayant fait l'objet du questionnaire détaillé

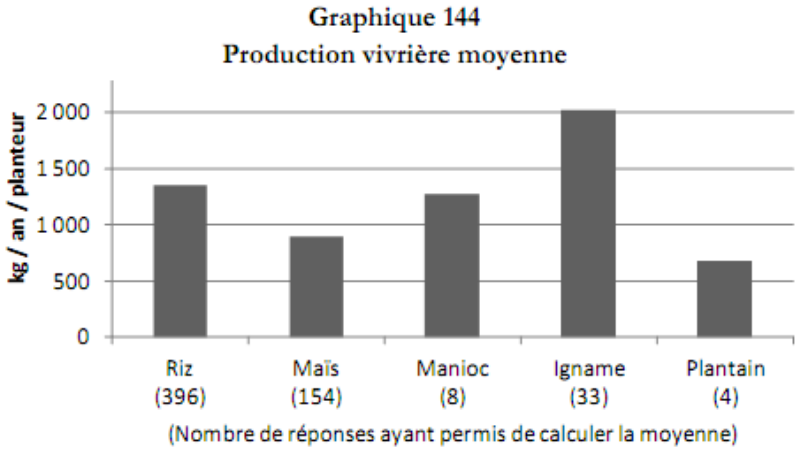


Total surface area dedicated to a certain crop (Varlet & Kouame, 2013). Food crops cumulated under 'Vivrier'.

Graphique 48
Taille moyenne des parcelles
(et nombre de réponses ayant permis de calculer la moyenne)



Mean farm size for each crop. Amount of responses on which the mean has been calculated I between brackets (Varlet & Kouame, 2013).



Yield per year per crop per farmer (Varlet & Kouame, 2013).

Land Allocation to Other Cash Crops

Table 5. Findings on Land Allocation to Other Cash Crops

Study	Land allocation
Study A	*NA*
Study B	*Rubber 12% (farmers involved with the company and certified farmers) and 5% (non-certified farmers)* *Palm oil less than 1%*
Study C	*21% of farmers grow rubber and palm oil*
Study D	*Coffee (2.8Ha), rubber (3.9Ha), palm oil (3.8Ha)*

**Detailed information on trainings received by farmers is presented in Appendix 7*

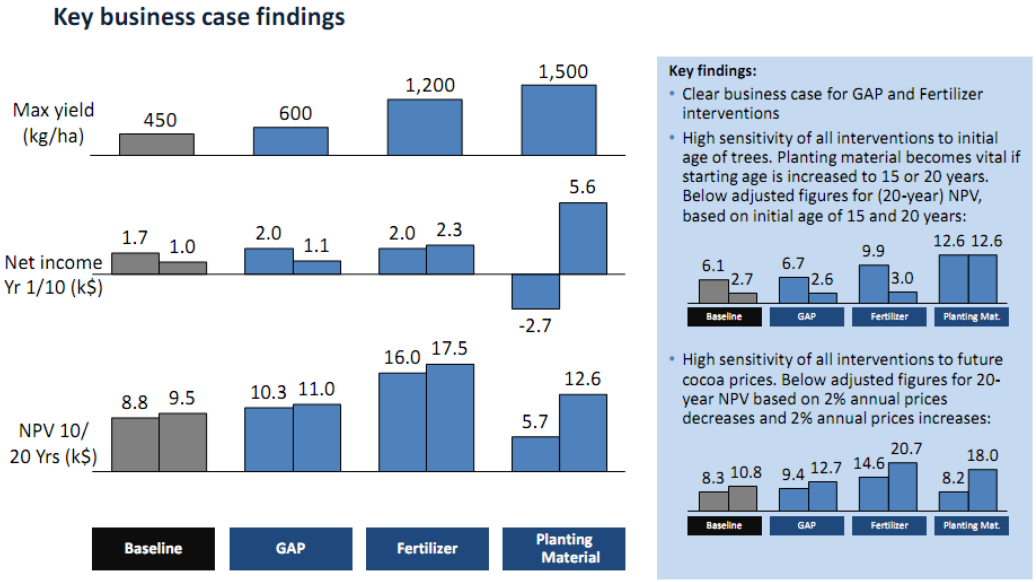
Source: Maytak, 2014 (IFC)

Cocoa income

Ghana

Income/ha/day/year/	Region/other	Source	Note
150-300$/ha 450-700$/ha	Agroforestry Full sun	Ruf (2011)	
0,42$/day 0,63$/day	Income from cocoa Income from all sources	Victor et al. (2011)	
2,174 GHC/year	Certified farmers	Waarts et a. (2013)	Income over 2011
1937 GHC/year	Mean for Ghana	Anang (2016)	
4596 GHC/year	Mean for Ghana	Asamoah et al. (2013)	Income from all sources
5073 GHC/year	Mean for Ghana	Kumi and Daymond (2015)	Income from cocoa ranges from 604 to 16,400 GHC/year
645,94$/year 756,13$/year	From cocoa From all sources	Hiscox & Goldstein (2014)	Not clear whether Cedi's or Dollars
733,87$/year 249,57$/year	Men Women	Hiscox & Goldstein (2014)	Not clear whether Cedi's or Dollars

5909GHC/year 5251GHC/year	Uncertified Certified	Nelson et al. (2013)	Gross household income from cocoa
7976GHC/year 6783GHC/year	Uncertified Certified	Nelson et al. (2013)	Gross household income from all sources
2951$/year	Mean for Ghana	Donovan et al. (2016)	2012-2013 season household income from cocoa



Yield and income in different scenarios (Blackmore & Heilbron, 2015).

Table 5.6: Gross margins in 2009/10

Land Quintiles	Gross margin (GHC/ha)				Gross margin (per Adult Equivalent)*			
	Ashanti	Brong Ahafo	Western	Total	Ashanti	Brong Ahafo	Western	Total
Q1	508.55	636.28	940.24	745.66	142.35	175.60	266.16	209.00
Q2	348.64	484.08	777.01	539.54	84.72	123.37	224.42	142.30
Q3	245.80	430.40	722.78	539.50	55.97	94.42	183.01	128.07
Q4	272.13	417.38	526.12	394.68	63.37	90.95	126.72	91.65

Source: Authors' estimations using producer price at GHC2.4/kg, fertilizers cost at GHC0.5/kg (High Tech report 2009/10), cost of insecticide at GHC14.1/liter (Gockowski 2014) and hired labor at GHC4/person day (Hainmueller 2011).

Gross margins in GHC/ha (Kolavalli et al. 2016).

Table 6.3: Yields and income by intensity typologies.

	Q1 extensive	Q2 extensive fertilizer, intensive pesticide	Q3 intensive fertilizer, extensive pesticide	Q4 intensive
Producer frequency Western region	24%	25%	14%	37%
Producer frequency other regions	54%	32%	5%	9%
Cocoa yield(KG/ha)	227	336	397	497
Mean farm size (ha)	4.2	2.8	3.5	3.3
Mean gross margin (GHc/ha)	519	787	852	1025
Mean producer income (GHc)	2013	2139	2934	3521

Yield and income under different typologies (Kolavalli et al. 2016).

Table 1: From soil to bean
Farmer revenue & share of FOB per tonne

	FOB %	Revenue	Input costs	Income
Côte d'Ivôire	65%	€ 1.328	€ 660	€ 668
Ghana	72%	€ 1.474	€ 237	€ 1.237
Nigeria	90%	€ 1.839	€ 825	€ 1.014
Indonesia	70%	€ 1.430	€ 375	€ 1.055
Equador	90%	€ 1.839	€ 667	€ 1.172

Income from cocoa for different countries (Fountain et al. 2014).

Table S.1	Baseline situation of the sampled cocoa farmers (March 2012)				
Indicator	**Unit of measure-ment**	**Mean**	**Mini-mum**	**Maxi-mum**	**Difference between project groups and control group?**
Knowledge level	Score, scale 0-1	0.38	0.32	0.42	3 of the 6 project groups: higher score than control group
Implementation of good agricultural practices	Score, scale 0-1	0.64	0.59	0.71	2 out of 6 projects: higher score than control group
Main cocoa farm size	Acre	7.14	0.5	60	No
Labour costs	GHS per acre	71	0.8	500	No
Fertiliser costs	GHS per acre	45.5	0.9	558	No
Planting material costs	GHS per acre	20.5	0.1	171.4	No
Insecticide costs	GHS per acre	33.4	2.3	294	No
Herbicide costs	GHS per acre	12.3	1.1	102.9	No
Fungicide costs	GHS per acre	37.1	0.1	720	No
Productivity	Bags per acre	2.06	0.02	12.33	1 out of 6 project groups: higher productivity than control group
Cocoa production efficiency	Input/output ratio		0.3	0.5	No
Net cocoa income	GHS per year	2174	50	15,600	No
Net cocoa income	USD per day	3.78			No
Gross household income	GHS per year	3,313			2 out of 6 project groups: higher gross household income
Cocoa quality	% of farmers with deductions	7%			No

Production figures from the baseline study (Waarts et al. 2013).

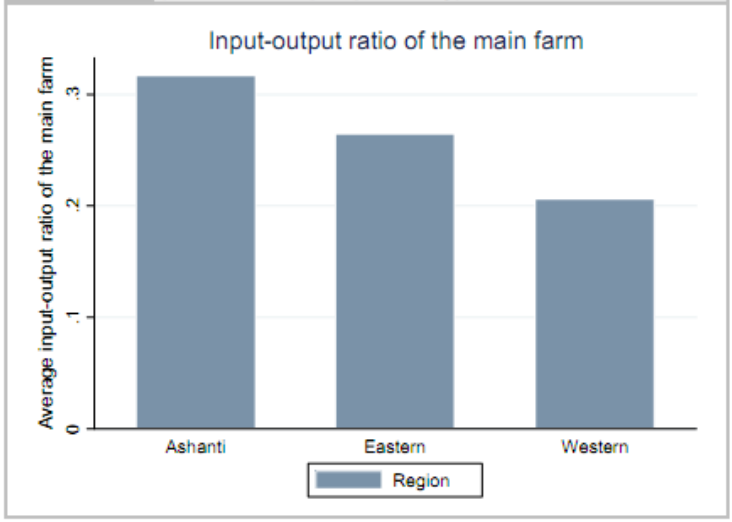
Table A4.18	Income earned last year from different sources				
Income source	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
Cocoa farming	272	2,174.7	2,269.3	50	12,300
Other crop farming	158	637.8	811.6	20	7000
Livestock	30	706.5	862.6	50	4,000
Trade-Retail	40	2,490.9	5,946.1	96	36,000
Remittance	13	1,784.6	2,059.9	100	7,200
Other	38	1,827.8	2,684.9	60	12,000
Total	274	3,312.8	3,925.0	100	36,979

Total income from various sources (Waarts et al. 2013).

Table A7.19a	Total households annual income (in GHS) estimated by the respondents per region				
Region	**Obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
Ashanti	63	3,390	3,152	100	15,000
Eastern	81	1,883	1,436	410	8,000
Western	65	5,138	5,123	400	25,125
Total	209	3,349	3,697	100	25,125

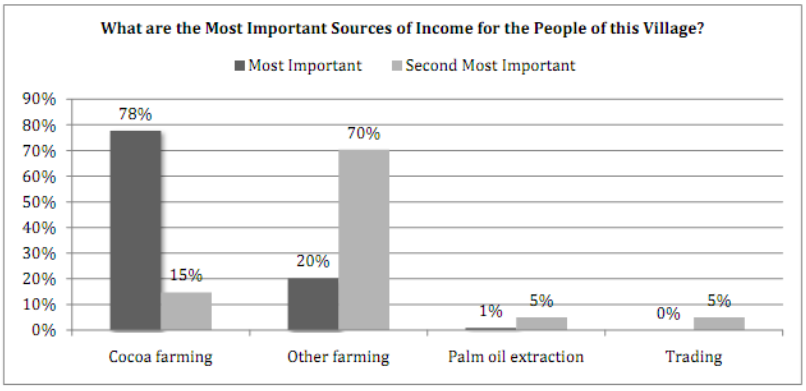
Total household income for different regions (Waarts et al. 2013).

Figure A4.15b Comparison of the average input-output ratio across regions (Lower ratio = higher profitability)



Input output ratio for different regions (Waarts et al. 2013).

Figure 10: Most Important Sources of Income



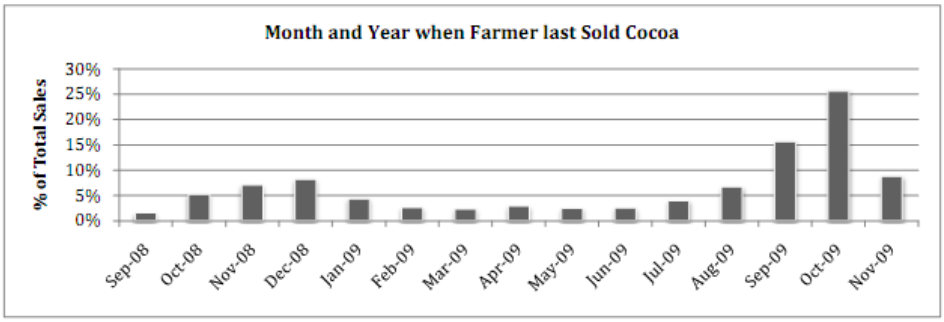
Income sources (Hainmueller et al. 2011).

Table 6: Median Annual Income from Farming by Region (in GHC)

Region	Cocoa Income	Income From Other Crops	Total Crop Income	Total Crop Income per Household Member
Ashanti	918	53	1122	255
Brong Ahafo	1020	100	1290	326
Central	663	45	863	187
Eastern	570	155	936	225
Western	966	20	1114	277
CCP First Cohort - All	612	120	960	252
CCP First Cohort - CARE	1020	60	1326	330
CCP First Cohort– VSO	558	250	932	254
CCP First Cohort – World Vision	470	120	704	162
Total	716	80	1020	250

Hainmueller et al. (2011).

Figure 18: Timing of Cocoa Sales



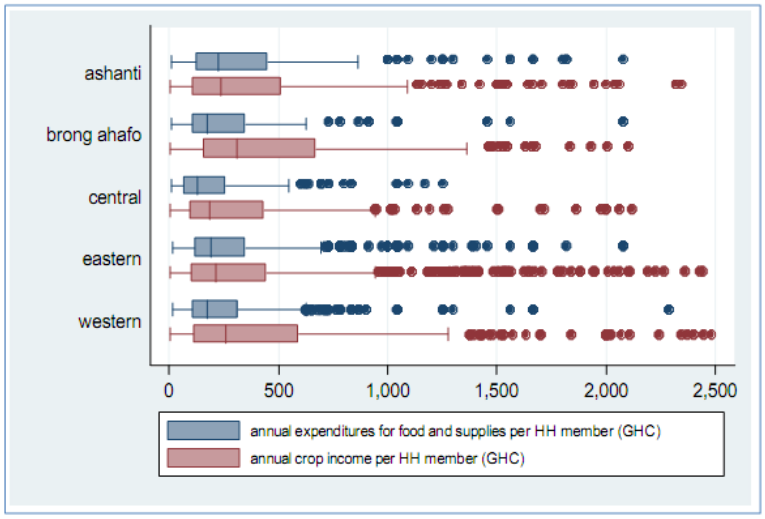
Hainmueller et al. 2011.

Table 6. Economics of the cocoa food crop intercropping during the first ten years (1992-2011)

Treatment	Cumulative net benefit (GHc)			% increase in net benefit due to intercropping	Benefit: Cost Ratio
	Food crops (1998-2001)	Cocoa (2002-2011)	Total		
Sole cocoa	--66.1	3261.9	3195.8		3.6
Cocoa/plantain	64.8	5343.4	5408.2	69.2	4.7
Cocoa/cassava	195.6	3221.5	3417.1	6.9	3.7
Cocoa/maize	12.2	4493.5	4481.3	40.2	4.0
Cocoa/cassava/plantain	299.2	4272.6	4571.8	43.1	4.3
Cocoa/cassava/maize	250.0	4698.1	4948.1	54.8	4.3
Cocoa/plantain/maize	15.0	4901.6	4916.6	53.8	4.3
Cocoa/plantain/ cassava/ Maize	219.2	4148.1	4367.3	36.7	3.9

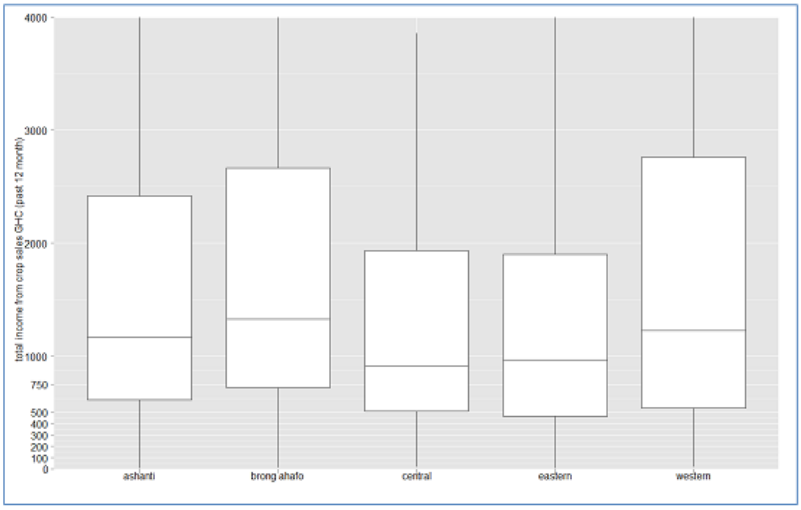
Incomes from different methods of intercropping (Ameyaw et al. 2011)

Figure 26: Annual Short-Term Expenditures and Income per Household Member by Region



Income and expenditure figures for different regions (Hainmueller et al. 2011).

Figure 20: Annual Income from Farming by Region



Total income from farming by region (Hainmueller et al. 2011).

Table 5: Proportion of income from cocoa

Proportion Of Income	Frequency	Percent
<5	27	4.3
5-7	332	52.1
>7-10	278	43.6
Total	637	100.0

Source: Field Data 2011, N=637

Table 6 Major source of income of respondents

Major source of income	Frequency	Percent
Cocoa	601	94.3
Plantain	9	1.4
Artisan	1	.2
Government Employee	5	.8
Self employed/petty trading	13	2.0
Cassava	6	.9
Yam	2	.3
Total	637	100.0

Source: Field Data 2011, N= 637

Asamoah et al. (2013).

Variable	Unit	Estimate			
		Current 2015/16	100% FOB	High yield	100% FOB + High yield
Farm size	*Ha*	2,47	2,47	2,47	2,47
Yield	*Kg/Ha*	420	420	800	800
Production (total)	*Kg/hh*	1037,4	1037,4	1976	1976
FOB price	*$/kg*	2,36	2,36	2,36	2,36
Farmgate price	*$/Kg*	1,75	2,36	1,75	2,36
Revenue cocoa	*$/hh*	1815	2448	3458	4663
Input costs	*$/hh*	300	300	500	500
Cocoa income	*$/hh*	1515	2148	2958	4163
% Cocoa of income		85	90	93	95
Non-cocoa income		227	227	227	227
Household income	*$/year*	1743	2376	3185	4390
Household size	*person*	5	5	5	5
Daily income	*$/person/day*	0,95	1,3	1,75	2,41
National poverty line	*$*	0,94	0,94	0,94	0,94
$ Extreme Poverty line WB	*$*	1,9	1,9	1,9	1,9
PPP extreme poverty line	*$PPP*	1,83	1,83	1,83	1,83
Poverty line WB	*$*	3,1	3,1	3,1	3,1
PPP poverty line	*$PPP*	2,98	2,98	2,98	2,98

Cocoa income under different scenarios (Oomes et al. 2016).

Table 4. Cash flow projections for high input certified cocoa production system.

Year	Labor quantity (days)	Labor costs (GHc/ha)	Physical input costs (GHc/ha)	Total costs (GHc/ha)	Total revenues (GHc/ha)	Net annual return (GHc/ha)	Expenditures during production season (GHc/ha)	Expenditures during harvest season (GHc/ha)
1	121	420	223	643	0	-643	643	0
2	85	295	64	359	900	541	307	52
3	91	317	7	324	500	176	295	29
4	136	471	367	838	374	-464	648	190
5	241	837	267	1,104	1,094	-9	548	556
6	259	900	267	1,167	1,219	52	548	619
7	275	954	267	1,221	1,326	104	548	673
8	288	1,000	267	1,267	1,415	148	548	718
9	299	1,036	367	1,403	1,487	84	648	755
10	306	1,063	267	1,330	1,541	210	548	782
11	312	1,082	267	1,349	1,577	228	548	801
12	315	1,092	267	1,359	1,596	238	548	810
13	315	1,092	267	1,359	1,598	238	548	811
14	312	1,084	367	1,451	1,581	130	648	803
15	307	1,067	267	1,334	1,548	214	548	786
16	300	1,041	267	1,308	1,496	188	548	760
17	290	1,006	267	1,273	1,427	154	548	725
18	277	962	267	1,229	1,341	112	548	681
19	262	909	367	1,276	1,237	-39	648	628
20	244	847	267	1,114	1,115	1	548	566
21	1434	4,977	267	5,244	6,576	1,332	548	4,696

Cost/benefit summary for certified cocoa production (Victor et al. 2010).

Table 13:– Percentage of respondents investing cocoa income in the following;

	2010	2012	Sig
N	691	697	
Cocoa income used for investments (%)	89%	94%	***
Children's education	77%	88%	***
Household durables	47%	52%	*
House improvements	38%	57%	***
Land acquisition	31%	19%	***
Land improvements / investments	36%	47%	***
Farming activities or inputs	78%	86%	***
Livestock	31%	22%	***
New livelihood activities	14%	9%	***
Ranking of importance: 1 = most important, 2 = second most important, etc			
Children's education	1.31	1.19	***
Household durables	3.48	3.80	***
House improvements	3.00	3.24	ns
Land acquisition	2.99	2.91	ns
Land improvements / investments	2.83	2.98	*
Farming activities or inputs	2.32	2.38	ns
Livestock	3.76	4.19	*
New livelihood activities	4.02	3.38	ns

Sig = Significance of differences between groups (based on Mann-Whitney test): ns = not significant, *P≤0.05, **P≤0.01, *** P≤ 0.001

Reinvestment of cocoa income (Nelson et al. 2013).

Cocoa as % of total income	Region/other	Source	Note
67%	Mean for Ghana	Asante-Poku & Angelucci (2013)	-
82% 74% 81% 79%	Tepah Konongo New Edubiase Mean for all 3	Calkins & Ngo (2015)	All areas are in the Ashanti Region
70-100%	Mean for Ghana	Anang (2016)	Broad bracket

79%	Mean for Ghana	Asamoah et al. (2013)	-
75,3%	Mean for Ghana	Kumi & Daymond (2015)	-
81%	Mean for Ghana	Nelson et al. (2013)	For 2010
76,3% 75,8%	Uncertified Certified	Nelson et al. (2013)	For 2012
80-90%	Mean for Ghana	Oomes et al. (2016)	-

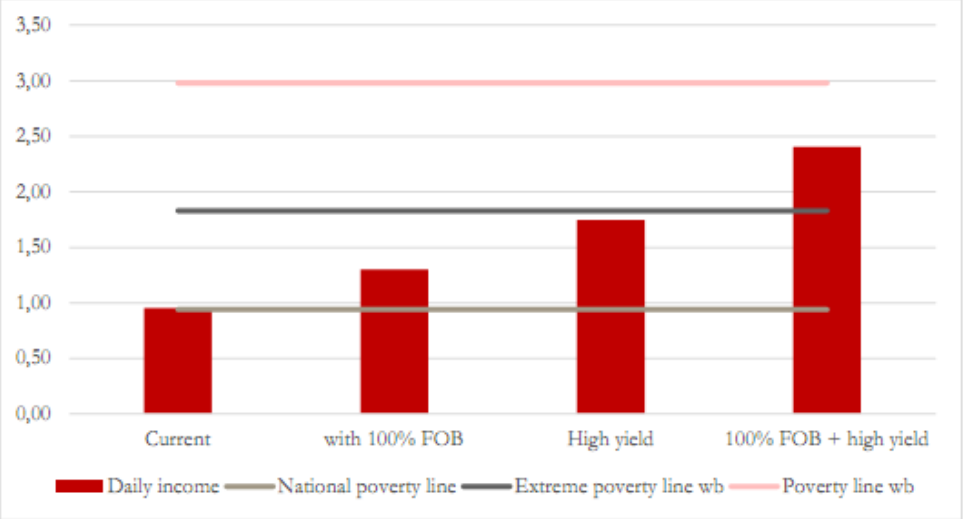
Descriptives:

- Data on mean farmer income from cocoa is subject to large variations and standard deviations. This is caused by differences in cocoa output (Aneani et al. 2011).
- The most important factors influencing cocoa income in the 2005/2006 season were productivity, access to extension services and the age of the farmer. Whereas factors such as being member of a farmer group, having access to the input market and access to credit were not significant, though positively correlated with income (Barrientos & Akyere, 2012):
    - Access to extension services is positively correlated with a higher income from cocoa.
    - Productivity is also positively correlated with higher income (higher yield->higher income).
    - Age of the farmer is significantly negatively correlated with income from cocoa, meaning that older farmers earn less from cocoa than younger farmers. This is likely due to older farmers being less able to perform labour tasks on the farm or declining investments .
- There are regional differences when it comes to performance indicators such as net income from cocoa and yield/ha. Farms in the Western South Region score significantly better on these indicators than farms in the Eastern Region. The farms in the Western South Region are larger and more concentrated while the farms in the Eastern Region are relatively old (Barrientos & Akyere, 2012).
- Farmers in the Eastern Region have a far lower gross cocoa income than farmers from the Ashanti or Western Region, which can be explained by lower yields in the Eastern Region (Waarts et al. 2013).
- 70% of farmers have other sources of income besides cocoa and cocoa is the most important source of income for 80% of farmers (Waarts et al. 2013).
- Land size is positively correlated with income, meaning that farmers with larger farms have higher incomes (Wiggins & Leturque, 2011).
- Farmers with high incomes are overall more satisfies with the pricing of cocoa than farmers with low incomes (Anang, 2016).
- Cocoa production is a risk inherent business as investments do not necessarily translate into higher productivity or income. This is mainly due to factors such as irregular rainfall and diseases and pests. This leads to an unstable income from cocoa that needs to be supplemented by diversifying income with other crops or other economic activities (Aneani et al. 2011).
- Farmer's main reasons to produce cocoa is that they see it as a means for financial security at an older age. Other reasons included the guaranteed market and known/stable prices. They argued that cocoa is less risk inherent compared to other crops that are more prone to

weather conditions, volatile prices and unpredictable marketing systems that lead to frequent post-harvest losses (Aneani et al. 2011).

- Cocoa is the main source of income for about 91% of farmers (Asamoah et al. 2013).
- Productivity is the most important factor by which farmer income can be increased. The only way in which productivity can be raised is by encouraging and financially assisting farmers in adopting CRIG approved farm technologies (Asamoah et al. 2013).
- Age is negatively correlated with total income (older farmers earn less) (Schouten, 2016).
- Income from cocoa and income in general is usually higher when intercropped with food crops (Ameyaw et al. 2011).
- The mean annual household income from cocoa was around 5,000 GHC, but ranged from 615 to 16,400 GHC/yr. This shows the great variability in incomes derived from cocoa (Kumi & Daymond, 2015).
- Around 75,3% of farmers rely on cocoa for most of their income. The income from cocoa is the only readily available income source that can meet household demands such as food, education and social contributions such as funerals and church activities (Kumi & Daymond, 2015).
- Overdependence on cocoa can have significant negative impacts on household income in case of declining yields or cocoa prices or during the off season when cocoa productivity is low. Income diversification into other crops or other economic activities can avert poverty in farmer households (Kumi & Daymond, 2015).
- The use of pesticide and fungicide is associated with an income increase of 20%, the use of fertiliser is associated with an income increase of 30% and the attainment of literacy is associated with an income increase of 30% derived from cocoa farming (see also ‘fertiliser’ and ‘pesticide and fungicide’)(Hiscox & Goldstein, 2014).
- The most important reasons for farmers to produce cocoa are meeting household subsistence needs, generating capital to invest elsewhere, providing inheritable property to next of kin and to use as security for old age (Baah et al. 2012).
- Appelman (2016) distinguishes between 4 strategies to raise farmer income:
    - Raising farm size to increase productivity
    - Raise productivity/ha to increase income
    - Reducing costs by improving cost-efficiency
    - Receiving a higher price for cocoa

Figure 6.3 In order to raise cocoa farmer incomes in Ghana above the poverty line, a combination of policies will be needed



High yield= 800 kg/ha (Oomes et al. 2016).

Côte d'Ivoire

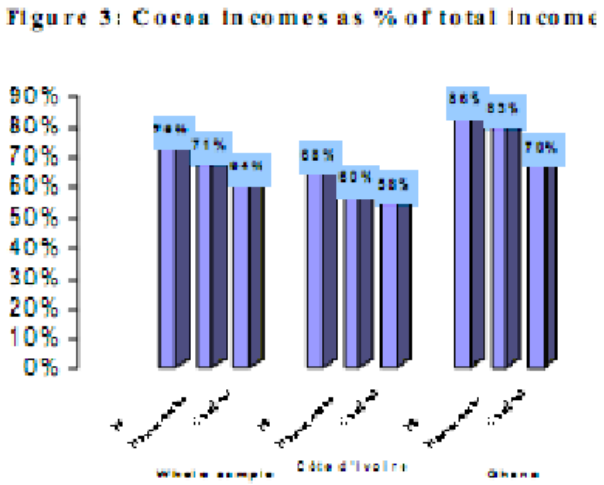
Income/ha/day/year	Region/other	Source	Note
3.333.894 CFA/year 1.685.000 CFA/year	Long-time participant Mean for all participants	Ingram et al. (2013)	About participants in a Cargill/Solidaridad program
1.461.703 CFA/year 2.345.849 CFA/year	Net cocoa income Gross household income	Ingram et al. (2014)	Certified farmers
2.219$/year 3.716$/year 3.387$/year	Study A Study C Study D	Maytak (2014)	Synthesis report of different studies figures are gross income

Cocoa as % of total income	Region/other	Source	Note
79%	Mean for CdI	Ingram et al. (2014)	Not clear if certified farmers or control group or both
93%	Mean for CdI	Ingram et al. (2013)	Cargill/Solidaridad program participants
80-90%	Mean for Ghana + CdI	Oomes et al. (2016)	-

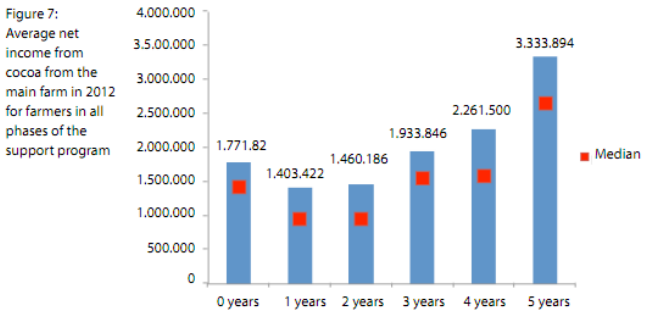
Bilan

	Cumul de 0 à 3 ans	**4 ième année**	**5 ième année**	**6 ième année**	**7 ième année**
Total dépenses	872 150	155 000	155 000	155 000	165 000
Total recettes	0	300 000	420 000	480 000	480 000
Bilan/année	-872 150	+145 000	+265 000	+325 000	+325 000
Bilan cumulé	**-872 150**	**-727 150**	**-462 150**	**-137 150**	**+187 850**

Cost/benefit of planting a cocoa farm (CNRA, 2014).



Left: whole sample, middle CdI, right Ghana. Not very clear graph (Calkins & Ngo, 2005).



Farmer incomes for Cargill/Solidaridad program participants (Ingram et al. 2013).

Table V.14: Descriptive income statistics for hypotheses 10

Variables of cooperative impact on income and community development	Breakdown of income by source				
	Income per capita (USD)	Cocoa sales, bonuses & dividends as % of total income	Non-farm income as % of total income	Salaried employment as % of total income	Remittances from migrants as % of total income
Whole sample	162.27	71%	4%	3%	4%
Members	168.10	76%	3%	3%	3%
Non-members	163.93	**71.0%**[c]	5%	2.9%	3%
Control	150.36	**63.9%**[a]	**7%**[b]	**5%**[a]	**5.5%**[c]
Côte d'Ivoire	175.94	63%	5%	5%	3%
Members	174.11	68%	3%	4%	3%
Non-members	191.03	60%	8%	4%	2%
Control	163.61	**58.0%**[b]	7%	6%	5%
Ghana	148.23	71%	4%	2%	4%
Members	161.92	86%	2%	1%	3%
Non-members	135.44	83%	2%	2%	4%
Control	137.10	**69.8%**[a]	**7%**[a]	**4%**[c]	**6.1%**[c]
Tiassale	113.71	52%	13%	8%	3%
Adzopé	212.06	61%	1%	5%	5%
Abendgourou	202.86	78%	2%	1%	1%
Tepah	158.36	82%	1%	1%	4%
Konongo	121.80	74%	5%	3%	6%
New Edubiase	164.90	81%	4%	2%	3%

a= significantly different from members at the 1% level, b = significant at the 5% level, c= significant at the 10% level.

Income statistics for Ghana, CdI and various areas within. Also for cooperative membership (Calkins & Ngo, 2005).

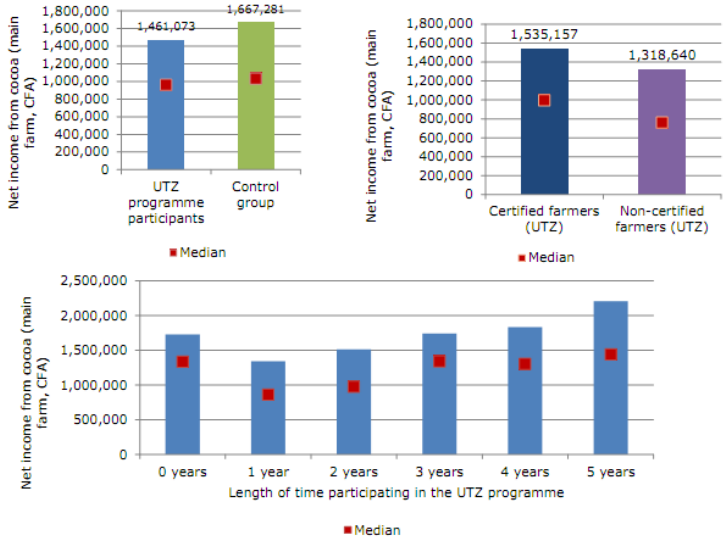


Figure 48 *Average net household income.*

Cocoa farming forms on average 79% of all farmers' total gross household income, indicating strong dependence upon cocoa revenues.

Cocoa incomes from main farms for certified and uncertified farmers (Ingram et al. 2014).

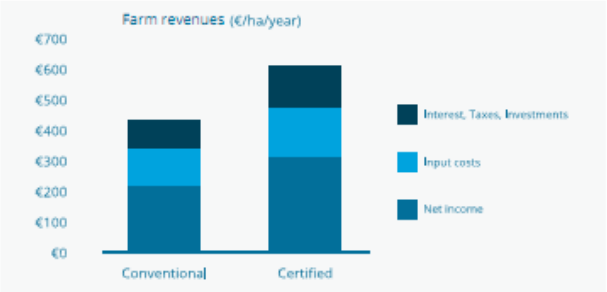


Figure 8 Revenues (split up in costs and net income) for the average conventional and certified farm

Fobelets & de Groot Ruiz (2016)

Tableau 6 : Rentabilité économique des techniques de replantation en fonction du matériel végétal

Techniques de replantation / Indicateurs de rentabilité	Replantation avec du matériel végétal non amélioré	Replantation avec des hybrides du CNRA	Taux d'accroissement (%)
Replantation après jachère naturelle :			
rendement (kg ha^{-1})	372	454	22,0
prix (F CFA kg^{-1})	875,7	875,7	
autres produits	10 121,9	17 550,0	73,4
revenu monétaire brut	335 871,1	415 104,2	23,6
charges de production	62 967,0	94 534,1	50,1
bénéfice net	272 904,1	320 570,1	22,2
bénéfice net additionnel		47 666,0	
taux moyen de rentabilité (%)		151,0	
Replantation sous les vieux cacaoyers :			
rendement (kg ha^{-1})	390,6	491,8	25,9
prix (F CFA kg^{-1})	864,2	864,2	0,0
autres produits	5 245,4	8 194,1	56,2
revenu monétaire brut	342 801,9	433 207,7	26,4
charges de production	80 193,5	89 044,9	11,0
bénéfice net	262 608,4	344 162,8	31,1
bénéfice net additionnel		81 554,4	
taux moyen de rentabilité (%)		921,4	

Source : Kacou (2010).

Income/ha under different scenarios (Assiri et al. 2012).

	Producteurs conventionnels	Producteurs certifiés
Taille moyenne de la parcelle	5,69 ha	5,84 ha
Rendement moyen	444,12 kg/ha	463,01 kg/ha
Prix moyen reçu	729,82 FCFA/kg	760,81 FCFA/kg
Revenu annuel issu de la vente du cacao	1 424 243 FCFA	1 733 973 FCFA
Revenu annuel total (y compris autres activités)	1 809 500 FCFA	1 923 996 FCFA

Figure 36. Estimation des revenus des producteurs conventionnels et certifiés durable ou équitable.
Source : BASIC, d'après la thèse de M. A. Schweisguth, University of California Davis (2015)

Difference between certified and uncertified farmers (PFCE, 2016).

Année de calcul : 2014	Producteurs conventionnels
Taille moyenne de la parcelle de cacao	5,69 ha
Rendement moyen	444 kg/ha
Prix moyen reçu	750 FCFA/kg
Coûts moyens de production par exploitation	375 000 FCFA
Revenu annuel issu de la vente du cacao	1 545 000 FCFA
Revenu annuel total (y compris autres activités)	1 809 500 FCFA
Nombre moyen de personnes par foyer	10,9
Revenu annuel moyen par personne	170 300 FCFA
Coût du panier de biens essentiels annuel au Cameroun	272 000 FCFA
Coût du panier de biens essentiels annuel au Ghana	290 000 FCFA
Coût du panier de biens essentiels estimé Cote d'Ivoire	281 000 FCFA

Figure 39. Estimation des revenus des producteurs conventionnels en Côte d'Ivoire.
Source : BASIC, d'après les données de M. A. Schweisguth, F. Ruf, GLSS6, ECAM 4 et la Banque Mondiale

PFCE (2016).

Tableau No 5.11. Estimation des coûts et des productivités moyennes du café et du cacao. Approches par le contrat abusan/Abugnon

	Situation en 2005/06		Situation en 2007/08	
	Café	Cacao	Café	Cacao
Production par ha (kg)	470	425	470	425
Produit brut (Fcfa/ha)	94 000	148 750	199 750	191 250
Prelèvement par l'abusan (kg)	235	142	235	142
Prix du kg en 2005/06	200	350	425	450
Coût en main d'oeuvre	47 000	49 583	99 875	63 750
Pesticides	2 000	5 850	2 000	6 500
fongicides	-	360	-	400
Engrais	-	3 870	-	4 300
Location matériel et essence	-	4 050	-	4 500
Ss total Estimation coût Intrants	2 000	14 130	2 000	15 700
Coût de décorticage	11 750		11 750	
Cout total / ha	60 750	63 713	113 625	79 450
Coût/kg	129	150	242	187
Marge nette par hectare	**33 250**	**85 037**	**86 125**	**111 800**
Marge nette/kg	71	200	183	263
Estimation nombre de jours de travail				
- par tonne	140	100	140	100
- par production de 1 ha	66	43	66	43
Marge nette / jour de travail	505	2 001	1 309	2 631
Cout d'une journée de travail sur le marché	1 000	1 000	1 000	1 000
Estimation du profit / jour, hors amortissement	- 495	1 001	309	1 631

Sources : enquête consultants, Nov. 2007

Costs and benefits of cocoa and coffee (Ruf & Agkpo, 2008).

Tableau 15
Revenu brut par hectare du cacao

Pour un hectare	Nombre d'unités	Unités	Prix unitaires (FCFA)	Valeur (FCFA)
Coûts de production :				
Main d'œuvre salariée	19	hommes.jours	2 000	38 000
Herbicides	3	litres	3 000	9 000
Fongicides	24	sachets	600	14 400
Insecticides	2	litres	6 000	12 000
Petits équipements	1	forfait	5 000	5 000
Total des coûts				78 400
Recette de production	455	kg	725	329 875
Revenu brut par hectare				**251 475**

Tableau 16
Revenu brut par hectare de l'hévéa

Pour un hectare	Nombre d'unités	Unités	Prix unitaires (FCFA/unité)	Valeur (FCFA)
Coûts de production :				
Main d'œuvre salariée	97	hommes.jours	2 000	194 000
Herbicides	4	litres	3 000	12 000
Fongicides	6	sachets	600	3 600
Stimulants (Ethephon)	4	litres	3 200	12 800
Petits équipements	1	forfait	5 000	5 000
Total des coûts				227 400
Recette de production	2 109	kg humide	582	1 227 438
Revenu brut par hectare				**1 000 038**

Gross incomes for cocoa and rubber (Kouamé & Varlet, 2013).

TABLE 4.11. Gross margins on different land quartiles

	Land quartiles				
Margins/costs	**Q1 [0, 1.69] (ha)**	**Q2 [1.70, 3.37] (ha)**	**Q3 [3.78, 5.90] (ha)**	**Q4 [6.06, 69.05] (ha)**	**Total**
Cost hired labour	55,642.66	80,542.48	109,722.90	220,022.40	108,946.80
Cost hired labour/ha	41,712.68	29,775.99	23,385.89	20,647.47	29,872.80
Cost plant protection inputs	36,467.86	70,405.66	113,218.80	150,857.50	86,584.05
Cost plant protection inputs/ha	29,699.69	24,557.37	23,802.32	14,167.19	23,644.88
Gross margins	245,767.40	643,138.60	820,239.50	1,942,418.00	844,835.10
Gross margins/ha	187,921.40	227,213.40	168,116.20	148,160.70	187,039.70
Gross profits/ha	259,536.50	281,546.80	215,304.40	183,196.30	240,602.40

Source: *adult's questionnaire, Côte d'Ivoire*

Vigneri et al. (2016).

Table 5 – Cocoa farmers' income

Status of farmers (n° of obs., see also Figure 7)		Cocoa farmers, not hhd (118) Group 1 (A)	Cocoa farmers, hhd (585) Group 3 (B)	Cocoa farmers, whether or not hhd (total, 703) Group 1+3 (C)	Difference between 1 and 3 (D)	Hhd, not respondents (118) Group 2 (E)
Total income (n° of obs.)	(1)	648,581 (109)	**1,760,657** (571)	1,582,397 (680)	1,112,076***	n.a.
Cash crop income						
average	(2)	652,013 (103)	**1,658,750** (562)	1,502,820 (665)	1,502,820***	1,460,680 (55)
share in total income	(3)	98,20%	**97,50%**	97,63%	n.a.	n.a.
Cocoa income						
average (declared, only by farmers who just grow cocoa)	(4)	658,476 (93)	**1,500,032** (455)	1,357,214 (548)	841,556***	n.a.
second estimate (quantity*price)	(5)	1,489,027 (94)	**1,569,130** (454)	1,555,390 (548)	0	n.a.
difference between 1st and 2nd estimates	(6)	829,897*** (91)	52,189* (449)[a]	183,247 (540)***	n.a.	n.a.
share of cocoa in cash crops (only for farmers who grow another cash crop)	(7)	86% (5)	88% (93)	88% (98)	n.a.	n.a.
Differences in						
cash crop income between farmers who only grow cocoa and the others	(8)	0 [b]	833,640***[c]	827,590 [d]	n.a.	n.a.
total income between farmers who only grow cocoa and the others	(9)	0	750,196***[e]	759,706	n.a.	n.a.
total income between farmers who have one activity and the others	(10)	0	0	0	n.a.	n.a.

Notes:

(a) Statistical indication, but 3.48% of average declared.
(b) Only 10 grow another cash crop, 93 only grow cocoa.
(c) 107 grow another cash crop, 455 only grow cocoa (av. cash cop income for the former: 2,333,672).
(d) 117 grow another cash crop, 548 only grow cocoa (av. cash cop income for the former: 2,184,803).
(e) 107 grow another cash crop, 455 only grow cocoa.

Balineau et al. (2017).

COCOA PRODUCERS' *Average Yearly* **INCOME** *[Table 1]*

	Côte d'Ivoire	Ghana
Regulated farmgate[12] price for 2013/2014 season (in local currency)	850 CFA/kg	5.12 GHS/kg
Regulated farmgate price for 2013/2014 season (per kg, in USD)	$1.61[13]	$1.60[14]
Average productivity[15]	500 kg/hectare	500 kg/hectare
Standard farm size[16]	2-5 hectares	2-5 hectares
Estimated annual GROSS income range	**$1,610 - $4,025**	**$1,600 - $4,000**
Labor costs[17]	$400 - $2000[18]	$430 - $860[19]
Input costs	$454.70 - $1136.75	$186.88 - $467.19
Estimated annual NET income range	**$755.30 - $888.25**	**$983.12 - $2672.81**

LAMBERT ET AL. (2014).

Table 11 – Average production per crop, and gross income estimations

Crops	Price (CFA)/kg (2012-13)	N° of farmers producing	Kg	Gross income (price*kg)
Cocoa	725	684	2,247	1,629,005
Coffee	620	94	549	340,387
Rubber	1,200	16	1,162	1,394,550

Note: To get the estimations of gross income for each crop, we multiply the production declared by farmers by prices. Estimates are different from those provided in Table 5, but are, however, quite similar.

Balineau et al. (2017).

Descriptives:

- The smallholder nature of cocoa farming leads to constraints regarding increasing and diversifying income. Farming is associated with low incomes, low productivity and a high incidence of poverty. The low returns limit the options for farmers to diversify their income, leading to farmers relying solely on cocoa revenue. This problem is further exacerbated by a lack of resources, lack of access to credit, lack of knowledge, lack of access to markets and limited property rights. Consequently, the revenue from cocoa is barely sufficient to meet a farmers' basic needs. Furthermore, the limited revenue of cocoa farmers makes accumulating agricultural surpluses for investment in improving yields or income diversification impossible (ICCO, 2010).
- Income remains the most material externality (63% of total external costs) on certified farms, as only family labour has a slightly higher income due to higher profits. No distinctive data on forced labour was found for certified farms. As a result, forced labour is the second largest external cost on certified farms (9.2% of total external costs) (Fobelets & de Groot Ruiz, 2016).
- Assiri et al. (2012) discusses that farm revenue can be increased by increasing yields. The increasing of the yields can be done through a few mutually reinforcing strategies, namely:

(partial) replanting with selected planting material, the rehabilitation of old farms, applying good agricultural practices and applying fertiliser and fungicide/pesticides. The success of these strategies depends largely on the producer price.

- (Re)planting of farms becomes profitable only after 7 years and the profitiability depends greatly on the producer price (CNRA, 2014).
- The profitability of cocoa is lower for larger farms. The gross margin/ha is 50% higher for farmers with farms between 1.7 and 3.4 ha compared to farmers with farms larger than 6 ha. This is because the production costs per hectare increases faster than yields. In other words: farmers earn less per unit of land (gross margin per hectare declines) (Vigneri et al. 2016).
- Cocoa ultimately remains by far the main crop for cocoa farmers, as in 2013-2014, 80% of farmers only harvested cocoa (Balineau et al. 2017).
- As regards the core sample of 585 cocoa farmers who are also heads of their households, they declared a total annual income of CFA 1,760,657, with more than 97% being drawn from cash crops, i.e. from cocoa for 80% of the core sample. When cash crops include other crops than cocoa – which is only the case for 20% of cocoa farmers – cocoa still accounts for 88% of income from cash crops (Balineau et al. 2017).
- According to farmers' statements, cocoa yields about 1.5 million CFA per grower. Their statements regarding cocoa produced provide cocoa income estimates which are slightly higher (3.48%) than their income declarations. This may be due to an overestimation of production or because farmers reported "net" income. Indeed, in some villages, a small proportion of the cocoa production of each producer is withdrawn to finance collective investments at the village level, or for expenditures related to the functioning of cooperatives etc (Balineau et al. 2017).
- Dividing gross income by the household size, we find a rough estimate of a per capita daily cocoa income of CFA 568, whereas the national poverty line reaches CFA 737 (Balineau et al. 2017).

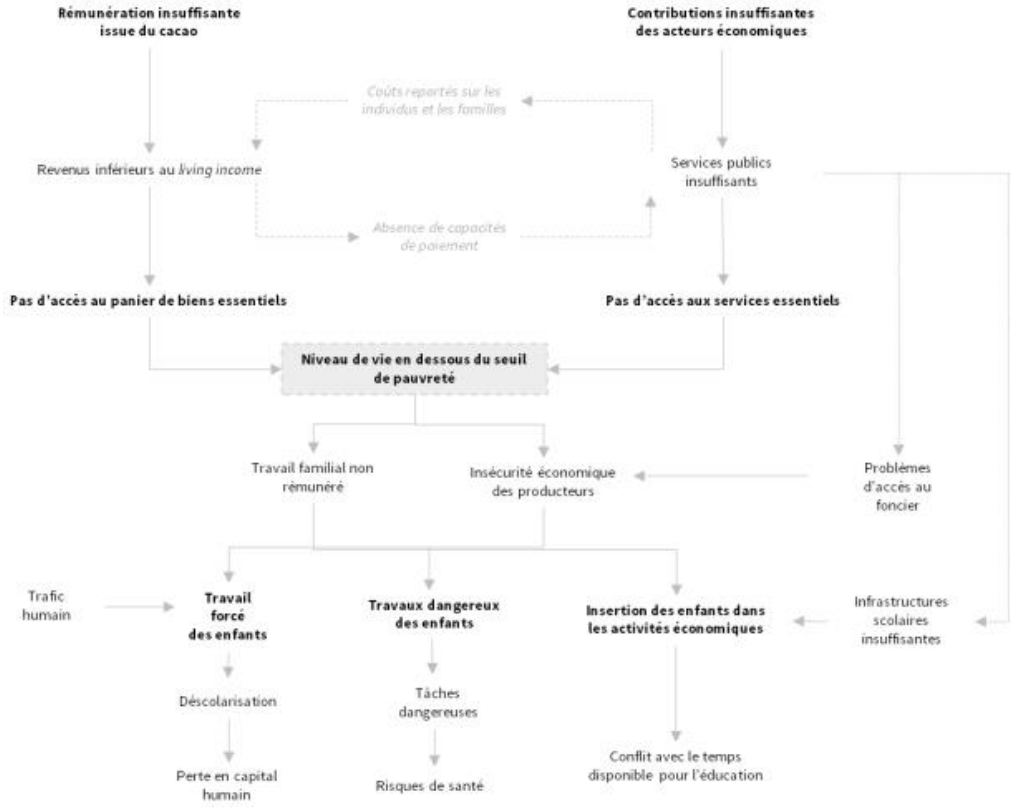


Figure 32. Chemins et boucles d'impacts lié au travail des enfants dans la filière cacao ivoirienne.
Source : BASIC

Causes and effects of low revenues in cocoa farming (PFCE, 2016).

Other income activities (non-agricultural)

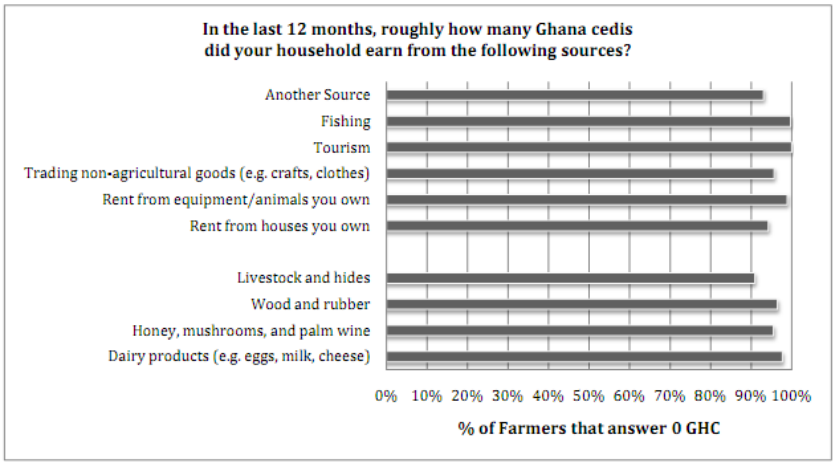
Ghana

Table 5.10: Different sources of household income

		Percentage of income from each income source								
District	Number of households	Cocoa	Other crops	Animals	Off-farm	Wage labour	Remitt-ances	Other Transfers	Savings	Rent
Agona Mampong	34	58.9	12.5	0	23.2	3.3	2.1	0	0	0
New Edubiase	35	59.8	19.5	4.20	11.8	4.1	0.3	0	0.3	0
Akim Oda	27	67.3	12.9	0.32	8.29	5.7	4.9	0	0	0.6
New Tafo	30	58.7	10.6	0	18.1	2.2	9.2	1.2	0	0
Dunkwa	37	76.5	4.8	0.62	14.1	0.5	0.7	2.0	0	0.8
Manso Amenfi	34	74.9	9.2	0.49	9.8	5.6	0	0	0	0
All Districts	197	66.2	11.5	0.99	14.3	3.5	2.6	0.6	0.06	0.2

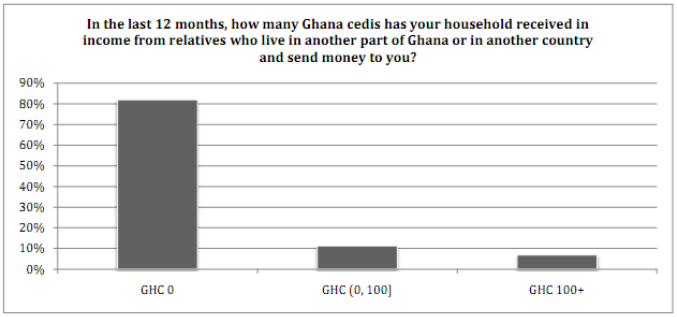
Different income sources (Barrientos & Akyere, 2012).

Figure 22: Farmers Reporting Zero Income from Non-Crop Sources



A very small percentage of farmers generate income from non-agricultural activities (Hainmueller et al. 2011).

Figure 23: Farmers Reporting Income from Remittances



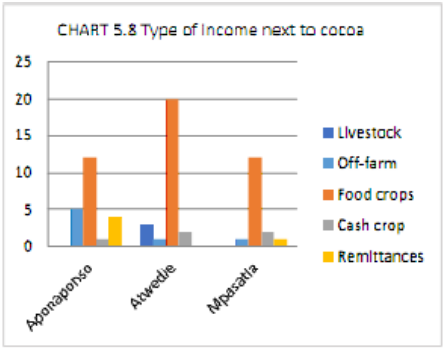
Only a very small percentage of farmers report having received remittances (Hainmueller et al. 2011).

Table 4: Main occupation of head of household

Main Occupation	Frequency	Percent
Farmer	247	90.5
Government Employee	11	4.0
Artisan/ Self-Employed/Petty Trader	15	5.5
Total	273	100

Source: Field Data 2011, N= 273

Main occupation of farmers (Asamoah et al. 2013).



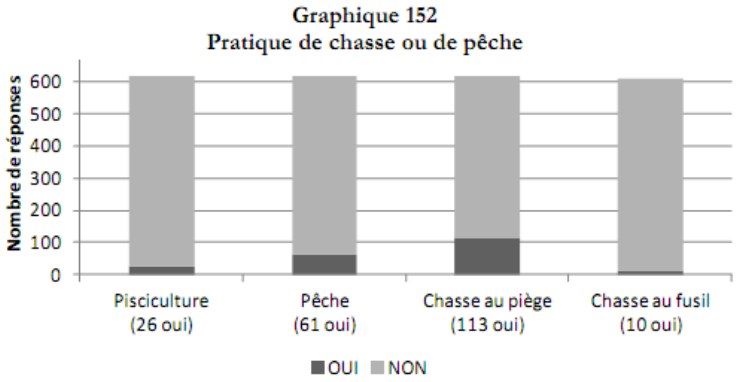
Income types in three UTZ Certified communities in Ashanti (Schouten, 2016).

- Farmers in the Western Region have poor access to the timber market and therefore often sell trees on their plantations to (mostly illegal) local unofficial chainsaw teams. The revenue from the sold trees is needed to have a source of revenue between the two main cocoa harvesting seasons (Ruf, 2011).
- Trees are also used to meet household needs such as fuel wood, construction material and fruits (Ruf, 2011).
- The seasonal nature of cocoa forces farmers to diversify their incomes. Especially women see diversification as imperative and engage in trading and the growing of other crops. Both men and women hire themselves out to work on other cocoa farms (Barrientos & Akyere, 2012).
- Cocoa farmers report that they work outside their own cocoa farms for about 15 hours a week during the busy cocoa season and 19 hours outside the busy season. The revenue from these activities was roughly 200 GHC in the last 12 months and thus only constitutes a small part of the total yearly revenue. Farmers also engage in unpaid activities (Hainmueller et al. 2011).
- Non-agricultural income sources included trading, masonry, carpentry and remittances (Steijn, 2016).
- The two most important non-crop sources of income are trading (GHC 360/year) and permanent employment (99 GHC/year) (Nelson et al. 2013).
- Other non-crop incomes are: making/selling soap, palm-wine tapping, fitting, masonry, carpentry, dressmaking and electrician work (for Western Region) (Nelson et al. 2013).
- Cocoa producers hardly invest savings in expansion of landholding due to the low availability of land. Cocoa revenue is therefore sooner invested in trading, crop-diversification, selling of agrochemicals, transportation or residential housing (Kolavalli et al. 2016).
- Gold mining is another alternative income source for farmers. However, gold mining is highly destructive for cocoa farms. Declining cocoa incomes and rural poverty often pushes young farmers to either sell their cocoa farm to a gold mining company or household heads start waged labour as gold miner while the rest of the household focuses on cocoa farming. In the latter case, income from gold mining is often used for fertiliser for cocoa. Another diversification strategy is to move to urban areas to seek income sources there (Oomes et al. 2016).
- The danger of gold mining as an income source is that it usually results into higher cash incomes, but only in the short term. The extracting of gold often damages the cocoa farm to a significant extent. This leads to farmers having no income source to fall back to once the gold has been extracted (Steijn, 2016).

Côte d'Ivoire

Income source	Amount/share hh income	Source	Note
Remittances Salaried employment	5% 4%	Calkins & Ngo (2005)	Older source
Trading Transportation Real estate	Unknown	Tanno (2012)	These alternative incomes arise from investment during good cocoa seasons (high price/productivity).
Labourer in palm oil	Unknown	FLA (2015)	Mostly girls/women who are paid in cash or in kind

Production palm oil	Unknown	FLA (2015)	Women acquire palm nut through own production or by other means to produce and sell palm oil
Remittances Waged labour Rent	Unknown	Maytak (2014)	Income sources are mentioned, but it is unknown how many farmers have these income sources or how important they are



Fishing and hunting are only practiced by a small number of farmers (Varlet & Kouamé, 2013).

Figure 8 – Number of household heads' activities (703 obs.)

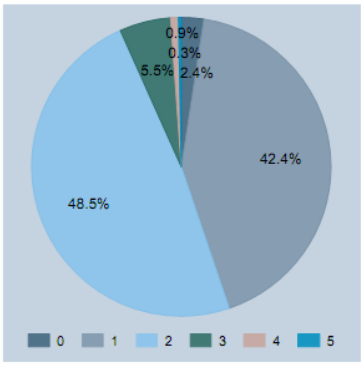


Figure 10 – Household heads' secondary activities (703obs.)

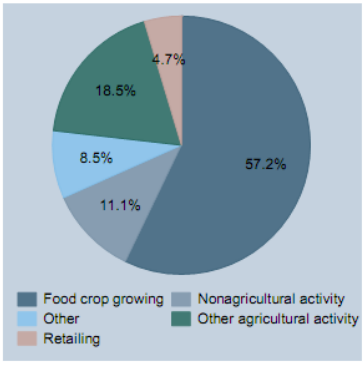


Figure 9 – Number of activities, women (813 obs.)

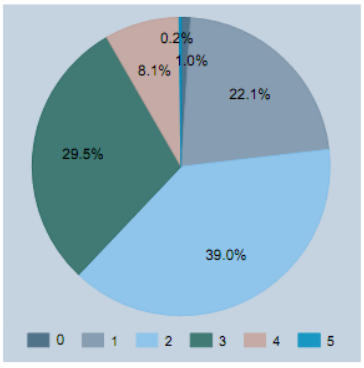


Table 4 – Women's activities

% of women who say that they:	
Do household chores/look after children	93.6
Grow food crops	61.5
Grow cash crops	24.9
Sell food crop surpluses	21.4
Have another income-generating activity (retailing, restaurant, etc.)	11.2
Have another nonagricultural activity	3.4

Other income activities in Cdl (Balineau et al. 2017).

Descriptives

- Most farmers have diversified their incomes, but most of them appear to do so in other agricultural crops or in agriculture related waged jobs. There are no clear figures on the percentage of total income that comes from non-agricultural sources. It is also likely that most farmers do not benefit from remittances (note from desk study author).
- Non-farm incomes allow farmers or non-farmers—including bureaucrats and other white-collar managers—to invest in diversified crops whose planting material is expensive. They can do so more easily than aging smallholders whose incomes from their main crops are in decline (Ruf & Schrotz, 2015).
- Throughout the developing world, young people leave rural areas to try their luck in the cities. But in times of economic crisis, they are often unsuccessful in finding employment and end up back in the village and the farm, usually with a level of education higher than that of the average villager. While some do not fit back into rural life, others try to take advantage of a rent. Nevertheless, at least some of them return with more openness to change and innovation. Chambon and Mokoko describe this situation in Cameroon where liberalization of the cocoa sector resulted in a sharp increase in that crop's price. This motivated young people to return to their villages to set up cocoa farms. They brought fresh life and a new dynamism into the old cocoa farms, which they soon diversified by adopting new crops such as oil palm and rubber. We also find the same phenomenon in Côte d'Ivoire with oil palm in the 1990s (Ruf & Schrotz, 2015).

Migration

Côte d'Ivoire

- Lambert et al. (2014) have found that immigrants from Burkina Faso and Mali are far worse off than their Ivorian counterparts. Severe poverty occurs mostly among migrants from Mali and Burkina Faso working on cocoa farms. These migrants are often poorly educated, do not speak the local language and rely on non-permanent work. The workers often receive wages far below the national minimum wage (4$ a day) as the farmers that employ them make poverty incomes themselves. Furthermore, the children of migrant workers often join their parents to Côte d'Ivoire and are unable to attend school due to language barriers or lack of income (Lambert al. 2014).
- Tanno (2012) report low literacy rates among Burkinabé migrants in Côte d'Ivoire.
- Smith-Dumont et al. (2014), report more positively regarding migrants, namely that migrants own farms that are generally larger than that of autochthones (for Côte d'Ivoire).
- Ruf (2011) found that, overall, migrant farmers more often opt for zero-shade cocoa production than autochthone farmers.

Household characteristics

Household size

Definitions

- Ingram et al. (2014) define household as 'the number of people the farmer takes care of'.
- Varlet & Kouamé (2013) define the household as the 'number of people to feed'. Maytak (2014) definition is 'the number of family members living on the farm'.
- Studies can either focus on household size or on the number of dependants. A dependant is defined as: 'A dependant is defined as someone who depends on you for financial support, such as a child or a family member who does not work' (Cambridge dictionary, 2017).

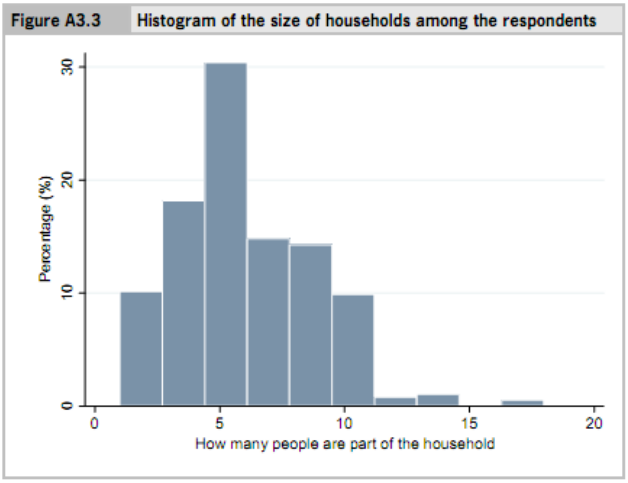
Ghana

Mean household size	Region/other	Source	Note
6	Mean Ashanti, Western, Brong-Ahafo	Waarts et al. (2013)	Western has smaller household
5-6	Mean for Ghana	Hainmueller et al. (2011)	-
1-5 6-10 11-15 16-20	54,7% of respondents (n=150) 38,7% 5,3% 1,3%	Kumi & Daymond (2015)	No mean size reported
5	Both certified and uncertified	Nelson et al. (2013)	-
5	Mean for Ashanti, Western & Brong-Ahafo	Kolavalli et al. (2016)	-
4,4 4,3 4,4	Ashanti Western Mean for both regions	Vigneri et al. (2016)	Means based on 4 districts in Ashanti + 2 in Western Region

Table 5.4a: Distribution of household size by cocoa region

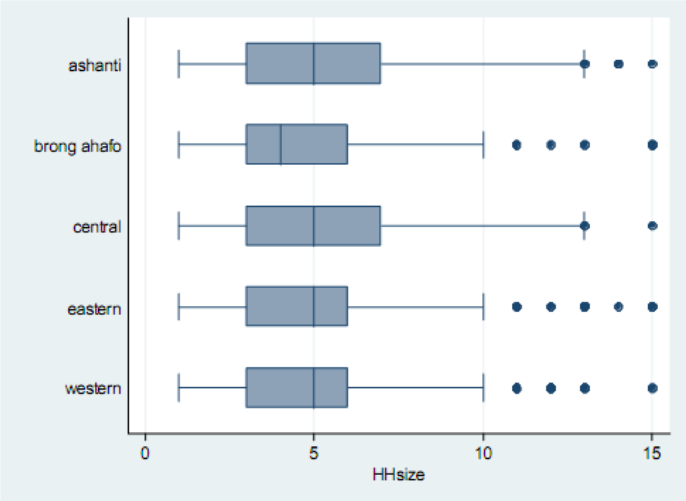
	Household size by ranges (persons)				
Region	1–3	4–6	7–9	10 and above	Total
Ashanti	10 (13.5%)	33 (44.6%)	25 (33.8%)	6 (8.1%)	74 (100.0%)
Eastern	15 (22.1%)	25 (36.8%)	17 (25.0%)	11 (16.2%)	68 (100.0%)
Western	9 (12.0%)	31 (41.3%)	21 (28.0%)	14 (18.7%)	75 (100.0%)
Total	34 (15.7%)	89 (41.0%)	63 (29.0%)	31 (14.3%)	217(100.0%)

Mean household sizes per region (Barrientos & Akyere, 2012).



Household sizes (Waarts et al. 2013).

Figure 3: Household Size



Hainmueller et al. (2011).

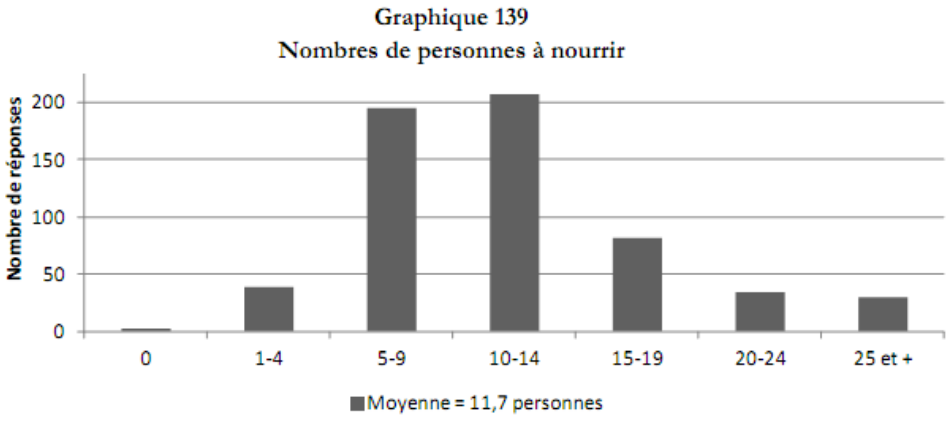
Descriptives

- Aneani et al. (2011) argue that household labour in Ghana is underused. Using more household members on the cocoa farm should lead to an increase in farm output.
- More information on household labour can be found under '**Labour'.**

Côte d'Ivoire

Mean household size	Region/other	Source	Note
11	Mean for CdI	Ingram et al. (2014)	Is about 'amount of people the farmer takes care of'
6,52 5,15 4,4	Baoulé Bakwé Burkinabé	Tanno (2012)	
5,8	Indenié-Djuablin	Vigneri et al. (2016)	-

7,31 5,98 5,38 6,21	Nawa Loh-Djibua Haut-Sassandra Mean for all four		
3,75 4,07 3,49 2,87 3,63	Indenié-Djuablin Nawa Loh-Djibua Haut-Sassandra Mean for all four	Vigneri et al. (2016)	Adults in household >17
2,05 3,23 2,49 2,51 2,58	Indenié-Djuablin Nawa Loh-Djibua Haut-Sassandra Mean for all four		Number of children in the household <17
6,07 6,63 6,53	100-250 kg/ha 251-599 kg/ha >600 kg/ha	Vigneri et al. (2016)	Household size by yield
10 7 13 7,3	Study A Study B Study C Study E	Maytak (2014)	Synthesis report on other studies.



Number of people to feed (Varlet & Kouamé, 2013).

Age of farmers

Ghana

Mean age	Region/other	Source	Note:
51,5	Mean for Ghana	Aneani et al. (2011a)	Respondents
55	Mean for Ghana	Baah & Anchinarah (2010)	Respondents
51	Mean for Ghana	Barrientos & Akyere (2012)	Respondents
55	Mean for district in Eastern	Dormon et al. (2004)	Respondents
49,5	Mean for Ghana	Waarts et al. (2013)	Respondents
51	Mean for Ghana	Hainmueller et al. (2011)	Respondents
50	Median for Ghana	Hainmueller et al. (2011)	Household heads
55	Estimate for Ghana	Anon (1999) in Dormon (2006)	Cocoa farmers in general
48	Mean for Ghana	Anang (2016)	Respondents
51	Mean for Ghana	Aneani et al (2011b)	Respondents
48,7	Mean for Ghana	Asamoah et al. (2013)	Household heads

55,81	Mean for 6 communities in Ashanti region	Steijn (2016)	Respondents
51	Mean for West Africa	Barry Callebaut (2014)	?
53	Mean for Ghana	Boahene et al. (1999)	Respondents
47,8	Mean for Ghana	Tulane University (2015)	Household heads
> 50	Mean for Ghana	Laven & Boomsma (2012)	?
52 47,3 49,08	Ashanti Western Region Mean for both regions	Vigneri et al. (2016)	Respondents
20-30 31-40 41-50 51-60 60+	11,2% of respondents (n=160) 14,4% 22,5% 19,4% 32,5%	Bosompen & Mensah (2012)	Respondents (No mean age mentioned)

Table A3.2 The distribution of respondents in different age groups

Age of the respondent	Frequency	Percentage
age ≤ 20 years	2	0.5%
20 ≤ age < 40 years old	102	27.1%
40 ≤ age < 60 years old	201	53.5%
60 ≤ age < 80 years old	67	17.8%
age > 80 years old	4	1.1%
Total	376	100%

Age distribution across sample (Waarts et al. 2013).

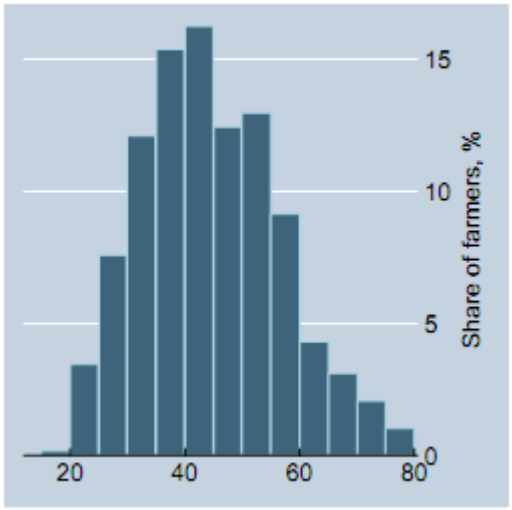
Descriptives:

- Old age of farmers is associated with a potential decrease in output as old farmers may no longer be able to perform certain tasks (such as pruning of mistletoe). This would increase the reliance on household or paid labour (Aneani et al. 2011).
- Old age of farmers is associated with lower yields/ha and lower adoption rates of new innovative production technologies (Barrientos & Akyere, 2012).
- Most important factors influencing net cocoa revenue are productivity, access to extension service, and the age of the cocoa farmer. Where increasing age leads to lower incomes from cocoa (Barrientos & Akyere, 2012).
- The age of the farmer is significantly positively correlated with price satisfaction (price satisfaction increases with age) (Anang, 2016).
- Older farmers have a lower technology uptake. This is likely due to either reducing investment in cocoa or that older farmers have more trouble introducing new technologies (Oomes et al. 2016).
- It is often assumed that young farmers are more innovative and thus are more likely to diversify their crops (or those of their fathers) but empirical evidence is less clear-cut (Ruf & Schrotz, 2015).

Côte d'Ivoire

Mean age	Region/other	Source	Note
46	Mean for CdI	Ingram et al. (2014)	Respondents
43	Mean for CdI	Tulane University (2015)	Household heads
50 54 45	Baoulé Bakwé Burkinabé	Tanno (2012)	Source compares migrant groups. Ages are for respondents
47,14 46,50 47,70 46,79 47,18	Indénié-Djuablin Nawa Loh-Djiboua Haut-Sassandra Mean for all four	Vigneri et al. (2016)	Respondents
46,8 35 Fem/ 45 male 47	Study A Study C Study D	Maytak (2014)	Synthesis report on various studies. Not all studies mention mean age (i.e. missing study B)
45	Programme participants	WUR (2014)	Respondents
49	Mean for CdI (n=800)	Assiri et al. (2009)	Respondents

Figure 6 – Age structure of cocoa farmers



Balineau et al. (2017).

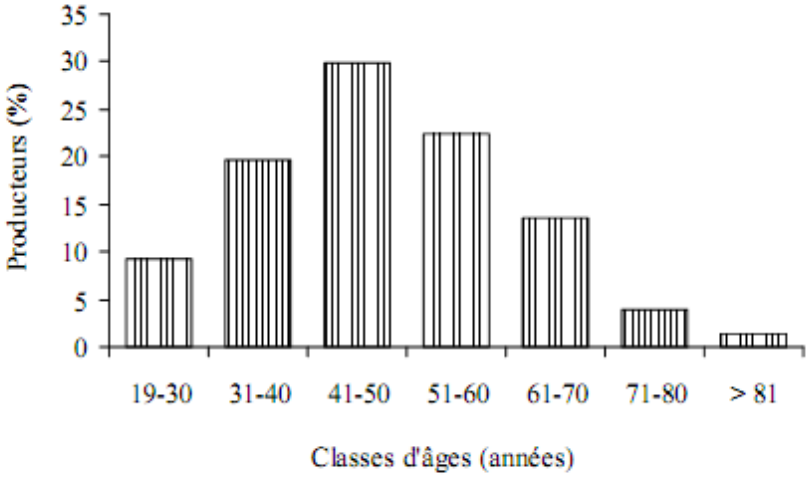
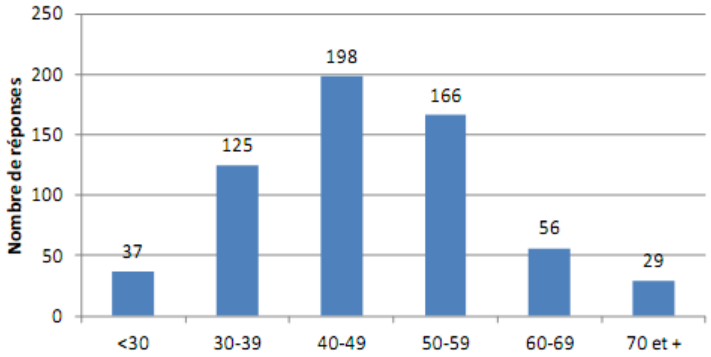


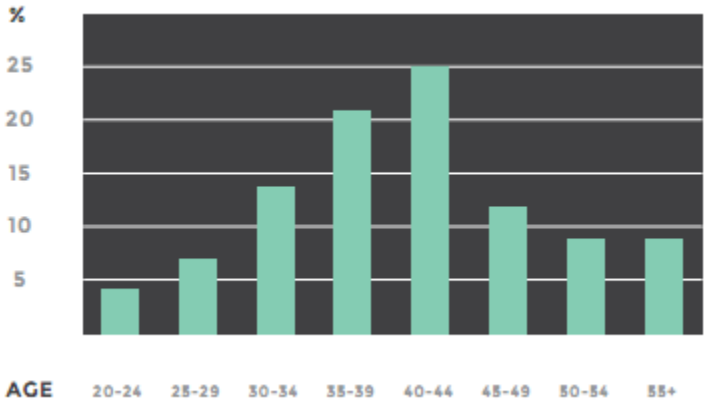
Figure 1: Pyramides des âges des producteurs de cacao.

Deheuvels et al. (2009).

Graphique 3
Répartition de l'échantillon par classe d'âge



Varlet & Kouamé (2013).



LAMBERT ET AL. (2014).

Marital status

Ghana and Côte d'Ivoire, unless indicated otherwise

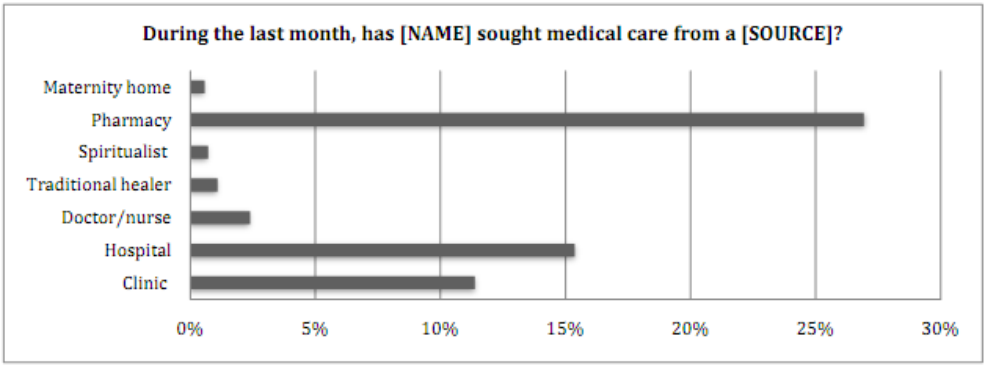
- Vignera & Sera (2016) identify four different statuses: not married (single), married, divorce/separated, and widowed.
- The Ghana Statistical Service (2015) and the Ivorian Ministry of Agriculture (i.e. République de Côte d'Ivoire, 2009) also make a distinction between formal and informal marriages. An informal marriage, also known as 'concubinage' or 'cohabitation', is not recognised as an official marriage in Ghana or in Côte d'Ivoire (Kumasi Metropolitan Assembly, 2017).
- Unofficial marriages may lead to problems in land security in terms of inheritance when the husband (landowner) passes away. In this case, the family of the deceased may lay claim to the land and the concubine has no legal claim to the land as the marriage was not official (WILDAF, 2016).
- Another form of marital status is a polygamous marriage, where a man has multiple wives (never the other way around). Varlet & Kouamé (2013) report that 46% of their sample is in a polygamous marriage (**for Côte d'Ivoire**). An important reason to have multiple wives is to increase the household labour force since women offer an important contribution to labour tasks related to cocoa production (and farming in general).
- According to WILDAF (2016) and Higgins & Fenrich (2012), land access in **Ghana** is easier for married women compared to single, divorced or widowed women. This is because they can access land through their husbands, who cede part of land to their spouses. However, the land accessed in this fashion in **Côte d'Ivoire** is usually of poor quality and the husbands do not allow for the production of perennial crops because the women are not the official landowners (Varlet & Kouamé, 2013). In Ghana, married women access smaller pieces land that are of lesser quality because women traditionally grow food crops, which does not require large or quality parcels (Higgins & Fenrich, 2012).
- Married women can more easily access land through purchase or through sharecropping. This is because women require a male witness (husband or male family member) for the signing of the contract, and unmarried women are less likely to be supported by a male witness (WILDAF, 2016).
- Takane (2000) finds that marital status is important for labour tasks on the farm, because spouses support their husbands in farming tasks. Unmarried men cannot rely on a spouse for support in farming and therefore need to rely more on their own labour or, if possible, on family or hired labour.

Health

Ghana

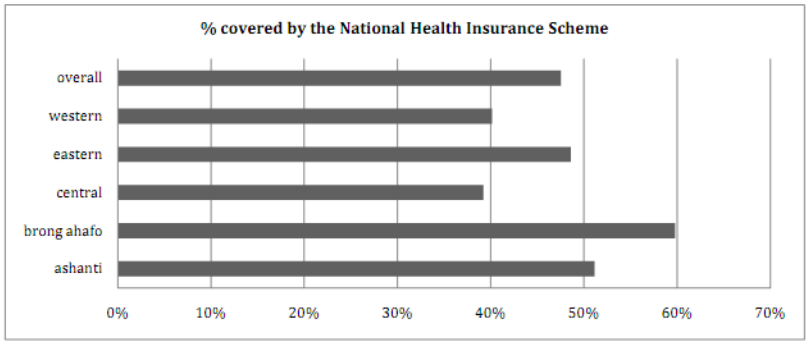
- Most of the communities in cocoa growing areas do not have access to health facilities. The nearest health facility is on average 10 km away. The roads and lack of transport can make healthcare a big challenge as the sick and injured need to be carried on bikes (Barrientos & Akyere, 2012).
-

Figure 42: Use of Alternative Types of Medical Care



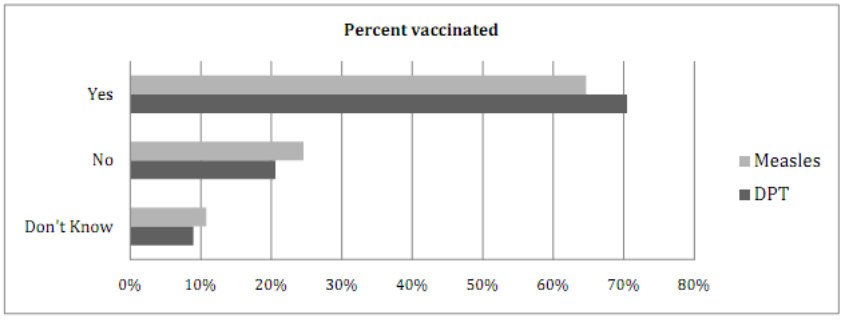
Hainmueller et al. (2011).

Figure 43: Health Insurance



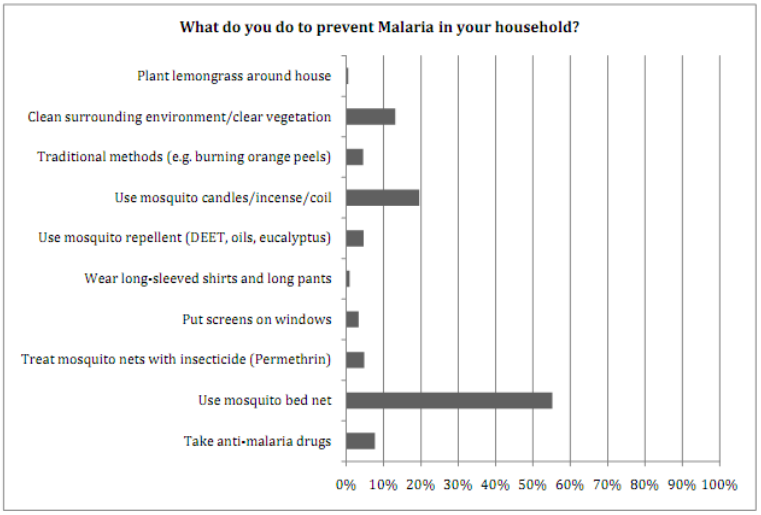
Hainmueller et al. (2011).

Figure 44: Rates of Vaccination for Measles, Diphtheria, Pertussis, and Tetanus



Hainmueller et al. (2011).

Figure 46: Anti-Malaria Measures

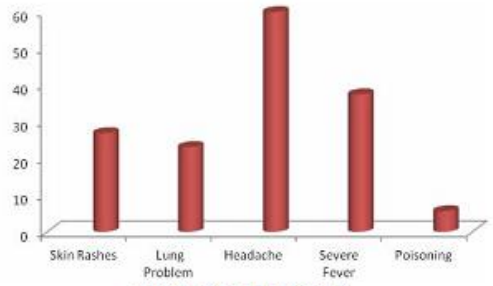


Hainmueller et al. (2011).

Table 6.8: Number of worker injuries from cocoa farming per year.

Type of injury	Number (n=106)	Percent of injuries	Percent of farmers
Machete injuries	68	25,6%	72,3%
Back aches from heavy loads	58	21,8%	61,7%
Burn injuries	24	9%	25,5%
Respiratory problems	38	14,3%	40,4%
Skin damage or irritation	31	11,7%	33%
Eye irritation	47	17,7%	50%
Total:	266	100%	283%

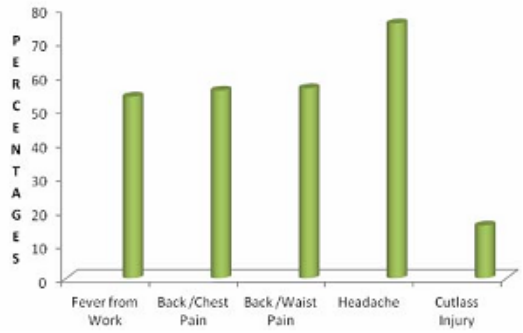
Steijn (2016).



Source: Field data (2011)

Figure-4. Hazards and injuries associated with application of agro-chemicals (n=160).

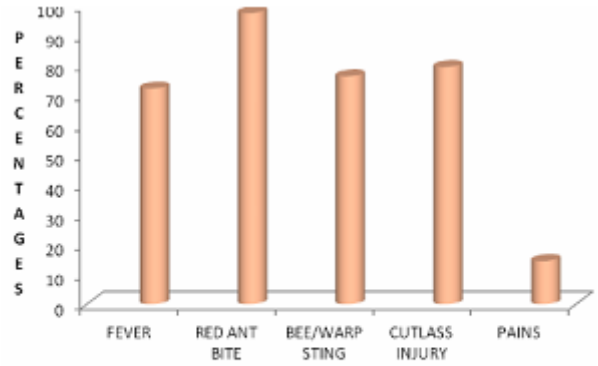
Bosompen & Mensah (2012).



Source: Field data (2011)

Figure-6. Hazards and injuries associated with post-harvest operations in cocoa production (n=160).

Bosompen & Mensah (2012).



Source: Field data (2011)

Figure-3. Hazards and injuries associated with maintenance of farm (n=160).

Health risks associated with cocoa farming (Bosompen & Mensah, 2012).

Table-4. Mode of treatment of hazards and injures faced by the respondents.

Hazard and Injury	Self medication (%)	Hospital treatment (%)	Both (%)
Cutlass injury	42.2	54.4	3.4
Snake bite	12.3	82.4	8.8
Scorpion sting	-	4.4	-
Stump and thorns- injury	62.5	37.5	-
Burns injury	46.2	53.8	-
Bee/warp sting	87.7	12.3	-
Skin rashes	54.8	45.2	-
Difficulty in breathing	48.6	51.4	-
Headache	30.8	64.7	4.5
Severe fever	36.4	59.5	4.1
Harvesting tool injury	41.9	58.1	-
Back and waist pains	54.5	39.7	5.8
Fallen object on eyes	74.1	23.5	2.5
Back and chest pains	58.3	41.7	-

n = 160, Source: Field data (2011)

Bosompen & Mensah (2012).

Côte d'Ivoire

- Availability of health facilities is an important factor in malnutrition in children (FLA, 2015).

- Children often have a delay in growth and health issues such anemia and malnutrition are widespread (FLA, 2015).

Table 24b. Injuries Experienced by Children While Working in Agriculture, Children 5-17 Years Working in Cocoa Production, in Côte d'Ivoire and Ghana, 2013/14

Percentage of children working in cocoa production	Côte d'Ivoire	Ghana
	2013/14	2013/14
Population of children working in cocoa production	1,303,009	957,398
Type of injury		
Wounds/cuts	36.7%	26.2%
Broken bones	0.3%	0.3%
Snake bites	1.1%	0.5%
Insect bites	18.5%	18.9%
Back pains	1.5%	11.2%
Muscle pains	11.0%	6.7%
Other pains	0.5%	2.2%
Burns	3.2%	1.6%
Skin itchiness or scratches	5.3%	25.9%
Other	0.7%	0.2%

Source: Tulane child survey 2013/14, weighted data, strata 1-3.

Tulane University (2015).

Household poverty/wealth

Ghana

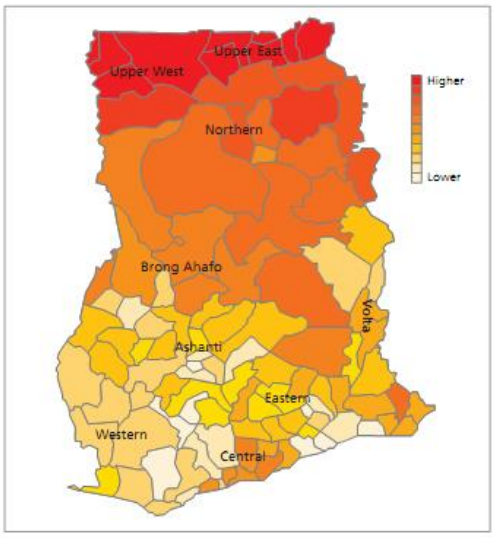
Definitions of living income and basic needs (Appelman, 2016, taken from Nikol, 2015):

- The aggregate of household incomes that should be sufficient to allow for i) a life of decent quality for all household members according to time- and place specific standards, ii) economic growth, and iii) economic resilience.
- Basic needs are :
    - Need for a nutritious, low cost diet, which is appropriate for culture and country.
    - Need for adequate clothing and footwear
    - Need for clean drinking water and sanitation
    - Need for education
    - Need for transportation and health care
    - Need for household furnishing and equipment.

Descriptives:

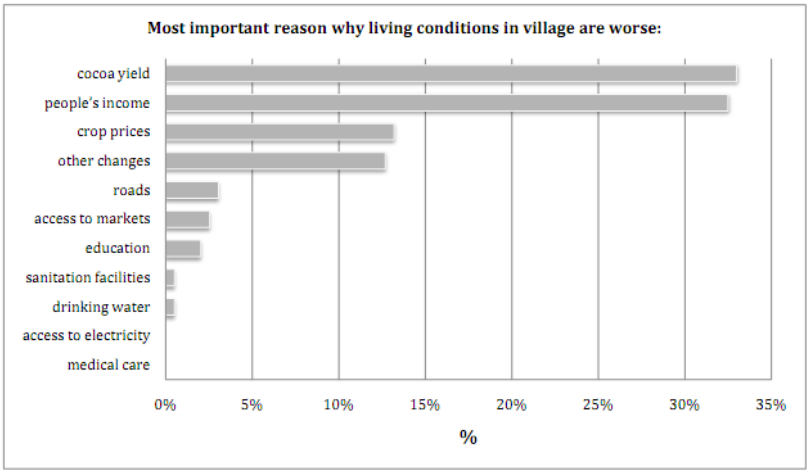
- Larger landholdings are associated with higher income, higher degree of income diversification and lower poverty levels (Wiggins & Leturque, 2011).
- The standard of living for each individual is measured as the total consumption expenditure per adult equivalent of the household to which he/she belongs as expressed in constant prices of Accra, January 2008. With this definition, the Ghana statistical service set two poverty lines at GH¢288.50 for extremely poor and GH¢370.90 for poor persons (Asamoah et al. 2013).

Figure 9: Ghana poverty map



Wiggins & Leturque (2011).

Figure 61: Causes of Decline in Living Conditions



Causes for declining living conditions (Hainmueller et al. 2011).

Table 6. Percentage of respondents living below the national poverty line in 2013 based on computed and updated from the national living standard survey 2006 (GLSS 5)

GLSS 5 poverty lines (2006)*per equivalent adult (GH¢) GH¢ 1 = $0.92	Computed GSS poverty lines in 2013 ** (GH¢)	Percentage of respondents living below poverty lines (field survey, 2013)***	Minimum wage index as at June 2013 GH¢ 5.24 /day * 264 working days per year (GH¢) ****	Percentage of population below minimum wage in 2013
Extremely poor 288.50	630.29 (288.50/0.92) *2.01	4.7%	GH¢ 1, 383.36	14%
Poor 370.90	810.33 (370.90/0.92) *2.01	8.0%		

Source: Authors' calculation using data from the GLSS 5 and Field Survey, 2013.
+ Two poverty lines used in the GLSS 5.++ Inflated value of GLSS 5 Upper and Lower poverty lines at the exchange rate as at June, 2013 ($1 = GH¢ 2.01).
+++ Percentage of respondents living below computed the national poverty lines based on farmers income.
++++Workers in Ghana work for 5 days a week so it is assumed that there are 22 working days in a month for each of the 12 months in a year (264 working days)

Poverty levels in cocoa producing households (Kumi & Daymond, 2015).

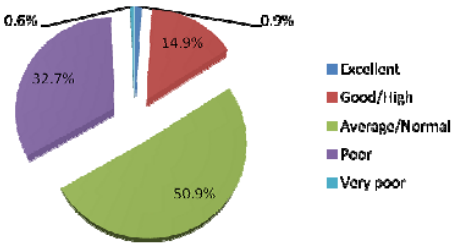


Fig. 1 Self -assessment of standard of living by respondents
Source: Field Data 2011, N= 637

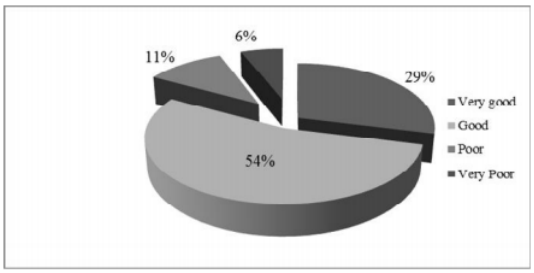
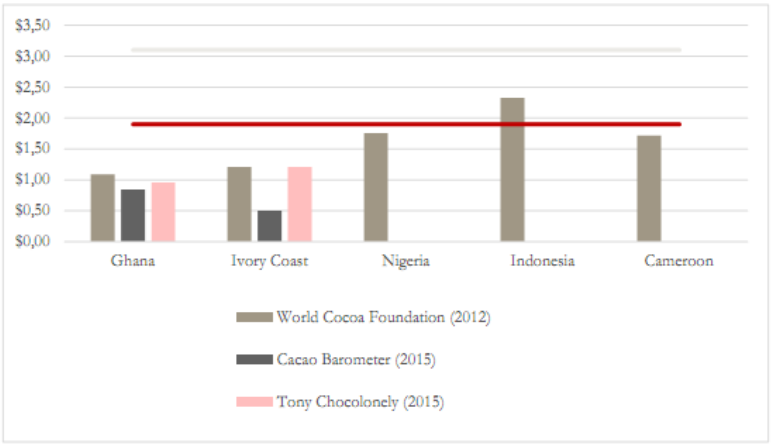


Fig. 7. Farmers perception about their poverty level and standards of living (n=150)

Self-assessed standard of living of cocoa farmers (Asamoah et al. 2013 (left): Kumi & Daymond, 2015 (right)).

Figure 6.2 Average per capita income of cocoa farmers lies below $2 per day



Source: SEO Amsterdam Economics

Daily income figures for cocoa farmers (Oomes et al. 2016).

Variable	Unit	Estimate			
		Current 2015/16	100% FOB	High yield	100% FOB + High yield
Farm size	*Ha*	2,47	2,47	2,47	2,47
Yield	*Kg/Ha*	420	420	800	800
Production (total)	*Kg/hh*	1037,4	1037,4	1976	1976
FOB price	*$/kg*	2,36	2,36	2,36	2,36
Farmgate price	*$/Kg*	1,75	2,36	1,75	2,36
Revenue cocoa	*$/hh*	1815	2448	3458	4663
Input costs	*$/hh*	300	300	500	500
Cocoa income	*$/hh*	1515	2148	2958	4163
% Cocoa of income		85	90	93	95
Non-cocoa income		227	227	227	227
Household income	*$/year*	1743	2376	3185	4390
Household size	*person*	5	5	5	5
Daily income	*$/person/day*	0,95	1,3	1,75	2,41
National poverty line	*$*	0,94	0,94	0,94	0,94
$ Extreme Poverty line WB	*$*	1,9	1,9	1,9	1,9
PPP extreme poverty line	*$PPP*	1,83	1,83	1,83	1,83
Poverty line WB	*$*	3,1	3,1	3,1	3,1
PPP poverty line	*$PPP*	2,98	2,98	2,98	2,98

Farmer incomes and poverty lines (Oomes et al. 2016).

Côte d'Ivoire

Common indicators of 'livelihood and well-being' (Maytak, 2014):

- Access to sufficient food
- Dietary diversity
- Food crops grown
- Source of water
- Distance to a source of water
- Access to sanitation
- Type of cooking fuel
- Ownership of livestock
- Share of income from cocoa as a portion of total household income
- Production of other cash crops
- Ownership of the farm
- Total household revenue and revenue from cocoa production
- Ownership of bank account
- Ownership of mobile phone and farm equipment
- Participation in a cooperative
- Cost of cocoa production
- Poverty rate

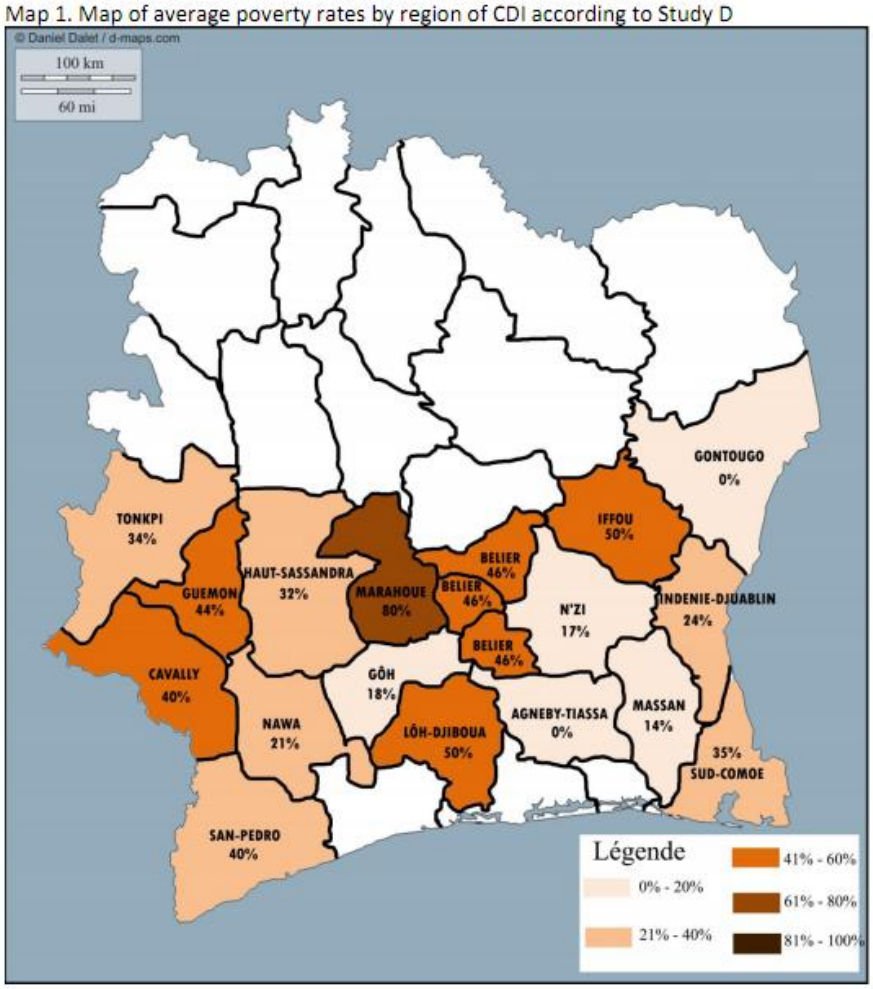
Descriptives:

- Household poverty and malnutrition can lead to a higher cost of healthcare, which would reduce the revenue available for other expenditures (e.g. food, investments etc.) (FLA, 2015).
- Severe poverty occurs mostly among migrants from Mali and Burkina Faso working on cocoa farms. These migrants are often poorly educated, do not speak the local language and have non-permanent work. The workers often receive wages far below the national minimum wage (4$ a day) as the farmers that employ them make poverty incomes themselves. Furthermore, the children of migrant workers often join their parents to CdI and are unable to attend school due to language barriers or lack of income (LAMBERT ET AL. 2014).

Study	Source of water	Access to sanitation	Source of energy/Cooking fuel
Study A	*60% well*	*84% and 89% use a pit latrine. About 6% have a formal toilet, with 1% of households having a flushing toilet.*	*30% use electricity, most households rely on batteries, kerosene and other gases. In CDC sites over 50% of HH use electricity. Electricity is more common among older HH heads.*
Study B	*61% well, 15% public pump, 11% surface water, 10% improved village water (HVA), 2% private tap, and 1% common (shared) tap*	*From 68% to 89% of farmers have access to a pit latrine. Less than 1% of farmers have access to a flushing toilet and 32% have no access to a toilet*	*96% collected wood for cooking fuel, 3% use purchased wood and 1% use coal*
Study C	*60% well*		-
Study D	*82% well. 35% of communities take water from rivers/springs*	*90% of farmers have access to sanitation facilities (no type of toilet specification)*	-
Study E	-	-	*Farmers don't have electricity on the farm (0%)*

Maytak (2014).

Map 1. Map of average poverty rates by region of CDI according to Study D



CdI poverty map (Maytak, 2014).

Table V.11: Descriptive standard of living statistics for hypothesis 9

Variables of cooperative impact on habitat &health	Living area/capita (m^2)	Total value of possessions (1 = boots- 50=auto)	Value of possessions per capita	Score of habitat quality (max= 31)	Distance to clinic/ health centre (km)	Diarrhoea in kids (%)	Malaria in kids (%)	Diarrhoea in adults (%)	Malaria in adults (%)
Whole sample	15.71	35.05	4.63	16.55	7.06	8.2%	35%	4.3%	25%
Members	16.43	35.00	4.50	16.36	7.32	7.9%	33.0%	4.1%	24%
Non-members	12.26	30.05	4.60	16.21	7.26	10.21%	40.02%	5.01%	30.14%
Control	17.92	36.09	4.91	**17.18**[b]	6.44	7.0%	33.02%	4.01%	22.83%
Côte d'Ivoire	23.05	40.02	5.61	17.35	2.56	10%	36.54%	4.0%	29.42%
Members	24.10	43.84	5.71	17.72	2.71	8.7%	36%	3.6%	27%
Non-members	17.83	**33.14**[c]	5.26	**16.74**[c]	**4.46**[c]	14.6%	39%	4.6%	**36%**[c]
Control	26.56	41.06	5.78	17.32	**0.32**[a]	7.0%	34%	3.3%	28%
Ghana	8.16	29.98	3.63	15.73	11.6	6.5	34 %	4.7%	21%
Members	8.53	25.99	3.26	14.97	12.06	7.1%	31%	4.3%	21%
Non-members	6.40	27.62	3.88	**15.64**[b]	10.21	6.0%	41%	5.5%	24%
Control	9.27	31.03	4.02	**17.03**[a]	12.55	5.8%	32%	4.7%	18%
By regional area									
Tiassale	13.36	39.90	6.41	14.42	4.46	11.8%	33%	4.2%	33%
Adzopé	9.12	34.58	4.13	17.68	1.78	10.1%	36%	3.4%	30%
Abendgourou	46.79	45.59	6.28	19.99	1.41	8.1%	40%	3.8%	25%
Tepah	9.35	25.21	3.20	16.15	7.24	7.6%	36%	9.7%	17%
Konongo	7.81	27.55	3.76	16.69	5.98	4.8%	31%	1.6%	22%
New Edubiase	7.34	37.10	3.92	14.35	21.70	7.2%	35%	2.9%	24%

a= significant at the 1% level, b = significant at the 5% level, c= significant at the 10% level.

Statistics for living standards for *Ghana* and *Côte d'Ivoire* (Calkins & Ngo, 2005).

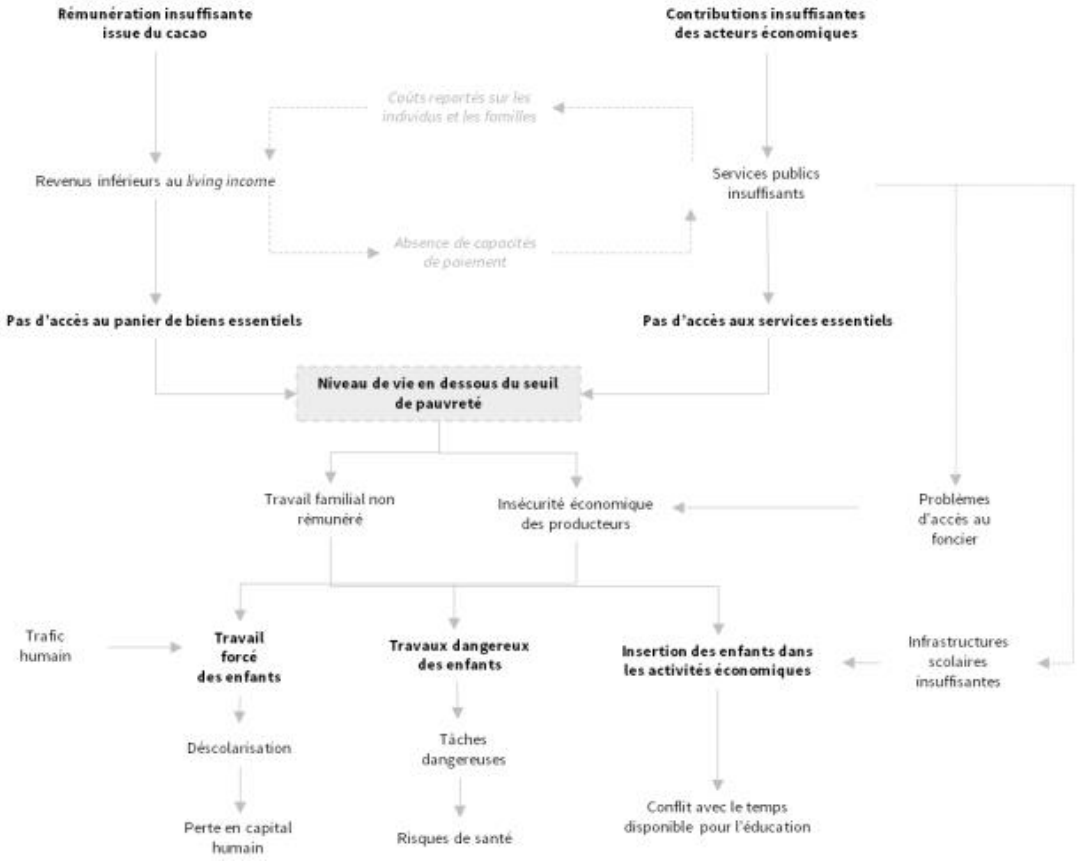


Figure 32. Chemins et boucles d'impacts lié au travail des enfants dans la filière cacao ivoirienne. Source : BASIC

Causes and outcomes of low standards of living in CdI (PFCE, 2016).

Cost of living (expenditures)

Ghana

- Typically, one household member goes to the market every week to buy food for 10 GHC on average (Hainmueller et al. 2011).
- The nearest water source is usually 4-10 minutes walk away. One household member gets water from this source 7 times a week on average. The monthly cost of water is about 1,2 GHC for boreholes, 0,2 GHC for wells, and 2,4 GHC for pipe borne water sources (Hainmueller et al. 2011).
- Positive effects of certification (higher yields, higher incomes) are eroded by an increased cost of living caused by inflation (Steijn, 2016).
- Results from Kumi & Daymond (2015) show that the household expenditures on food have steadily increased over the years. This leads to concerns about household food security levels, especially those that rely mostly on markets for their food (Kumi & Daymond, 2015).

Table 8: Household expenditure (GHc) of respondents for the year 2010

ITEM	N	Minimum	Maximum	Mean	SD
Food	637	600.00	14609.00	2890.58	1843.31
Toiletries	637	24.00	800.00	171.63	136.04
Rent	93	30.00	200.00	96.70	21.30
Electricity	238	30.00	984.00	154.30	177.31
Gas/Charcoal	93	35.00	384.00	156.61	96.28
Health	617	8.00	840.00	69.89	115.46
Water bills	213	30.00	400.00	107.86	84.32
Cloths	637	20.00	2000.00	261.87	269.15
Funeral	**629**	**20.00**	**1200.00**	**153.36**	**200.27**
Church	**607**	**30.00**	**2400.00**	**217.37**	**302.47**
Transport	**637**	**10.00**	**1200.00**	**234.51**	**211.26**
Cell phone	**604**	**20.00**	**1800.00**	**230.03**	**228.70**
Others(gifts etc)	**289**	**10.00**	**1620.00**	**266.66**	**294.24**
Total	**637**	**1183.00**	**23776.00**	**5329.90**	**2981.60**

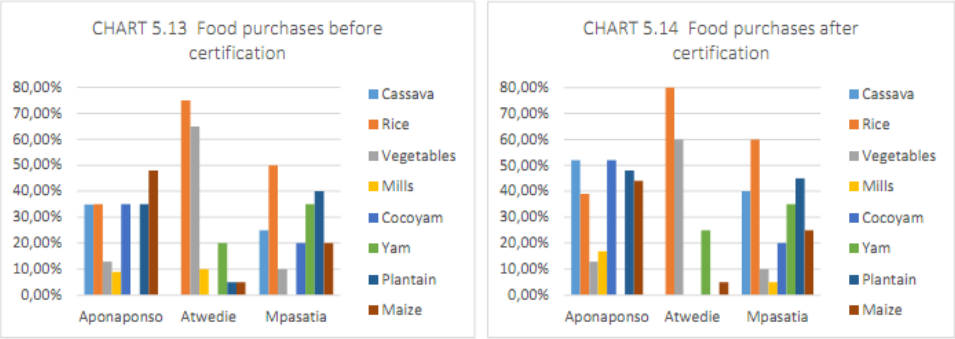
Source: Field Data 2011, N= 637

Household expenditures (Asamoah et al. 2013).

Table 5.12: Total annual household expenditure by activity of head of household (million cedis)

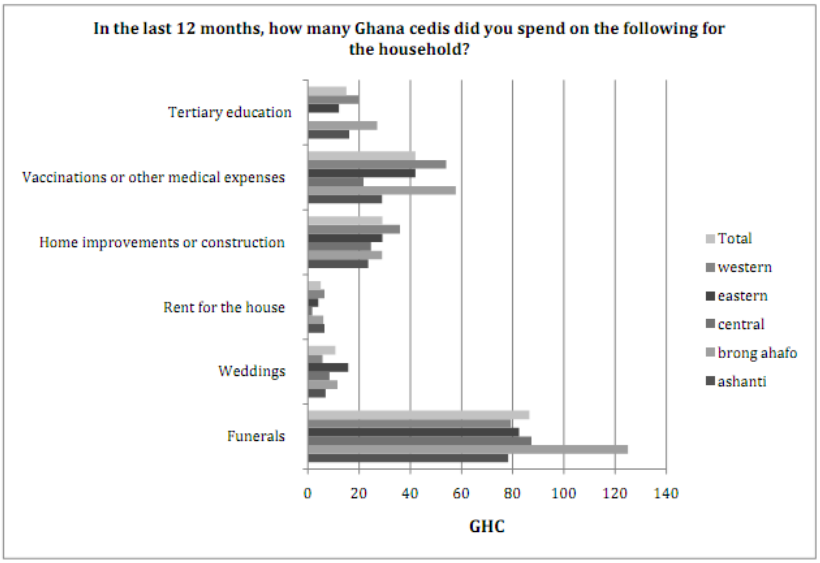
Total yearly household expenditure range (million cedis)	Main activity of head of household					Total
	Owner operator	Caretaker operator	Waged farm worker	Business operator	Unemployed	
5.00	4 (80.0%)	1 (20.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (100.0%)
5.01–10.0	12 (92.3%)	0 (0.0%)	0 (0.0%)	1 (7.7%)	0 (0.0%)	13 (100.0%)
10.01–15.0	31 (79.5%)	6 (15.4%)	1 (2.6%)	0 (0.0%)	1 (2.6%)	39 (100.0%)
15.01–20.0	41 (83.7%)	4 (8.2%)	1 (2.0%)	3 (6.1%)	0 (0.0%)	49 (100.0%)
20.01–25.0	30 (81.1%)	4 (10.8%)	0 (0.0%)	3 (8.1%)	0 (0.0%)	37 (100.0%)
>25.0	59 (86.8%)	7 (10.3%)	0 (0.0%)	2 (2.9%)	0 (0.0%)	68 (100.0%)
Total	177 (83.9%)	22 (10.4%)	2 (0.9%)	9 (4.3%)	1 (0.5%)	211(100.0%)

Older source (2005-2006) (Barrientos & Akyere, 2012).



Food purchases before after certification (Ashanti Region) (Schouten, 2016).

Figure 27: Annual Long-Term Expenditures per Household by Region



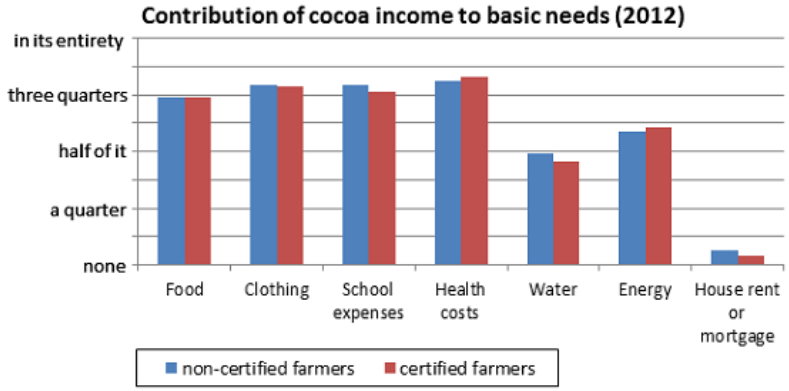
Hainmueller et al. (2011).

Table 4. Household annual expenditure (GH¢) for the 2012/2013 cocoa growing season (n=150)

Expenditure Item	Number of farmers	Minimum	Maximum	Mean	Median	Std. deviation
Root & tuber crops	150	50.00	5,000.00	1,188.41	864.00	1,176.34
Bread and cereals	150	15.00	900.00	150.50	100.00	175.29
Meat and fish	150	30.00	980.00	160.23	100.00	170.02
Oil, fats, vegetables	150	5.00	120.00	30.53	25.00	22.43
Clothing & footwear	150	10.00	1,500.00	257.94	150.00	264.95
Charcoal & gas	150	10.00	300.00	49.34	37.50	41.64
Water & electricity	150	20.00	750.00	168.31	100.00	164.02
Rental& housing	150	10.00	700.00	173.36	137.50	122.34
Toiletries	150	10.00	500.00	141.76	100.00	110.91
Funerals	150	10.00	2,000.00	248.06	150.00	287.30
Transport & Comm.	150	10.00	1,700.00	194.63	110.00	259.37
Church	150	10.00	1,000.00	168.48	120.00	164.24
Health	150	10.00	540.00	91.52	70.00	82.76
Education	150	10.00	600.00	116.50	100.00	98.68
Miscellaneous	150	10.00	4,500.00	243.43	120.00	427.42
Total	**150**	**220**	**24,090.00**	**3,383.00**	**2,284.00**	**3,567.71**

Kumi & Daymond (2015).

Figure 14 Contribution of cocoa income to basic needs (2012)



Nelson et al. (2013).

Table 12 Household expenditures in 2010 and 2012

	Non-certified farmers			FT-certified farmers		
	2010	2012	Sig	2010	2012	Sig
N	*349*	*344*		*394*	*352*	
Food (GHC)	153	291	***	118	248	***
Health (GHC)	27	71	***	17	52	***
Education (GHC)	91	210	***	76	198	***
Farm (GHC)	88	179	***	74	131	**

Sig = Significance of differences between groups (t-test): ns = not significant, *P≤0.05, **P≤0.01, *** P≤ 0.001

Nelson et al. (2013).

Table 13:– Percentage of respondents investing cocoa income in the following;

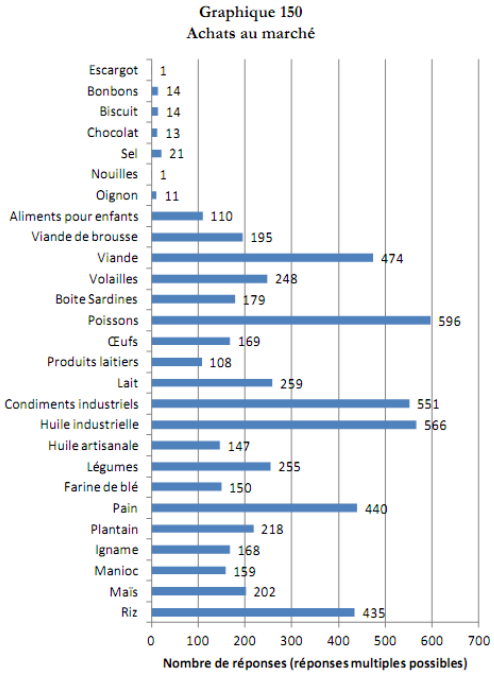
	2010	2012	Sig
N	691	697	
Cocoa income used for investments (%)	89%	94%	***
Children's education	77%	88%	***
Household durables	47%	52%	*
House improvements	38%	57%	***
Land acquisition	31%	19%	***
Land improvements / investments	36%	47%	***
Farming activities or inputs	78%	86%	***
Livestock	31%	22%	***
New livelihood activities	14%	9%	***
Ranking of importance: 1 = most important, 2 = second most important, etc			
Children's education	1.31	1.19	***
Household durables	3.48	3.80	***
House improvements	3.00	3.24	ns
Land acquisition	2.99	2.91	ns
Land improvements / investments	2.83	2.98	*
Farming activities or inputs	2.32	2.38	ns
Livestock	3.76	4.19	*
New livelihood activities	4.02	3.38	ns

Sig = Significance of differences between groups (based on Mann-Whitney test): ns = not significant, *P≤0.05, **P≤0.01, *** P≤ 0.001

Nelson et al. (2013).

Côte d'Ivoire

- Each harvest season, farmers have a core set of production costs that must be met; pesticide and fertiliser use, land rent, planting material, costs for training, transportation and storage, partly membership fees to a cooperative, maintenance, informal road tax etc. Some of these recurring operational costs are largely under-emphasised. Many farmers are sharecroppers or tenants of the land they till, and pay for the use of the land either in cash or with a percentage of their harvested cocoa. These costs are seldom incorporated in current calculations. Additionally to family labour, there is widespread use of (seasonal) hired labour, especially in harvest time, which is likewise regularly not applied in current calculation (Hütz-Adams & Fountain, 2015).
- The insufficient revenue from cocoa and the insufficient production of food crops to meet subsistence needs leads to food insecurity. The situation is further exacerbated by a relatively high cost of living caused by the linking of the CFA to the Euro (PFCE, 2016).
- Weak purchasing power caused by low incomes in combination with high food prices is the primary cause of food insecurity (FLA, 2015).
-



Market purchases (Varlet & Kouamé, 2013).

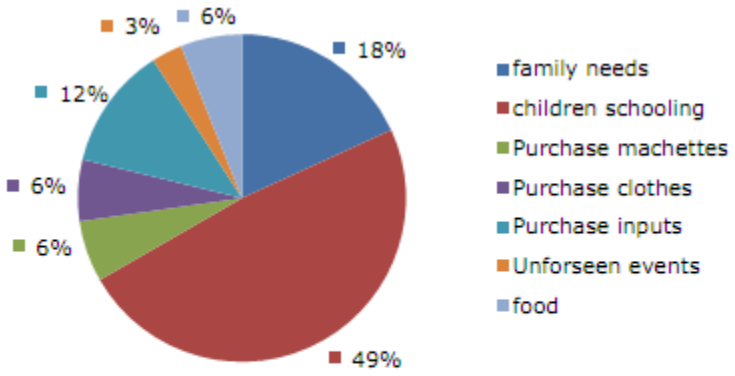
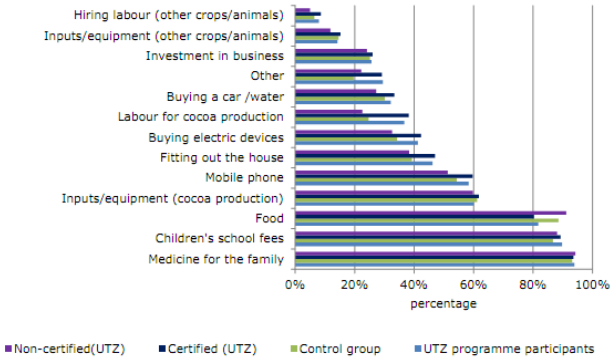


Figure 17 *Use of cocoa revenues by farmers.*
Source: Focus Group (121 participants)

Ingram et al. (2014).



(N = 937 multiple response possible)

Figure 50 *Farmers' spending of cocoa farm revenues.*

Ingram et al. (2013).

Année de calcul : 2014	Producteurs conventionnels
Taille moyenne de la parcelle de cacao	5,69 ha
Rendement moyen	444 kg/ha
Prix moyen reçu	750 FCFA/kg
Coûts moyens de production par exploitation	375 000 FCFA
Revenu annuel issu de la vente du cacao	1 545 000 FCFA
Revenu annuel total (y compris autres activités)	1 809 500 FCFA
Nombre moyen de personnes par foyer	10,9
Revenu annuel moyen par personne	170 300 FCFA
Coût du panier de biens essentiels annuel au Cameroun	272 000 FCFA
Coût du panier de biens essentiels annuel au Ghana	290 000 FCFA
Coût du panier de biens essentiels estimé Cote d'Ivoire	281 000 FCFA

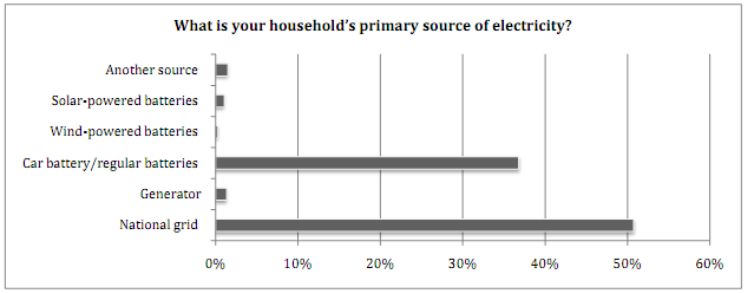
Figure 39. Estimation des revenus des producteurs conventionnels en Côte d'Ivoire.
Source : BASIC, d'après les données de M. A. Schweisguth, F. Ruf, GLSS6, ECAM 4 et la Banque Mondiale

PFCE (2016).

Household assets

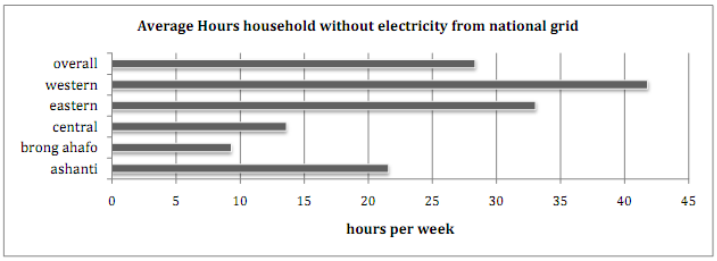
Ghana:

Figure 32: Source of Electricity (Households Reporting Access)



Hainmueller et al. (2011).

Figure 33: Power Outages



Hainmueller et al. (2011).

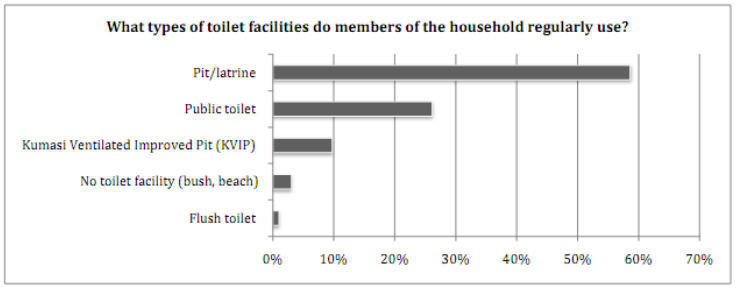
Table 11 Changes in household assets

2012 and 2010 survey data	Non-certified farmers			FT-certified farmers		
	2010	2012	Sig	2010	2012	Sig
N	*349*	*344*		*394*	*348*	
Land owned	12.37	17.60	***	15.22	15.80	ns
Land rented	1.20	0.73	ns	1.45	0.29	***
Land planted to cocoa	12.08	12.52	ns	13.02	10.94	*
Area of other crops	3.29	5.45	*	3.53	5.19	**
Number of cows	0.12	0.21	ns	0.30	0.13	ns
Number of chickens	13.63	21.87	ns	15.8	13.3	ns
Number of pigs	0.60	0.26	ns	0.14	0.24	ns
Number of goats	2.33	2.97	ns	2.49	3.14	ns
Number of training events	0.04	0.28	***	0.35	0.72	***
Number of bikes	0.28	0.23	ns	0.27	0.17	*
Number of motor bikes	0.07	0.16	***	0.05	0.13	***
Number of pickups	0.05	0.06	ns	0.05	0.06	ns
Number of radios	1.15	0.93	**	1.10	0.94	*
Number of TVs	0.42	0.42	ns	0.39	0.40	ns

Sig = Significance of differences between groups: ns = not significant, *P≤0.05, **P≤0.01, *** P≤ 0.001

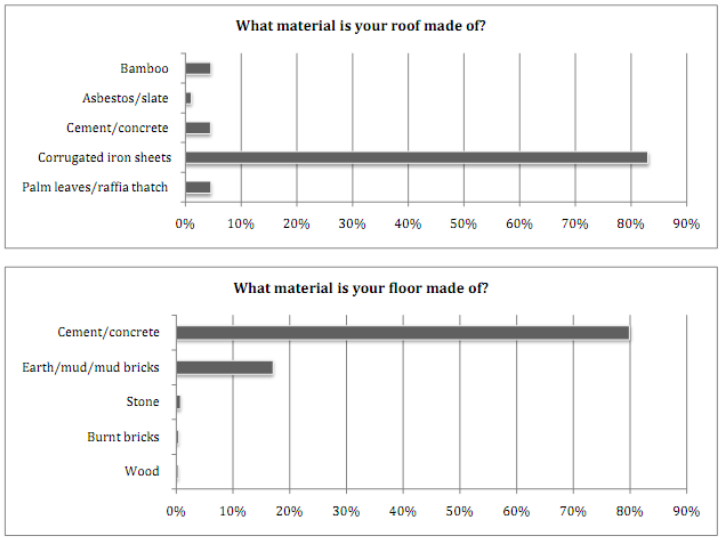
Household assets (Nelson et al. 2013).

Figure 37: Toilet Facilities



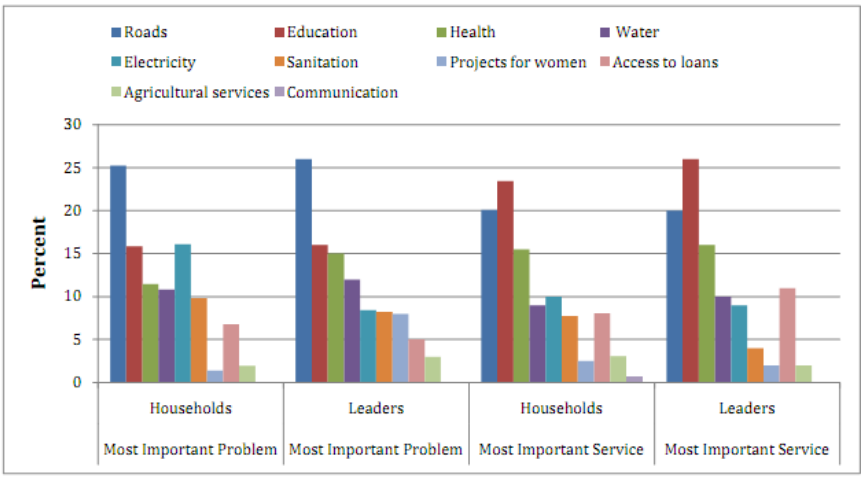
Hainmueller et al. (2011).

Figure 38: Housing Materials



Hainmueller et al. (2011).

Figure 58: Most Important Problems and Services Needed



Hainmueller et al. (2011).

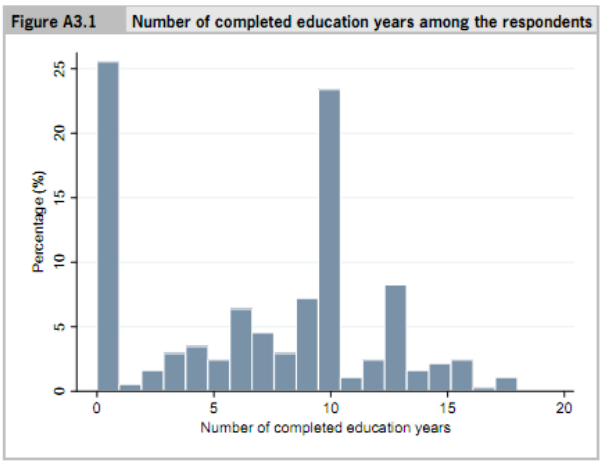
Education

Ghana

Descriptives:

- Young and more educated farmers usually have/work on farms that are more productive than that of older farmers. Younger and more educated farmers are also more likely to adopt new farming technologies (Barrientos & Akyere, 2012).
- Farmers with a higher education level are associated with higher degrees of technological input as they have better capabilities to understand new techniques (Oomes et al. 2016).

- The sources use different methods and categorisations to measure education levels. Waarts et al. (2013) and Vigneri et al. (2016) use 'years of completed education', while most sources (e.g.. Aneani et al. (2011), Kumi & Daymond (2015), FAO (2012) and others) look at the type/level of education completed (i.e. primary/secondary/tertiary education). (See figures below)(**same goes for CdI)**.
- Education enables the individual to critically assess situations particular issues of economic importance. Educated farmers who are well informed are likely to make better informed decisions and the knowledge of the price system could influence their perceptions about price. In addition, educated farmers have a higher opportunity cost of labour and will therefore anticipate higher rewards for their labour. It is therefore anticipated that educated farmers will be less satisfied with the price of cocoa. As the educated farmers interact with other workers in paid employment, this is likely to influence their perceptions (Anang, 2016).
- The sample (n=298) used by Aneani et al. (2011) showed that 78,5% of farmers were illiterate, Nelson et al. (2013) found an illiteracy rate of 65% with no significant difference between certified and non-certified farmers. Hiscox & Goldstein (2014) found that literate farmers usually attain higher levels of income from cocoa (see figure below).



Waarts et al. (2013)

Table-1. Educational background of respondents.

Educational level	Frequency	Percentage
No formal education	36	22.5
Basic education	97	60.6
Secondary education	10	6.3
Tertiary education	17	10.6
Total	160	100

n=160, Source: Field data (2011)

Bosompen & Mensah (2012).

Table 5.3: Educational level of household head

Educational attainment	Frequency	%
Basic	162	74.7
Post-basic	25	11.5
Uneducated	28	12.9
Artisan	1	0.5
Total	216	99.6
Missing System	1	0.4
Total	217	100.0

Barrientos & Akyere (2012).

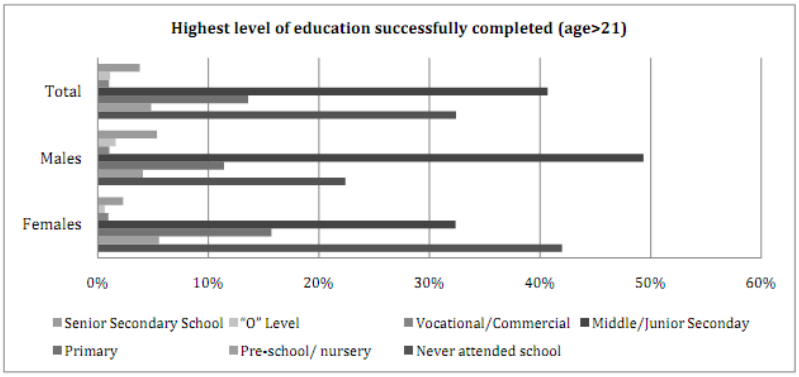
Table 2: Level of education of head of household

Level of Education	Frequency	Percent
No/non formal education	39	14.3
Primary school	29	10.6
Middle/JHS	165	60.4
Vocational/commercial/technical)	9	3.3
Senior High School (SHS)	18	6.6
Post SHS(Training colleges, Nursing etc)	10	3.7
Tertiary /University	3	1.1
Total	**273**	**100.0**

Source: Field Data 2011, N= 273.

Different categories used to measure education level (Aneani et al. 2011).

Figure 48: Education Attained

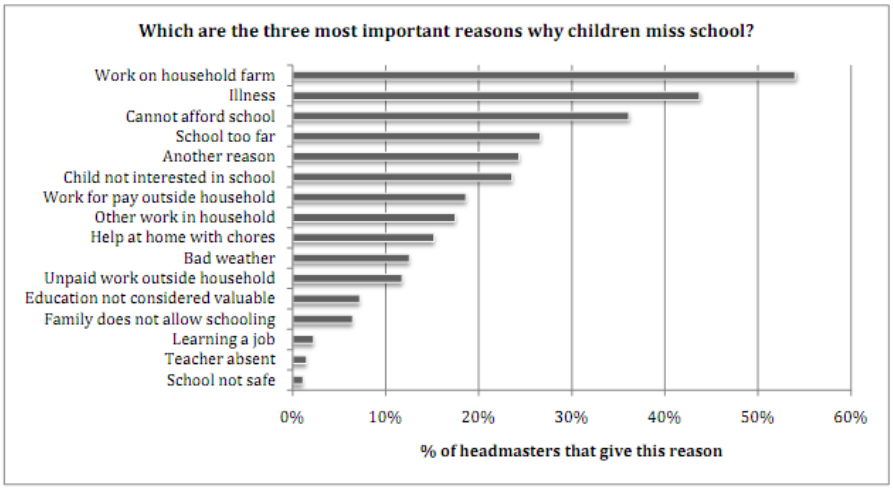


Hainmueller et al. (2011).

4. Educational level of respondents		
Basic (Primary and Middle School)	35	23.3
Secondary (Senior High School)	29	19.3
Tertiary	11	7.4
No education	44	29.3
Non formal education	31	20.7

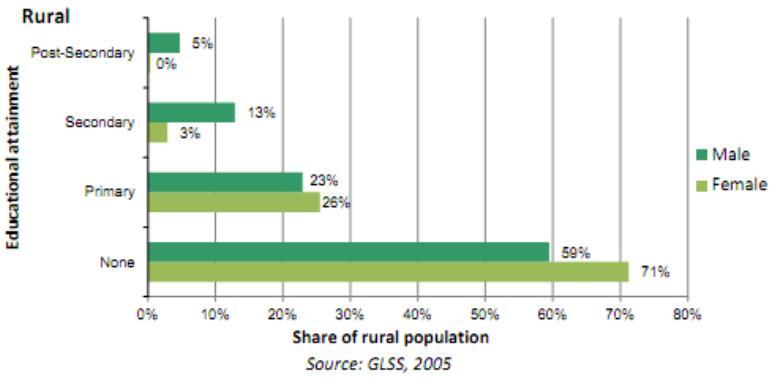
Education levels of respondents (n=150) (Kumi & Daymond, 2015).

Figure 57: Reasons for Absenteeism

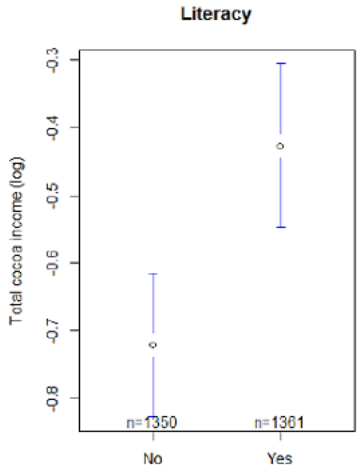


Hainmueller et al. (2011).

Graph 8. Cont'



Men usually have higher education levels compared to women. Note: graph is about all rural households, not just cocoa (FAO, 2012).



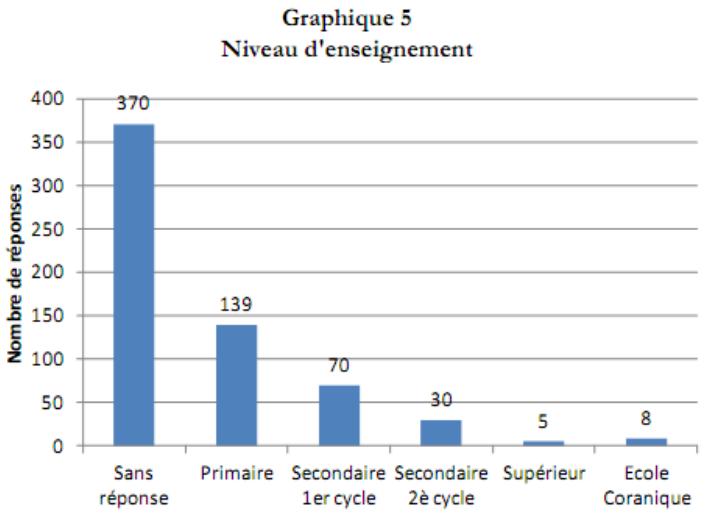
Relation between literacy and income from cocoa (Hiscox & Goldstein, 2014).

Côte d'Ivoire

Descriptives:

- Malnutrition is caused by three interrelated factors: education level of the mother, price of foodstuffs, the household income level and the availability of public health infrastructure (see also 'Nutrition') (FLA, 2015).
- Malnourishment can lead to reduced cognitive abilities and lower educative performances throughout life (see also 'Nutrition'(FLA, 2015).
- The literacy rate among cocoa farmers is very low. A quick test on the population of farmers to check their reading skills enabled us to estimate the share of literate farmers at only 30% (45% in Assiri et al. 2009). Nearly 60% of the farmers did not attend school, and among the remaining 40% of farmers, most only attended primary school (partly or entirely), while only 10% of all cocoa farmers surveyed went to a level beyond primary schooling (Balineau et al. 2017).

Education lvl/literacy rate	Region/other	Source	Note
<50% literacy	CdI whole of CdI	Barry Callebaut (2014)	-
67% No formal education 25% Finished primary educ 6% finshed secondary 0,6% finished superior	For Whole of CdI	Tanno (2012)	Among
64% Bakwé 52% Baoulé 0% Burkinabé	Literacy rates among ethnic groups	Tanno (2012)	Education problems prevail mostly among Burkinabé farmers
5,45 Indénie Juablin 3,08 Nawa 1,93 Loh Djiboua 6,88 Haute Sassandra 3,52 Mean for all 4 regions	Mean completed years of education per region	Vigneri et al. (2016)	-
35% have no education 60% are illiterate 53% are not educated 79% females are illiterate 45% are illiterate	Study A Study A Study B Study B Study D	Maytak (2014)	Synthesis report of various studies. Illiteracy mostly among female farmers.



Varlet & Kouamé (2013).

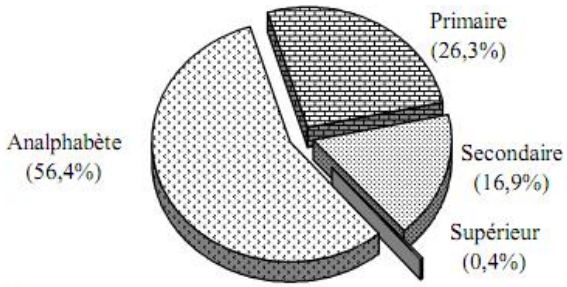


Figure 2: Répartition des producteurs de cacao en fonction de leur niveau intellectuel.

Intellectual levels of farmers (Deheuvels et al. 2009).

Farmer roles

Ghana

- Farmers may have a dual role as either lead farmer or purchasing clerk. The role as purchasing clerk is interesting as it may impact productivity and farm management in two distinct ways (Waarts et al. 2013):
    - Productivity might be worse compared to regular farmers because PC's have less time for farm management.
    - Productivity might be higher compared to regular farmers because PC's have a higher income and can thus invest more in their farms in term of inputs.

Nutrition/food security

Definition of malnutrition according to FAO (FLA, 2015):

- The incapacity of people to consume sufficient amounts of food to satisfy their energy needs.

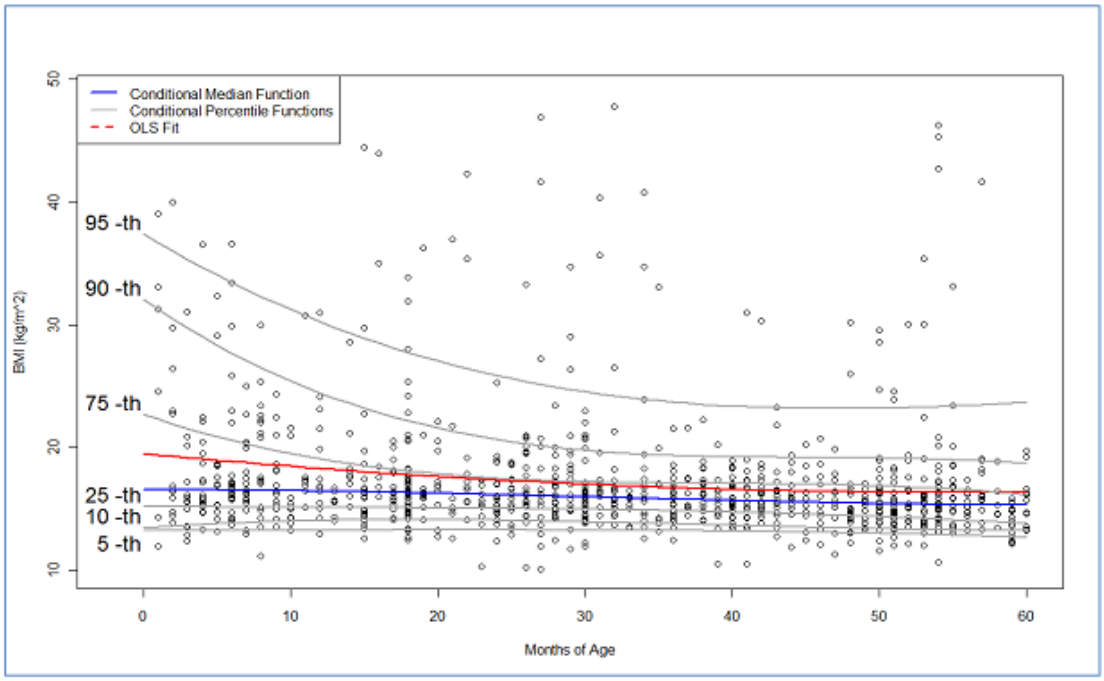
Two indicators for food security used by Nelson et al. (2013):

- Number of meals per day
- Amount of carbohydrate consumption

Ghana

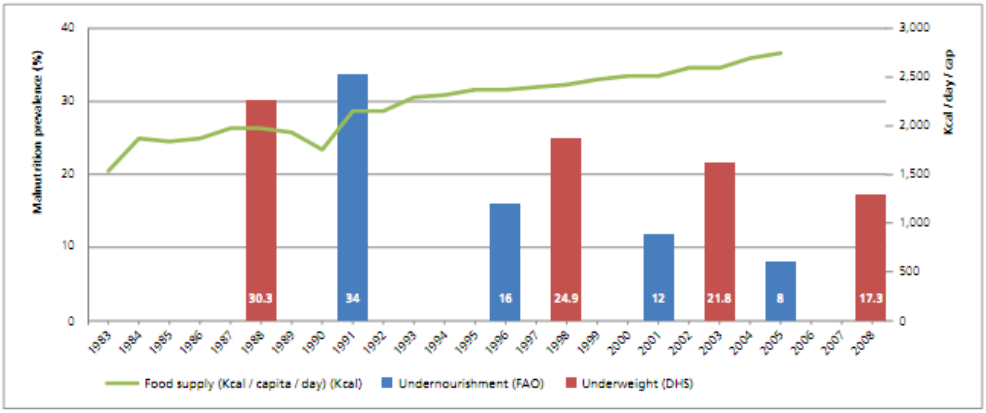
- One way of measuring malnutrition in children is by calculating the Body Mass Index (BMI). BMI is calculated by dividing the weight by the squared height. Figures from data in Ghana are then compared to typical values found for other children of the same age in healthy communities (Hainmueller et al. 2011).
- Intercropping of cocoa farms during the (re)planting phase can compensate for the loss of income and increases food security (Ameyaw, 2011).
- Buying food is one of the most important household expenditures. Increases in food prices can therefore significantly impact food security and lead to increased poverty (Kumi & Daymond, 2015).
- There is no significant difference between certified and uncertified farmers related to food security. Both farmer types had at least 2 meals a day on average (Nelson et al. 2013).
- There is a significant difference between men and women when it comes to protein and carbohydrate intake (men receive more than women) (Nelson et al. 2013).
- Growing food crops (see 'other crops') is important in maintaining food security. In 2012 only 22% of respondents produced all their own food for consumption while 62% produced half their own food consumption themselves (Nelson et al. 2013).
- Farmers in the Western Region complain about high food prices. Food vendors often buy food in the Ashanti Region to sell in the Western Region (Nelson et al. 2013).

Figure 45: Body Mass Index for Children under 5 Years



BMI for children aged 0-5 in Ghana (Hainmueller et al. 2011).

Figure 8: Improvement in food security, 1983-2008



Developments in food security in agricultural households in Ghana (Wiggins & Leturque, 2011).

Table IV.2 : Descriptive statistics of the study regions in Ghana

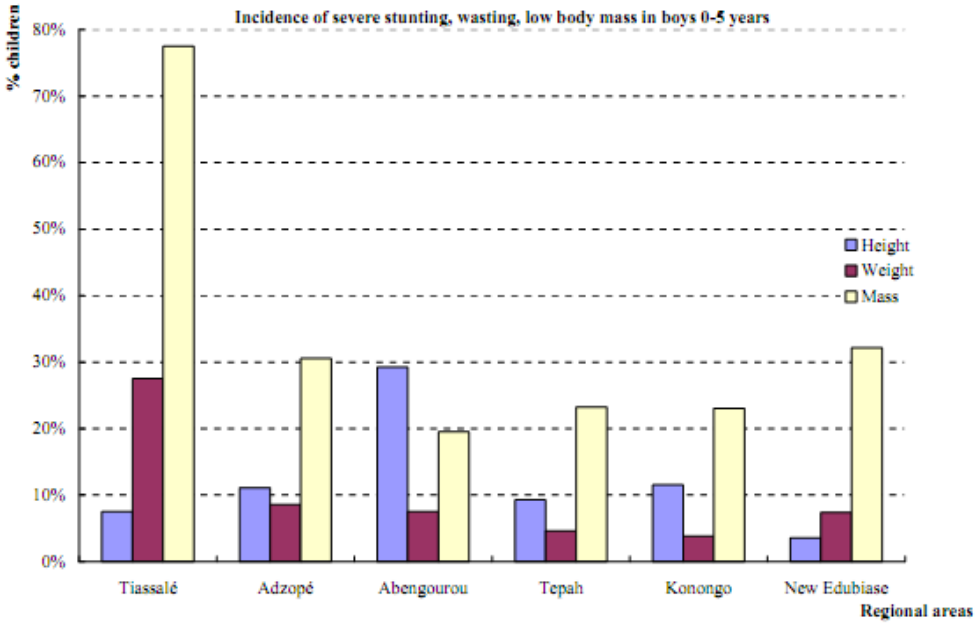
Areas of potential cooperative impact	Study region			
Well-being, health and environment	**Tepah (N=72)**	**Konongo (N=74)**	**New Edubiase (N=74)**	**Ghana (N=220)**
Living area per capita (m^2)	9.35	7.81	7.34	8.16
Land ownership per household (ha)	7.70	5.25	6.61	6.51[21]
Cocoa land per household (ha)	5.77	3.50	4.73	4.66[22]
Proportion of cocoa land share-cropped (%)	26%	20%	23%	23%[23]
Score of habitat quality (max = 31)	16.15	16.69	14.26	15.70
Distance to clinic or health center (km)	7.2	6.0	21.7	11.6
Diarrhoea in kids (%)	8%	5%	7%	6%
Malaria in kids (%)	36%	31%	35%	34%
Diarrhoea in adults (%)	10%	2%	3%	5%
Malaria in adults (%)	17%	21%	24%	21%
Meals per day (last 24 hours)	2.4	2.5	2.4	2.4
Meat per week (meals over last 7 days)	10.0	10.1	11.1	10.4
Value of possessions per capita (1 = Wellington boots … 50 = automobile)	3.2	3.7	4.4	3.7
Dependency ratio (non-workers supported/ worker)	1.3	1.3	1.5	1.4
Income level and sources				
Income from cocoa as a % of total income	82%	74%	81%	79%[24]
Government dividends/payments as % of total	1%	1%	1%	1%
Non-farm income as % of total income	1%	5%	4%	4%
Salaried employment as % of total income	1%	3%	2%	2%
Remittances from migrants as % of total income	4%	6%	3%	4%
Income per capita (in USD)	158.36	121.80	164.90	148.23
Production technology				
N per hectare (kg)	0.14	1.82	0.00	0.66[25]
P per hectare (kg)	11.0	16.19	9.19	12.15
K per hectare (kg)	9.0	13.25	7.52	9.94
Pesticide use per hectare (in USD)	14.38	15.26	14.41	14.69
Yield per hectare (kg)	232.16	230.55	277.35	246.82[26]

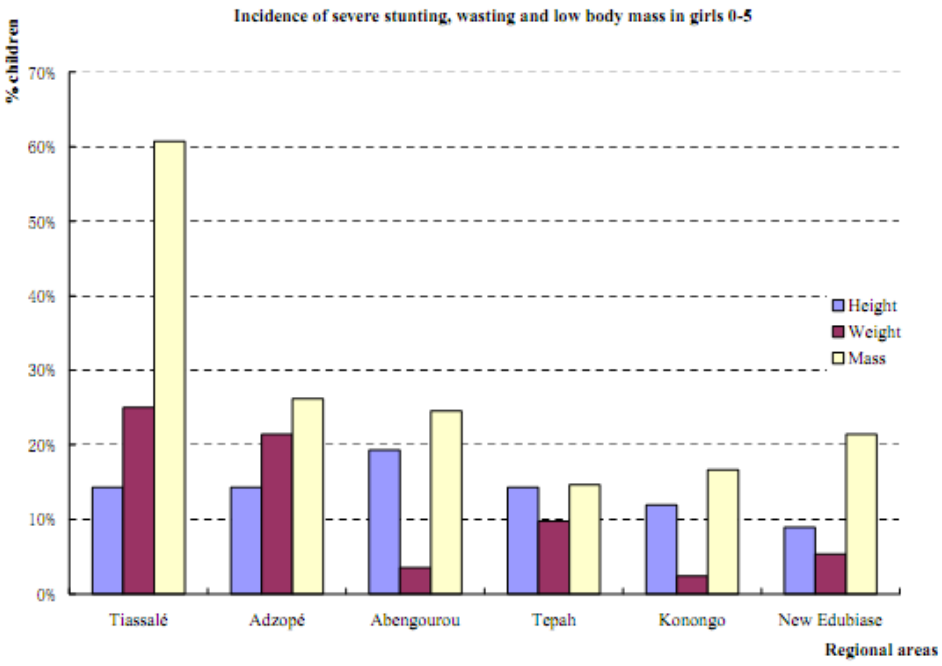
Statistics for areas in Ghana (all areas are in Ashanti)(Calkins & Ngo, 2005).

Table IV.3a: Boy weight and height - Results breakdown by country

	0 to 5			6 to 14		
COTE D'IVOIRE	Height	Weight	Mass	Height	Weight	Mass
Severe deficiency	16%	15%	43%	20%	32%	38%
Moderate deficiency	14%	21%	4%	7%	15%	8%
Mild deficiency	41%	24%	6%	17%	12%	8%
Healthy	29%	41%	47%	56%	42%	46%
GHANA						
Severe deficiency	8%	5%	26%	21%	33%	36%
Moderate deficiency	12%	11%	15%	8%	17%	15%
Mild deficiency	41%	21%	8%	13%	13%	10%
Healthy	38%	63%	51%	57%	38%	39%

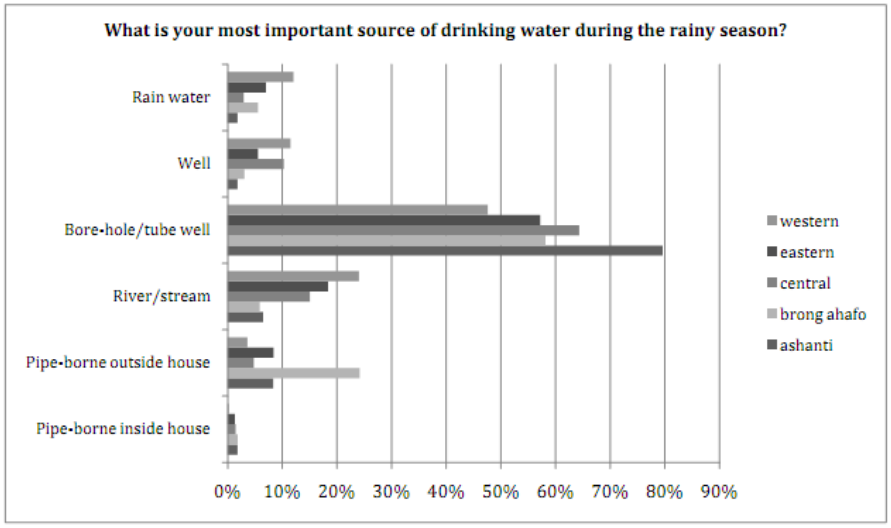
Height and weight deficiencies in children (Calkins & Ngo, 2005).





Deficiencies occur mostly for the mass of boys and girls (three regions left are CdI, others Ghana) (Calkins & Ngo, 2005).

Figure 31: Main Source of Drinking Water



Source of dirnking water (Hainmueller et al. 2011).

Côte d'Ivoire

Descriptives:

- The production and selling of food crops is often done by women who therefore play a key part in a households food security. Furthermore, women pick and prepare the food, feed the children and are in charge of the nutrition of a household in general (FLA, 2015).
- Malnutrition is caused by three interrelated factors: education level of the mother, price of foodstuffs, the household income level and the availability of public health infrastructure (FLA, 2015).
- The three most important obstacles for food security for vulnerable households are access to sufficient quantities of food (number of meals per day), the diversity of meals (balanced meals with protein etc.) and the quality of the food (in terms of micro- and macro nutrients). The food production of households is usually insufficient for food security (FLA, 2015).
- The eating habits of households are often inadequate, especially for young children. This is despite the fact that varieties of foods are available at markets (FLA, 2015).
- There is a negative correlation between productivity and anaemia (the lower the productivity the higher the incidence of anemia) (FLA, 2015).
- Anemia and malnutrition can affect farmer communities through the reduction of productivity due to sickness, fatigue and other health problems related to bad nutrition (relates to loss of labour) (FLA, 2015).
- Malnutrition during childhood can have significant negative influence on cognitive development and educative capabilities throughout life (FLA, 2015).
- The most important sources of nutrition in rural CdI are: rice, maize, yam, cassava and plantain. Diets differ between ethnic groups where migrants rely more on rice compared to natives (FLA, 2015).
- Fish (dried, fresh or smoked) is the most important source of protein for farmers. 100% of the respondents in the sample stated that they ate fish at least once in the past 7 days. Other sources of protein include porc, chicken, beef and snails. Protein intake, however, seems to

be lacking as diets focus more on carbohydrates such as rice and maize (see pyramid below)(FLA, 2015).

- The research showed that food such as dairy products, eggs, vitamins and minerals are largely absent from diets. The same is true for fruit which, despite the availability, is largely absent from everyday meals. Fruit consumption depends on availability during the season and is mostly consumed in the field directly from trees. Available fruits include: watermelon, banana, pineapple, mango, oranges and avocado (FLA, 2015).
- The general conclusion of the FLA (2015) research is that farmer diets have little diversity and are not balanced. The absence or lack of protein, dairy products and minerals can lead to degrading nutritional state of the population (FLA, 2015).
- Food conservation is a major constraint for food security. Food products are perishable and often season bound and thus not available throughout the year. Conservation is also a major constraint for the marketing of certain crops, such as watermelons, which limits further limits availability of certain food crops in communities (FLA, 2015).
- The majority of farmers stated that ate three meals a day: in the morning, at midday and in the evening (FLA, 2015).
- Drinking water is widely accessible in communities thanks to mechanical pumps which were present in all villages visited (FLA, 2015).
- Purchasing power differs greatly among farmers within communities. Especially migrant families and 1 parent households rely often on their own food production which is season bound. These households often cannot afford three meals a day between harvests and switch to only 2 meals a day for children and 1 a day for adults (FLA, 2015).
- 12,6% of rural household experience food insecurity. This is mainly caused by the low purchasing power of farmer households (FLA, 2015).
- Tropical tree crop farmers usually prefer to establish their tree crops in mixed plantings with food crops. This is generally the most economical way of caring for the young tree crop as long as the tree seedlings do not fully occupy the site. It also increases food security during the first years before the trees come into production and generate cash revenue. Interplanting tree crops such as cocoa, coconut, and rubber with food crops such as plantains during these initial years allows small and migrant farmers to subsist during this unproductive period of their plantation. This strategy of initial association of tree crops and food crops can be so important for farmer livelihoods that the gradual occupation of the landscape by tree crops with long life cycles, where little new or re-planting takes place, can lead to an increased risk of food insecurity. This has been reported for cocoa farmers in Côte d'Ivoire. When asked about this risk, rubber farmers in Côte d'Ivoire responded that their future income from rubber would allow them to buy rice, suggesting that increased and relatively secure income (and thus access to food) was valued higher by these farmers than “food sovereignty” (the ability to produce their own food) (Ruf & Schrotz, 2015).

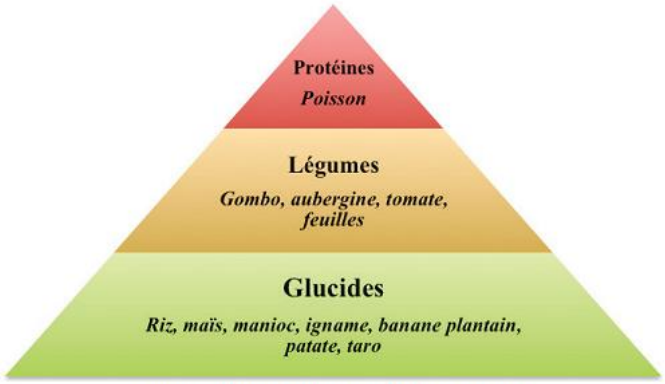
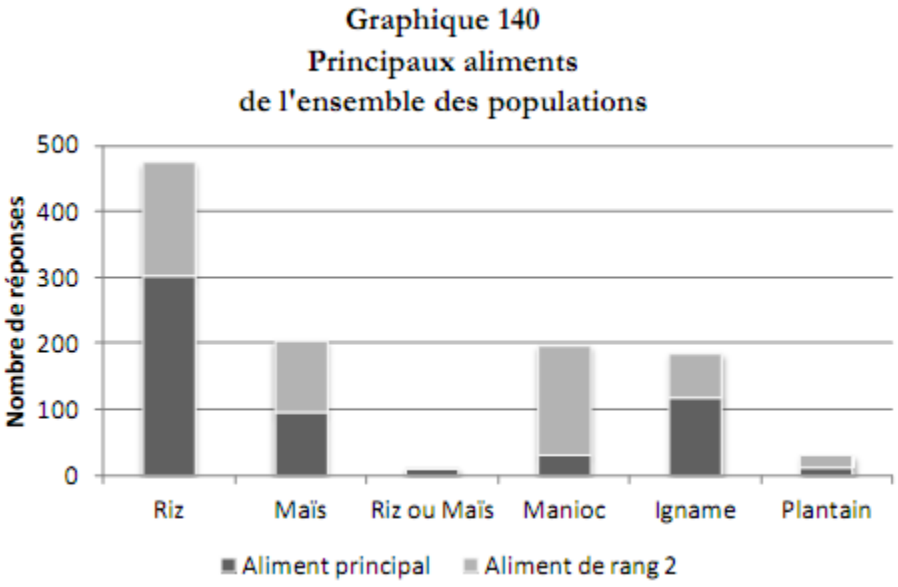


Figure 3. Pyramide alimentaire des ménages étudiés

Nutrition pyramid for investigated households (FLA, 2015).



Most important sources of nutrition for farmers (Varlet & Kouamé, 2013).

1) Adopt a common set of relevant indicators for the food security and nutrition impact area

Figure 5. Number of months per year where resources are not sufficient enough for food

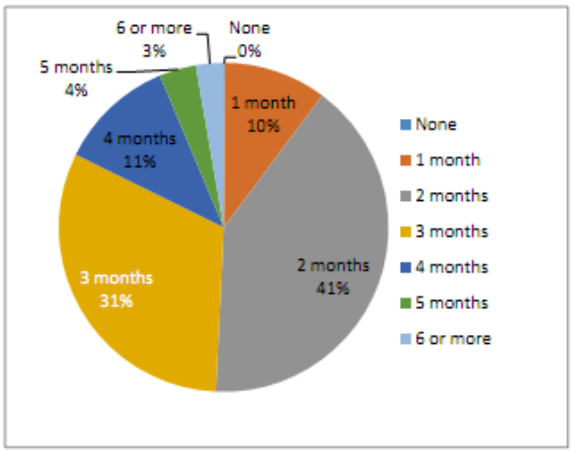
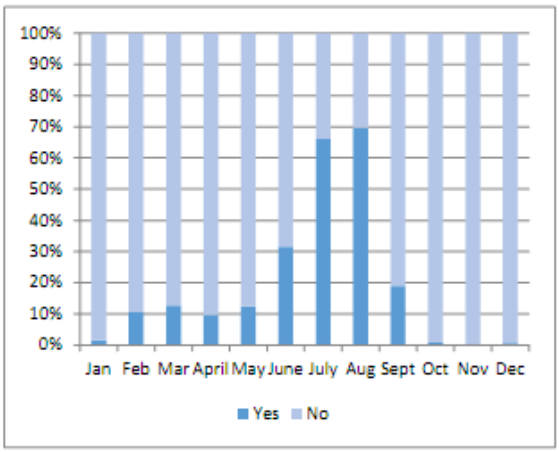


Figure 6. Percent of farmers without enough resources for food, by month



Source: Study B

Seasonality of food security (Maytak, 2014).

TABLEAU 8. ANALYSE DE L'ALIMENTATION ET DE LA SITUATION NUTRITIONNELLE DES MÉNAGES			
CONSTITUANT D'UNE BONNE ALIMENTATION (INDICATEURS)		COMMENTAIRE	SITUATION DE LA NUTRITION DES MÉNAGES VISITÉS
Variée		aliments de tous les groupes apportant tous les nutriments essentiels	Les ménages varient rarement leur alimentation.
Suffisante		quantité selon les besoins en énergie, en construction et protection	Les quantités selon les besoins en énergie sont bien souvent garanties hormis quelques disfonctionnements en période de soudure. La quantité selon les besoins en construction et en protection est rarement pourvue.
Satisfaisante		doit tenir compte des goûts	Hormis pendant les périodes de soudure, les ménages se nourrissent en fonction de leurs goûts.
Discipline alimentaire		Manger : à heure fixe, pas trop, pas trop gras, pas trop salé, pas trop sucré	Les ménages ne mangent pas à heure fixe, mangent trop (par moment) et mangent assez gras.
Fruits et légumes		Consommer plusieurs fruits et légumes par jour	Les ménages consomment assez de légumes, notamment à travers les sauces (gombos, aubergines, etc.). La consommation de fruits n'est pas systématique. Elle se limite à des périodes d'abondance de certains fruits (mangue, orange, papaye). Elle se fait souvent au champ pour assouvir la faim pendant le travail.
Equilibrée		aliment de base + aliment de construction + aliment de protection + aliment de force, à chaque repas	Les ménages ne mangent pas de façon équilibrée. Leur alimentation est surtout portée sur les aliments énergétiques. Les aliments de construction sont peu consommés et les aliments de protection sont presque ignorés.
Aliments énergétiques	aliments de base	Glucides : riz, manioc, banane plantain, igname	Fréquent
	aliments de force	Lipides : arachide, noix de coco, beurre de karité, huile de palme, avocat Sucres : sucre, canne à sucre, miel	L'huile de palme et l'arachide sont présentes dans leur alimentation.
Aliments de construction		Origine végétale: haricots, lentilles, arachides, soja Origine animale: poisson, crevettes, oeufs, volaille, viande, lait	Les ménages mangent quelques rares fois, de l'arachide et des haricots (allogènes et allochtones) Le poisson est plus disponible et accessible, mais il est souvent consommé en très petite quantité. La viande rouge et la volaille se consomment à des occasions rares de réjouissance.
Aliments de protection		Légumes: feuilles, gombos, aubergines, tomates, etc. Fruits: orange, citrons, mangue, papaye	Consommation de légumes est fréquente Les ménages mangent rarement des fruits
Eau		Consommation régulière d'eau potable	Les ménages disposent d'eau potable à travers des ouvrages d'hydraulique villageoise améliorée (HVA) et consomment régulièrement l'eau potable
Sport		équivalent d'une demi-heure de marche par jour	Les travaux champêtres et de ménage constituent le sport de base des ménages. Seuls les jeunes jouent souvent au ballon.

Dietary status of farmer households (FLA, 2015).

Table IV.1 : Descriptive statistics of the study regions in Côte d'Ivoire

Areas of potential cooperative impact	Study region			Côte d'Ivoire
Well-being, health and environment	**Tiassalé (N=62)**	**Adzopé (N=76)**	**Abendgourou (N=75)**	**Total (N=213)**
Living area per capita (m^2)	13.36	9.12	46.79	23.05
Land ownership per household (ha)	2.8	6.2	9.5	6.2[15]
Land to cocoa (ha)	2.75	6.22	9.53	6.15[16]
Proportion cocoa land share-cropped (%)	14%	34%	72%	40%[17]
Score of habitat quality (max = 31)	14.42	17.68	20.0	17.35
Distance to clinic or health center (km)	4.5	1.8	1.4	2.6
Diarrhoea in kids (%)	12%	10%	8%	10%
Malaria in kids (%)	33%	36%	40%	37%
Diarrhoea in adults (%)	4%	3%	4%	4%
Malaria in adults (%)	33%	30%	25%	29%
Meals per day (last 24 hours)	2.3	2.1	2.5	2.3
Meat per week (meals over last 7 days)	9.2	14.1	12.3	11.9
Value of possessions per capita	6.3	4.1	6.3	5.6
Dependency ratio (non-workers supported by each worker)	1.31	1.61	1.59	1.50
Income level and sources				
Income from cocoa as a % of total income	52%	61%	77%	64%[18]
Non-farm income as % of total income	13%	1%	2%	5%
Salaried employment as % of total income	8%	5%	1%	5%
Remittances from migrants as % of total income	3%	5%	1%	3%
Income per capita (in USD)	113.71	212.06	202.86	175.94
Production technology				
N per hectare (kg)	0.48	0.17	0.10	0.25[19]
P per hectare (kg)	0.03	0.09	0.03	0.05
K per hectare (kg)	0.01	0.04	0.01	0.02
Pesticide use per hectare (in USD)	5.11	12.85	13.22	10.41
Yield per hectare (kg)	243.37	310.33	226.76	261.41[20]

Calkins & Ngo (2005).

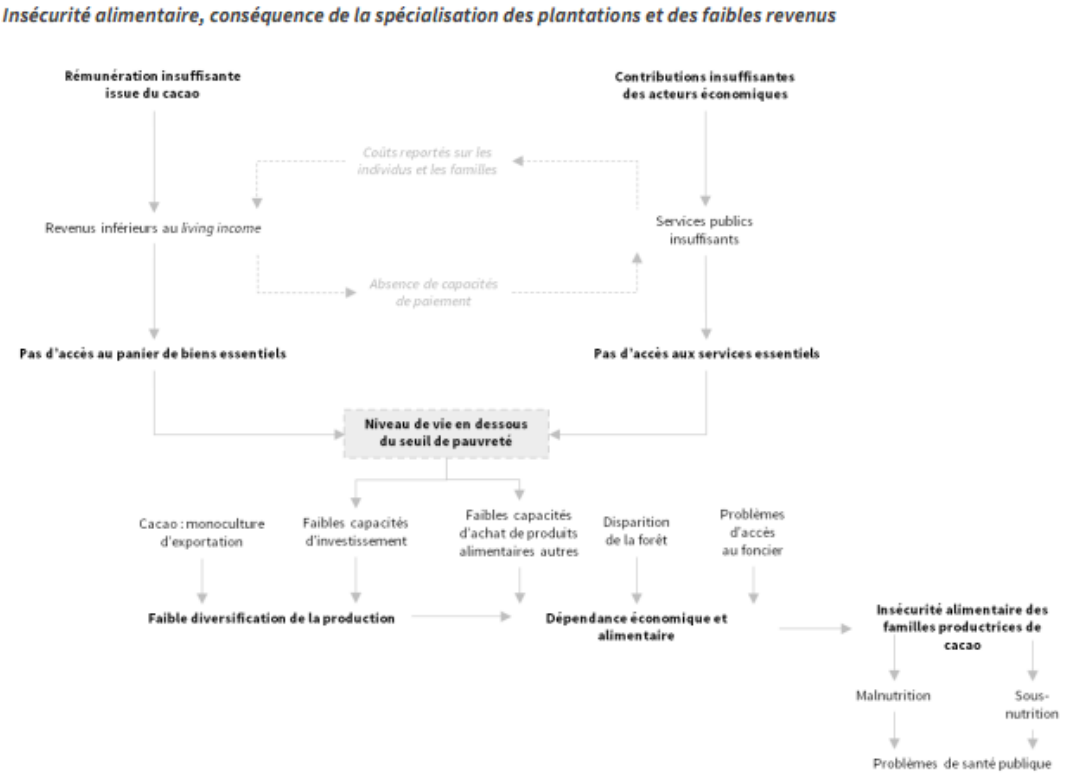


Figure 33. Chemins et boucles d'impacts lié à l'insécurité alimentaire dans la filière cacao ivoirienne. Source : BASIC

Food insecurity caused by monocroping and low revenues (PFCE, 2016).

Gender

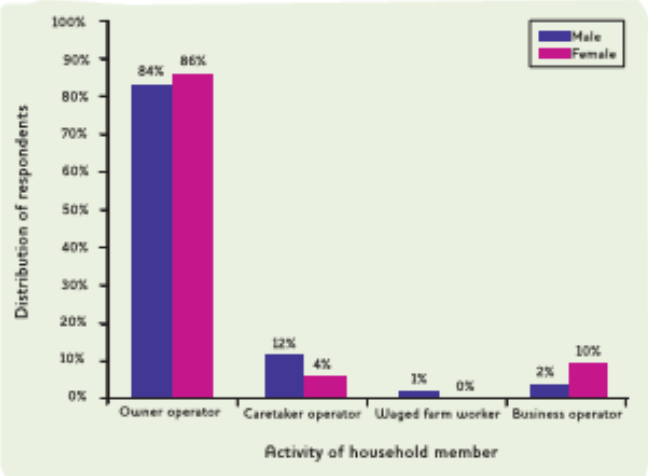
Ghana

Descriptives:

- Female farmers are often more dependent on hired labour as they cannot climb the trees or do not have the long-handled pruning tools. Operational costs are therefore higher for women (Barrientos & Akyere, 2012).
- Waarts et al. (2013) argue that knowledge levels of certified farmers are higher for men than for women. This is likely due to female farmers being less educated.
- About 27% of rural (not just cocoa) households are headed by women. Poverty rates among female headed households tend to be lower compared to male headed households (FAO, 2012).
- Access to credit is easier for male farmers than for female farmers. The main sources of credit for both genders are friends and relatives. Female farmers usually rely more on informal sources of credit, while males have better access to public credit sources as they usually produce market oriented cash crops (FAO, 2012).

- Women spend more time in household related activities (e.g. cooking, taking care of children). This results in women being less able to partake in income generating activities and to attain higher levels of education, both of which can improve economic returns and well-being (FAO, 2012).
- There is also a gender gap in younger age groups, where girls between 7 and 11 perform more household chores than boys of the same age. This difference is even larger in the 12-14 age group. This indicates that gender indicates roles and responsibilities even at a young age (FAO, 2012).
- Women experience great difficulties in obtaining land and official land titles. Without land titles, women are often excluded from saving and credit systems and have poor access to training and certification schemes. Women, however, increasingly run cocoa farms due to a high age difference between husband and wives, leading to a high number of widows that inherit farms. However, women are still less addressed in interventions, and are less involved in decision making processes, are less informed about market developments and effective ways of farm management and have less opportunities to invest in their farms. Furthermore, women who assist their husbands on the farms are seen as spouses instead of cocoa farmers and are therefore not able to participate in farmer group meetings (also for **CdI)** (Hütz-Adams & Fountain, 2015).
- Nearly all literature in this desk research indicates that there are far more men in the sample than women, usually around 75% male to 25% female (Waarts et al. 2013; Hainmueller et al. 2011; Bosompen & Mensah, 2012 etc.).
- There are significant differences between men and women when it comes to food security, where males consume more protein and carbohydrates than women. There were no significant differences in the amount of meals per day (Nelson et al. 2013).
- Women are paid less than men for wage labour in cocoa, where males were paid on average 7,49 GHC/day and women 4,44 GHC/day. Certified farmers pay higher wages to females than uncertified farmers (4,57 GHC/day vs. 4,13 GHC a day) (Nelson et al. 2013).
- Hiscox & Goldstein (2014) have identified the use of inputs, such as fertiliser and pesticides, as a major gender gap that should be targeted by interventions. The use of fertiliser and pesticides can greatly improve yield and income.
- The size of a woman's farm is often limited by her labour capacity and what her own family can contribute. Male farmers can often rely more on female household members. Marriage gives women access to land and men access to labour (Kolavalli et al. 2016).
- Women farmers often cannot afford waged labourers and therefore rely significantly more on child labour (<15) (Vigneri et al. 2016).

Figure 5.2: Distribution of main occupational activity of respondents by sex



Barrientos & Akyere (2012).

Table 5.11: Total income from cocoa by sex, 2005/06 season

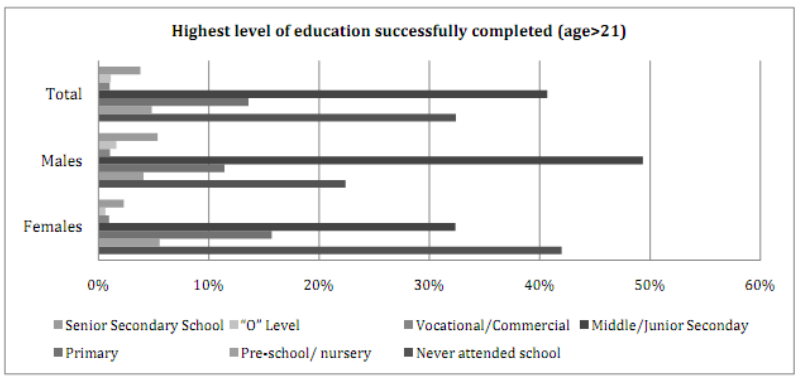
	Total income from cocoa 05/06 season (ranges in million cedis)									
Sex	0.5–2.0	2.01–4.0	4.01–6.0	6.01–8.0	8.01–10.0	10.01–12.0	12.01–14.0	14.01–16.0	>16.0	Total
Male	7 (4.6%)	21 (13.8%)	22 (14.5%)	16 (10.5%)	17 (11.2%)	11 (7.2%)	12 (7.9%)	7 (4.6%)	39 (25.7%)	152 (100.0%)
Female	10 (22.2%)	9 (20.0%)	3 (6.7%)	6 (13.3%)	8 (17.8%)	3 (6.7%)	0 (0%)	1 (2.2%)	5 (11.1%)	45 (100.0%)
Total	17 (8.6%)	30 (15.2%)	25 (12.7%)	22 (11.2%)	25 (12.7%)	14 (7.1%)	12 (6.1%)	8 (4.1%)	44 (22.3%)	197 (100.0%)

Income differences between genders (older data, 2005/06) (Barrientos & Akyere, 2012).

Table A3.1	Gender and position in the household of the respondent			
Gender	Position of the respondent in the household			Total
	Household head	Spouse	Other adult	
Male	303	2	5	310
Female	38	30	7	75
Total	341	32	12	385

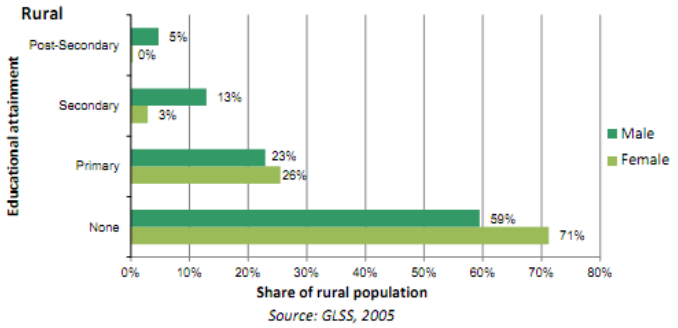
Household heads are usually male (Waarts et al. 2013) (also for Hainmueller et al. 2011).

Figure 48: Education Attained



Differences in attained education levels (Hainmueller et al. 2011).

Graph 8. Cont'



Source: GLSS, 2005

Gender differences in education for rural households (FAO, 2012).

Table 7. Farm holdings by size[33] and gender of the holder in Ghana: women hold a smaller share of the total farms.

	Male holding	Female holding	Total	Ratio (M/F)
Small farms (<5 Acres)	73%	27%	100%	2.7
Medium/large farms (5+ Acres)	89%	11%	100%	8.1
Total farms	76%	24%	100%	3.2

Source: GLSS, 2005

Table 8. Gender distribution of landholders in rural areas: females hold mostly small farms.

	Male holder	Female holder
Small farm (<5 Acres)	79%	92%
Medium/Large farm (5+ Acres)	21%	8%
Total	100%	100%
Ratio (S/ML)	3.7	11.5

Source: GLSS, 2005

Differences in land sizes between genders (for all rural households) (FAO, 2012).

Table 19. Average weekly hours spent on domestic activities in Ghana: with significant gender differences.

	Collecting fire wood	Collecting water	Cooking	Taking care of household members	Other Domestic*
Male	0.8	0.8	1.3	2.3	6.2
Female	2.7	3.2	11.2	10.0	12.5
Ratio (M/F)	0.3	0.3	0.1	0.2	0.5

Source: GLSS, 2005; "Other domestic" refers to ironing, shopping, cleaning, washing clothes, running errands, and others.

Hours spent on household activities (FAO, 2012).

Table 25: Challenges for women in cocoa production in West Africa

Constraints	Causes	Opportunities/solutions
Limited access to cocoa markets (reliance on intermediaries and lower prices)	Limited access to information Distance to markets Lack of infrastructure and transport facilities Lack of coop membership Lower quality and quantity of cocoa	Stimulate coop membership Improve infrastructure and transport facilities Training on good post-harvest practices to improve quality Improve access to inputs and credit
Limited access to training and information (extension services)	New agricultural knowledge and innovations are often not addressed to women Little attention for specific needs of women Lack of coop membership Lack of time because of other tasks Little awareness of opportunities for training Cultural barriers	Use approaches that are better directed to women Make training accessible for family members of cooperative members Recruit female advisors and rural extension services
Limited access to land	Land tenure structures Heritance laws and traditions	Adjust heritance laws Apply existing laws better Inform women about their land rights
Limited access to credit facilities	Lack of house title, land title, production of a profitable cash crop Approval of husband required Credit schemes are often directed to associations	Forming associations of women to obtain credit more easily
Limited access to cooperative membership decision-making bodies	Only producers (land owners) can become members Lack of information on the benefits of cooperative membership Exclusion/discriminatory practices. Lack of time Illiteracy New laws make organisation in cooperatives more complex	Awareness raising of men and women separately, Capacity building of cooperatives on the issue of organisation Address gender specifically in statutes, internal rules and other documents (e.g. non-discrimination)

Challenges for women in cocoa (both *Ghana* and *Côte d'Ivoire)*(Nelson et al. 2013).

Table 2: Gender Gaps – comparison of means of key measures for male and female farmers

Variable	*Mean: all*	*Mean: males*	*Mean: females*	*t-test p val*
Literate	0.50	0.56	0.25	0.00
Landowner	0.70	0.68	0.79	0.00
Total cocoa acreage	5.54	5.96	3.65	0.00
Cocoa acreage less than 1 acre	0.30	0.29	0.33	0.06
Total income (past 12 months)	756.13	854.38	312.17	0.20
Total cocoa income (past 12 months)	645.94	733.87	249.57	0.20
Used fertilizer (past 12 months)	0.23	0.24	0.18	0.00
Used insecticide (past 12 months)	0.55	0.57	0.46	0.00
Used herbicide (past 12 months)	0.21	0.24	0.08	0.00
Used fungicide (past 12 months)	0.22	0.23	0.16	0.00
Used motorized mist blower (past 12 months)	0.34	0.36	0.26	0.00
Received training (past 12 months)	0.34	0.35	0.27	0.00
Loan receipt (past 12 months)	0.14	0.15	0.12	0.06
Bank account?	0.31	0.34	0.18	0.00
Member of an organization	0.38	0.38	0.39	0.66
Leader in the organization? (only org. members)	0.43	0.42	0.48	0.20
Feel informed about cocoa prices in their region	0.75	0.78	0.63	0.00

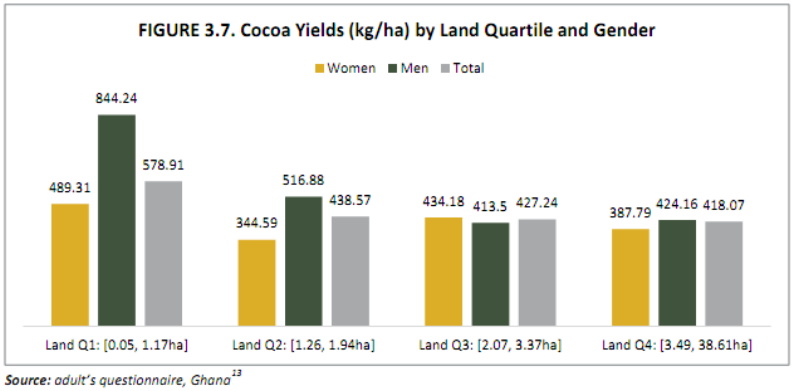
Difference between males and females on key measures (Hiscox & Goldstein, 2014).

Table 24: Women in cocoa production

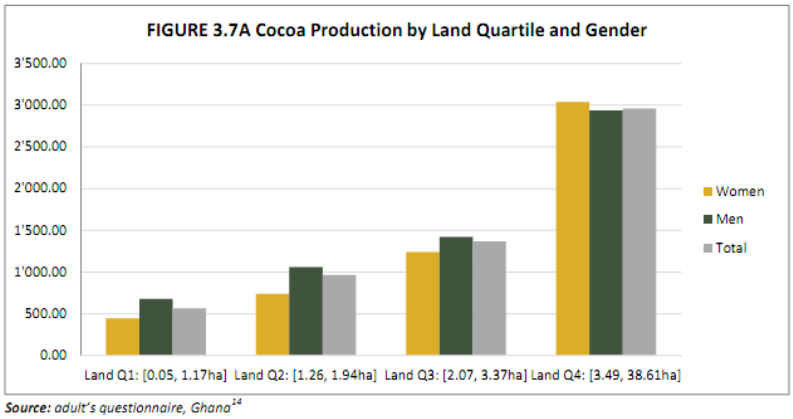
Category of women	Gender roles
Wives of cocoa producers	Active involvement in most stages of the production process, especially post-harvest activities, such as collecting and transporting harvested pods from the fields, taking beans out of the pods, drying and sorting. Men's jobs include climbing trees, pruning and applying agrochemicals. Women's labour important when cocoa trees are young and are cultivated together with food crops (IFPRI, 2002). Women do weeding, which is important for tree growth. Men tend to do heavier tasks. To remove beans from the pod husks, women tend to use a masher. Where a machine is used this is done by men. Female spouses are rarely involved in farm management. Men sell cocoa and receive revenues, while women manage income from food and market gardens. Men pay part of the family's expenses and sometimes pay their wives at the end of the season (in cash or in kind, fairly random calculation). Although men and women conduct different tasks, the time invested is similar. The distinction between traditional tasks for men and women becoming less clear as women take on activities previously undertaken by men. But adding these tasks to traditional roles of food growing, post harvest activities and household chores, strongly increased women's workload. Pregnancy and illnesses are not often seen as sufficient reasons for not working.
Women owning a farm	In West Africa cocoa farms are increasingly run by women, largely due to age differences between husbands and wives (leading to a high number of widows), HIV/aids, social conflicts and male rural-urban migration. 15 to 20% of cocoa farms owned by women in Ghana.
Remunerated workers	*Day labourers:* In general women earn lower wages. The best paid jobs are usually for men, who are regarded as being stronger. Female hired labourers often sort and sift beans on the drying tables. *Employees of the cooperative office:* Women hired by cooperatives usually work as a secretary or cashier. Whether a man or a woman is hired depends on the season. A difference was found in the way temporary labour was remunerated – men are generally paid by the day, women by the task.
Young girls and boys	Young girls are practically invisible in the cocoa chain. After school they tend to help their mothers with household and food production tasks. They rarely receive a plot of land to cultivate on their own account. After marriage, they help their husband on his fields, cultivate food crops and under other subsistence activities. Young boys share men's tasks on the cooca plantation. When going to school they contribute to production during the school holidays. If land is available in the family, they obtain a plot from their father to cultivate on their own account. Young men without land often rent their labour to others. In the low season they work on food crop production.

Source: Summarized from Solidaridad-Utz Certified, 2009

Role of women in cocoa production (Nelson et al. 2013).



Source: adult's questionnaire, Ghana[13]



Source: adult's questionnaire, Ghana[14]

Difference in productivity between genders per land quartile (Vigneri et al. 2016).

Côte d'Ivoire

Descriptives

- Women contribute to many aspects of cocoa farming, namely: field preparation, weeding, planting, transport from the field, and drying and sorting of beans. Female labourers provide between 48 and 69% of all farm labour (Ingram et al. 2014).
- Women are seen as the invisible workers in cocoa. Women in focus group discussions complain about their lack of awareness of, and involvement in certification and support activities. However, women do benefit from increased income from cocoa, 65% of female farmers indicate that they received a portion of cocoa income (Ingram et al. 2014).
- Certification participants indicate that they train other farmers (including their wives) after receiving training themselves. This way, the UTZ program indirectly benefits women (Ingram et al. 2014).
- Household heads and landowners are predominantly men. Usually women can become land owners through inheritance when their husband dies. A husband with multiple wives leaves his farm to all his wives, leading to fragmentation into smaller farms (Tanno, 2012).
- Most women in cocoa farming have not completed primary education or are illiterate. The women argued that their illiteracy made them ignorant about many things, making them further marginalised. Women argued that better education opportunities would enable them to make better decisions and earn money and assets in their own rights (Kapoor, 2016).

- According to FLA (2015), 95% of women are directly involved in cocoa production. 98% of women argue that their income is not enough to sustain their livelihoods, even though they have diversified their incomes. Furthermore, women work as hard as men do in cocoa, but face constraints regarding access to land, credit, and face abuse and exploitation more often.
- In most African countries, women are charged with the selling of food crops and are essential in providing food security for their households by producing food crops and preparing the food for their households. Even though women are in charge of the selling of crops, they often do not have the control over the revenue and are therefore trapped in a cycle of low productivity and poverty, potentially leading to food insecurity (FLA, 2015).
- During the harvesting season, women are often charged with the grouping of pods and providing water and food for the workers. Furthermore, most of the post-harvest process (drying and fermenting) is performed by female household members (FLA, 2015).
- Women are the principal producers of food crops, usually on the family plantation, but also sometimes in small gardens where they produce vegetables and other crops, including yams, plantain and cassava. Only a small portion of men engage in food production and usually only in small variety of crops: rice, maize, tomato, and cassava. The dominant activity for men is the production of cocoa (FLA, 2015).
- The raising of livestock is also mostly an activity reserved for women (FLA, 2015).
- Most women in the sample stated that they had little difficulty in accessing land for food production. The land is usually conceded by the husband or a family member. The women, however, are not allowed to grow permanent crops on the field as they are not the owner. Furthermore, the lands they get access to a usually the low quality of soil lands where growing cocoa is not possible (FLA, 2015).
- Development programs in cocoa communities often bypass female farmers. Especially educational programs on nutrition seem to be lacking (FLA, 2015).
- Women face significant market constraints for their food crops. Men usually produce cash crops such as cocoa, rubber or coffee that have established marketing avenues. Food crops, however, lack these marketing avenues and lead to fewer economic opportunities for women (FLA, 2015).
- There are a number of constraints that limit female farmers to have an income from food crops, namely (FLA, 2015):
    - Market saturation
    - Lack of means to conserve food crops for a longer time
    - Remoteness of villages
    - Lack of organisation
    - Lack of formal distribution networks
- Female labour efforts in cocoa communities contribute to the income of the male farmers, but not to their own incomes (FLA, 2015).
- Women participate in the following labour activities (Maytak, 2014):
    - Domestic activities (99%)
    - Food crop production (75%)
    - Cocoa fermentation (34%)
    - Cocoa drying (22%)
    - Cocoa pod cracking (16%)

  - Handling of pesticide (5%)
- Women and youth are usually not targeted by trainings and certification as they are not registered at a cooperative (Maytak, 2014).
- Women have technical mastery over food crops and thus play a key role in the diversification into these crops in perennial-crop farms. They can also play an increasing role in the adoption of perennial crops. In Côte d'Ivoire and Ghana, they are often the most responsive to development projects promoting the cultivation of cocoa, oil palm or rubber (Ruf & Schrotz, 2015).
- In the households, women are often subject to longer hours of work in order to fulfill their responsibilities both at home and at the farms. Women often do not have any rest days as they use them for marketing their food crops or doing household chores (FLA, 2016).

Conclusion	Results
Programme inclusiveness	
The programme has reached a large number of farmers, but women, youth and workers are under-represented in the programme. Ways are being sought to involve women more.	Participating farmers are typical in terms of age (on average 45), nationality (Ivorian, Burkinabé, and Malian) and sex, with 96% male: similar to cocoa farmers in Ivory Coast. Activities have targeted registered cooperative members.
	88% of farmers participating in the programme have received training related to certification, the remaining 12% have only recently joined the programme. 88% of the farmers participated in initiatives to strengthen cooperatives, 8% had received training, 13% had access to crop protection products, fertiliser and seedlings, 15% had access to credit and savings schemes, 8% had participated in community and social programmes, and 8% in improved fermentation schemes.
	83% of participating farmers have trained others.
	Farm workers, particularly women and youth, have fewer opportunities to be included in certification and support activities. UTZ and partners have started focusing more on women through a number of a small-scale training and empowerment activities.

Program results from UTZ Certified (Waarts et al. 2013).

TABLEAU 6. PRINCIPALES CULTURES VIVRIÈRES RÉALISÉES PAR LES FEMMES, LES HOMMES ET LES JEUNES		
TYPES D'ALIMENTS	FEMMES ADULTES ET JEUNES FILLES	HOMMES ADULTES ET JEUNES HOMMES
Cultures vivrières	Manioc, Banane plantain, Maïs, Riz, Igname, Patate, Taro, Aubergine, Gombos, Arachide, Tomate, Piment, Plantes à feuilles comestibles (Kplala, Dah, Epinard ...), Concombre, Carotte, Laitue, Chou, Pistache, Haricot, Pastèque	Manioc, Banane plantain, Maïs, Riz, Igname, Tomate, Concombre, Carotte, Laitue, Chou
Viande	Porc, Poulet bicyclette, Cabri, Mouton	Porc, Poulet bicyclette, Cabri, Mouton
Poisson	_	Poisson de pêche traditionnelle

Division of labour by gender and food producing activity (FLA, 2015).

TABLEAU 5. CARTOGRAPHIE DES TÂCHES DES HOMMES, DES FEMMES ET DES JEUNES, DANS LA PRODUCTION DU CACAO						
ETAPE	ACTIVITÉS	TÂCHES	FEMMES ADULTES	JEUNES FILLES	HOMMES ADULTES	JEUNES HOMMES
Création de la nouvelle plantation	Etablissement de la nouvelle pépinière	Construction de l'ombrière			X	X
		Remplissage des sachets plastiques	X	X	X	X
		Semi des grains de cacao			X	X
		Transport d'eau pour l'arrosage	X	X		
		Arrosage			X	X
		Application de pesticide			X	X
		Défrichage du champ			X	X
		Brûlage de l'espace défriché			X	X
		Sarclage	X	X	X	X
		Buttes et activités associées	X	X	X	X
	Planting des jeunes plants	Transport des jeunes plants	X	X		
		Piquetage			X	X
		Trouaisons			X	X
		Planting			X	X
	Maintenance de la nouvelle plantation	Planting des rejets de banane plantain	X	X	X	X
		Entretien (nettoyage) du nouveau champ	X	X		
		Traitement phyto du nouveau champ			X	X
Récolte	Maintenance de la plantation déjà en production	Entretien sanitaire des plantes (égourmandage,)			X	X
		Traitement phyto de la plantation en production			X	X
		Nettoyage de la plantation en production			X	X
	Cueillettes des cabosses	Cueillette des cabosses			X	X
		Ramassage des cabosses	X	X		
		Regroupement des tas de cabosses	X	X		
	Ecabossage	Ecabossage			X	X
		Restauration des travailleurs	X	X		
		Transport des fèves fraiches vers le lieu de fermentation	X	X		
Post-Récolte	Fermentation	Préparation du site pour la fermentation			X	
		Brassage et séparation des fèves du placenta	X	X	X	X
		Transport des fèves fermentées vers le lieu de séchage	X	X	X	X
	Séchage	Etalage sur la claie			X	
		Brassage	X	X	X	X
		Surveillance des fèves	X	X	X	X
		Tri des fèves	X	X	X	X
	Commercialisation	Ensachage des fèves sèches			X	X
		Transport des fèves sèches pour le stockage			X	X
		Vente des fèves sèches			X	
		Encaissement du revenu			X	

Division of labour in the certain stages of cocoa production (FLA, 2015).

Yield

Ghana

Yield	Region/other	Source	Note
400 kg/ha	Mean for Ghana	Aneani et al. (2011a)	-
+/- 400 kg/ha	Mean for Ghana	Barrientos & Akyere (2012)	-
137,5 kg/acre	30% of farmers in sample	Barrientos & Akyere (2012)	30% of farmers had yields far below the national average
400-500 kg/ha	Mean for Ghana	Blackmore & Heilbron (2015)	-
450 kg/ha	Mean for Ghana	Victor et al. (2010)	-
2,06 bags/acre	Mean for Ghana	Waarts et al. (2013)	Highest yields in Western region, lowest yields in Eastern region (three regions investigated)
382 kg/ha 389 kg/ha 355 kg/ha	Ashanti Brong Ahafo Central	Hainmueller et al. (2011)	Numbers based on measured size. Productivity numbers

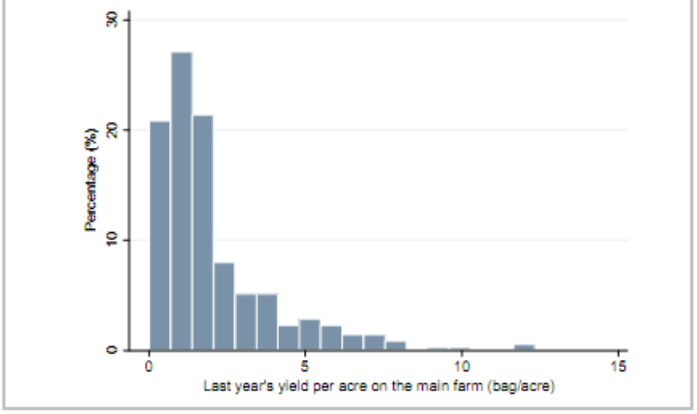
374 kg/ha 389 kg/ha 377 kg/ha	Eastern Western Mean for Ghana		were lower based on farmer estimates (see figure below).
232,16 kg/ha 230,55 kg/ha 277,35 kg/ha 246,82 kg/ha	Tepah Konongo New Edubiase Mean for all three	Calkins & Ngo (2005)	Older source
400 kg/ha	Mean for Ghana	Wessel & Quist-Wessel (2015)	-
362,7 kg/ha	Mean for Ghana	Aneani et al (2011b)	-
1400 kg/ha	*10% of farmers*	Asamoah et al. (2013)	10% of farmers have high technological input leading to high yields
>400 kg/ha	Mean for Ghana	Asamoah et al. (2013)	-
1,23 bags/acre	Ashanti, certified farmers	Schouten (2016)	Three communities in Ashanti region
400 kg/ha	Mean for Ghana	Kumi & Daymond (2015)	-
193,05 kg/ha 270,27 kg/ha 381,55 kg/ha 289,57 kg/ha	Ashanti Brong Ahafo Western For all three	Kolavalli et al. (2016)	*Median yields*
549 kg/ha	Mean for Ghana	Kolavalli et al. (2016)	Mean yield in 2012 according to FAO
400 kg/ha 650 kg/ha 1400 kg/ha	50-65% of farmers (low tech) 20-40% of farmers (med tech) Remainder (high tech)	Laven & Boomsma (2012)	-
420 kg/ha	Mean for Ghana	Oomes et al. (2016)	-
400-530 kg/ha	Mean for Ghana	Donovan et al. (2016)	-
< 400 kg/ha >400<850 kg/ha >850<2000 kg/ha	Low yield farmers (51%) Med yield farmers (31%) High yield farmers (18%)	ICI (2015)	The % relates to the amount of farmers in the sample
347,21 kg/ha 464,33 kg/ha 402,02 kg/ha	Ashanti Western Mean for Ghana	Vigneri et al. (2016)	Major differences also within regions
500 kg/ha	Mean for Ghana	LAMBERT ET AL. (2014)	Rough estimate (estimate is the same for CdI)

Descriptives:

- Low yields are mainly caused by pests/diseases, low adoption of production technologies, and inefficiency in the use and allocation of resources (Aneani et al. 2011).
- Distinction between two types of efficiency (Aneani et al. 2011):
    - Technical efficiency: the ability to achieve the maximum productivity with the available resources.
    - Allotment efficiency: the ability to gain optimal allocation of given resources.
- Low yields due to pests/diseases, poor extension services, low soil fertility and low producer prices (Baah & Anchinirah, 2010).
- Low yields due to pests/diseases, relatively old trees, low investments, absence of row planting (Asante-Poku & Angelucci, 2013).
- Division of the 7 cocoa growing districts based on productivity (Barrientos & Akyere, 2012):

  - High: Western Region
  - Medium: Ashanti/ Brong Ahafo
  - Low: Eastern/central region
- Three yield classes based on inputs/GAP (Waarts et al. 2013: Laven & Boomsma, 2012):
  - High class (1400 kg/ha): improved planting material, regular spacing (3m x 3m), regular weed management, pest control 4x/year, disease control 5-6x/year, frequent pruning, fertiliser 1x/year, shade management and frequent harvesting.
  - Medium class (650 kg/ha): planting in line with regular spacing, improved planting material, proper weed management, regular pruning, pest/disease control 2x/year, shade management, and frequent harvesting.
  - Low class (350 kg/ha): Planting at stake, no specific planting material, irregular spacing, high density, infrequent weeding, little/no pruning, infrequent disease/pest control, little shade management, and irregular harvesting.
- Reasons for low productivity: no access to credit, insufficient knowledge on pest/disease management, inadequate supply/high cost of improved planting material, poor harvest practices, weak extension service delivery, and late or absent delivery of inputs by COCOBOD (MOFA, 2012).
- Potential yields/ha estimated at 1000 kg/ha (Aneani et al. 2011: Kumi & Daymond, 2015).
- Current yields are estimated at only 18% of the full (experimental) potential (1900 kg/ha) (Wessel & Quist-Wessel, 2015).
- Abusa sharecroppers attain the highest yields (Vigneri et al. 2016).
- Yields do not increase with higher household/paid labour use (Vigneri et al. 2016).
- There is statistically significant evidence of higher yields occurring on smaller landholdings. This is likely caused by the inability of farmers with larger landholdings to reduce production costs or to efficiently allocate labour and other inputs (Vigneri et al. 2016).

Figure A4.16 **Distribution of yield per acre on the main farm among the respondents**



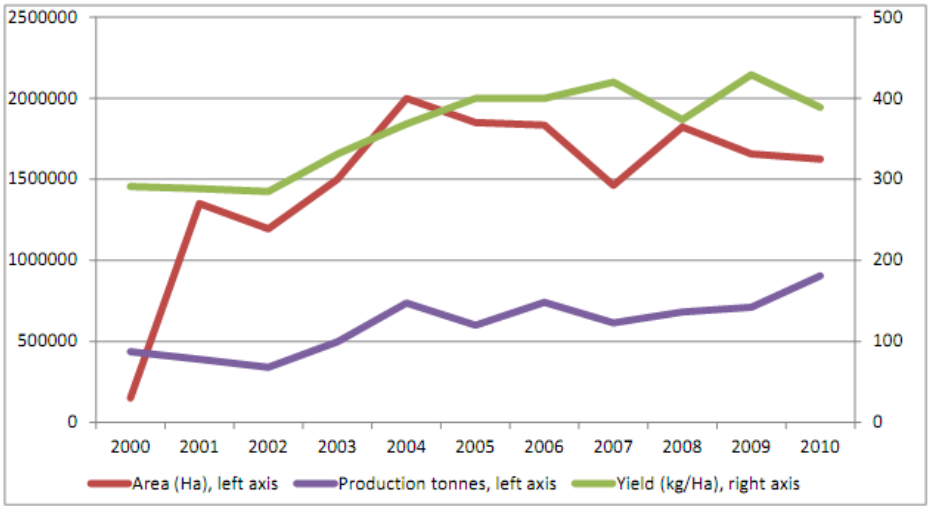
Distribution of yields per acre for the main farm (Waarts et al. 2013).

Table 5.4: Determinants of yield

Yield	Coef.	Std. Err.	T	P>t
Land	**-0.62**	**0.09**	**-6.60**	**0.00**
Labor/ha	0.03	0.04	0.92	0.36
Fertilizer/ha	**0.11**	**0.05**	**2.26**	0.02
Insect + fungicide/ha	**0.11**	**0.04**	**2.96**	**0.00**
tree age	**0.13**	**0.03**	**3.92**	**0.00**
tree age^2	**0.00**	**0.00**	**-3.84**	**0.00**
# years cocoa farming	**-0.06**	**0.02**	**-3.02**	**0.00**
# years cocoa farming squared	**0.00**	**0.00**	**2.59**	**0.01**
% ha under hybrid	0.10	0.23	0.41	0.68
% ha under amazon	0.06	0.25	0.25	0.80
% farmers spraying	**0.23**	**0.10**	**2.22**	**0.03**

Determinants of yield (Kolavalli et al. 2016).

Figure 3: Main production figures for cocoa in Ghana (2000-2010)



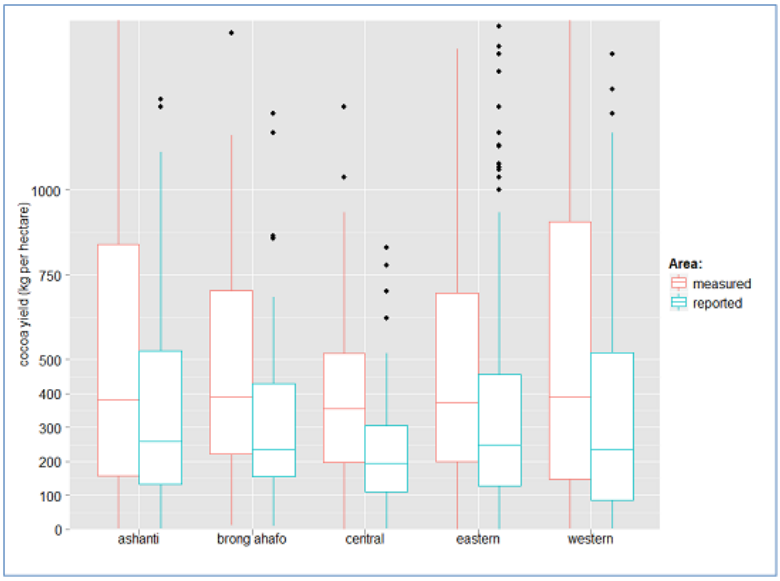
Asante-Poku & Angelucci (2013).

Interventions and key assumptions

	Description	Key Assumptions	
Baseline	Farmers continue to farm current crop, productivity declines as trees age	• Farm size: 2.9 ha • Cost of labor: USD 3.5 / day • Cocoa prices: stable at Sept 2014 prices and 2% annual increase each year (2 scenarios) • Farm gate price: 53% of world price • Fertilizer, pesticide, labors cost remain stable • Initial trees age: 10 years • Training costs excluded from analysis • Discount rate: 15%	• Yield: 450 kg/ha • Labor: 45 days/ha
GAP	Baseline + additional use of pesticides		• Max yield: 600 kg/ha • Labor: 67 days/ha • Pesticide cost: USD 58/ha
Fertilizer	GAP + additional use of (subsidized) fertilizer		• Max yield: 1,200 kg/ha • Labor: 100 days/ha • Fertilizer cost: USD 125/ha (subsidized)
Planting Material	Farmers replant 100% of their farm		• Max yield: 1,500 kg/ha • Labor: 140 days/ha • Replanting cost: USD 380/ha

Productivity levels in different scenarios (Blackmore & Heilbron, 2015)

Figure 13: Cocoa Yields by Region



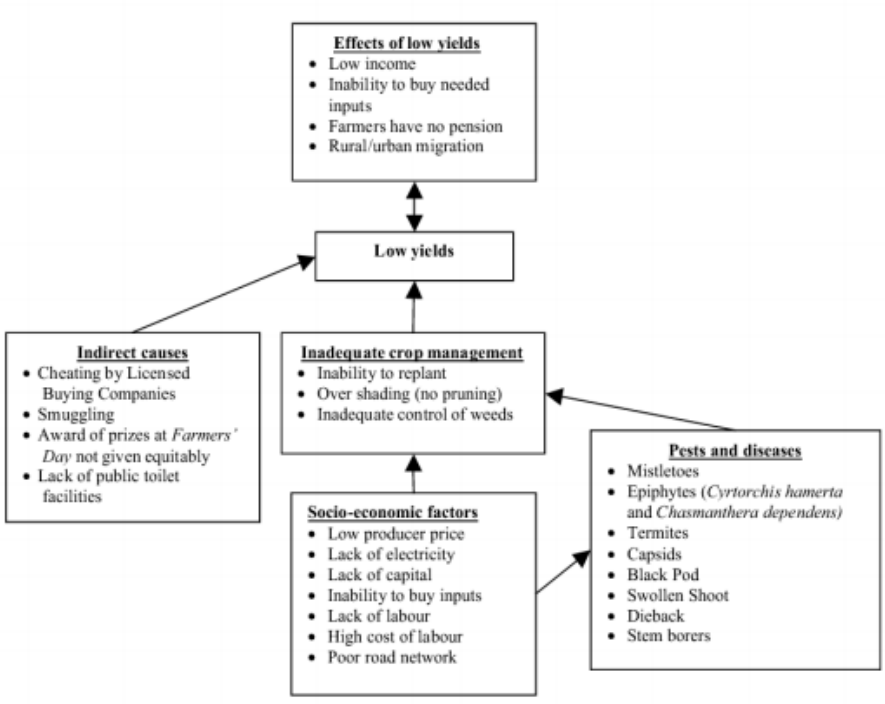
Measured vs estimated yields/ha in Ghana (Hainmueller et al. 2011).

Table 2. Descriptive statistics of the output of cocoa (Bags) and (Kg ha^{-1}) of the sampled cocoa farmers (n=150)

Variable	Frequency	Percentage
Output of cocoa (64 kg/ bag of dry beans)		
< 10	26	17.3
10.5 – 20	51	34
20.5 – 30	31	20.7
30.5 – 40	22	14.7
40.5 – 50	4	2.6
Above 50+	16	10.7
Total	**150**	**100.0**
Output of cocoa (Kg ha^{-1})		
Less than 300	12	8.0
300-400	15	10.0
401-500	34	22.7
501-600	61	40.7
Above 600	28	18.6
Total	**150**	**100.0**

Kumi & Daymond (2015)

Figure 6.6 Factors hampering farmers to increase production



Source: Dormon et al, 2004

Oomes et al. (2016)

Côte d'Ivoire

Yield	Region/other	Source	Note
493 kg/ha 486 kg/ ha 932 kg/ha 576-639 kg/ha	Average farmer Recently joined farmers Long member farmers Other certified farmers	Ingram et al. (2013)	Source is about Cargill/Solidaridad programme participants

560 kg/ha	Soubré	Smith-Dumont et al. (2014)	Farmers in this region used mostly unselected planting material
450 kg/ha	Mean for CdI	Blackmore & Heilbron (2014)	This source also worked out different scenarios (see below)
243,37 kg/ha 310,33 kg/ha 226,76 kg/ha 261,41 kg/ha	Tiassalé Adzopé Abendgourou Mean for all three	Calkins & Ngo (2005)	Relatively old source
300-500 kg/ha	Mean for CdI	Ingram et al. (2014)	-
467 kg/ha 315 kg/ha	Certified farmers Uncertified farmers	Ingram et al. (2014)	-
500-600 kg/ha	Mean for West Africa	Wessel & Quint-Wessel (2015)	No reliable statistics available
500 kg/ha	Mean for CdI	Barry Callebaut (2014)	-
620 kg/ha 570 kg/ha	Certified farmers Uncertified farmers	Ruf et al. (2013)	-
250-300 kg/ha 200 kg/ha	20-30 yr old trees 30+ yr old trees	Assiri et al. (2012)	-
425 kg/ha	Abusan farmers	Ruf & Agkpo (2008)	-
391 kg/ha 462 kg/ha 442 kg/ha	Autochtone Alloctones Allogènes	Ruf & Agkpo (2008)	Differences in productivity between ethnic groups
463,01 kg/ha 444,12 kg/ha	Certified farmers Uncertified farmers	PFCE (2016)	-
447 kg/ha	Mean for CdI	Tanno (2012)	-
351 kg/ha 492 kg/ha 498 kg/ha	Bakwé Burkinabé Baoulé	Tanno (2012)	Differences between ethnic groups
660 kg/ha	Mean for CdI	Kolavalli et al. (2016)	Yields in 2012
300-400 kg/ha	Mean for CdI	FLA (2015)	-
455 kg/ha	Mean for area around Taï national park	Varlet & Kouamé (2013)	Taï national park is located near Liberia
< 250 kg/ha 250-600 kg/ha 600-2500 kg/ha	Low yield farmers (41%) Med yield farmers (44%) High yield farmers (15%)	ICI (2015)	Percentage of farmers belonging to a certain yield category
394,6 kg/ha 396,1 kg/ha 236,1 kg/ha 258,4 kg/ha 314 kg/ha	Indénie-Juabin Nawa Loh Jibua Haut-Sassandra Mean for all four	Vignera & Ser (2016)	-
407 kg/ha 241 kg/ha	Certified farmers Uncertified farmers	Maytak (2014)	Synthesis of multiple researches
530 kg/ha 439 kg/ha 311 kg/ha	Multiple certifications Certified farmers Uncertified farmers	Maytak (2014)	Synthesis of multiple researches
506 kg/ha 492 kg/ha	Received training No training	Maytak (2014)	Synthesis of multiple researches
467,15 kg/ha 315,23 kg/ha	UTZ certified Uncertified	WUR (2014)	-
500 kg/ha	Mean for CdI	LAMBERT ET AL. (2014)	States yield/ha is same for Ghana and CdI
435 kg/ha	Mean for cooperative members	Balineau et al. (2017)	Barry Callebaut baseline survey

260-560kg/ha	Average yield of dry beans	Koko et al. (2013)	

Descriptives (most descriptives related to yield can be found under other topics such as fertiliser and labour):

- Anemia and malnutrition can negatively impact farm productivity due to loss of labour (days) (FLA, 2015).
- Yields are low (435 kg/ha), farms are small (4.87 ha) and old (24 years old), and affected by at least one disease (mainly by stem borer and swollen shoots virus (CSSV) and mirid bugs) (Balineau et al. 2017).
- The age of plots and the region are correlated with yields. Furthermore, trees are largely affected by diseases: 98% of plots are infected by one or several diseases. In short, plots characteristics are highly correlated with low yields, and the rejuvenation of plots is thus necessary (Balineau et al. 2017).

Box 6 Benchmarks: Productivity

620 kg/ha certified (N'Dao 2012)
576 kg/ha RA certified (RA 2013)
570 kg/ha non-certified (N'Dao 2012)
565 kg/ha (KPMG 2012)
450 kg/ha (HatlØy 2012)
352 kg/ha (Gockowski & Sonwa 2007)
334 kg /ha non- certified (RA 2013)

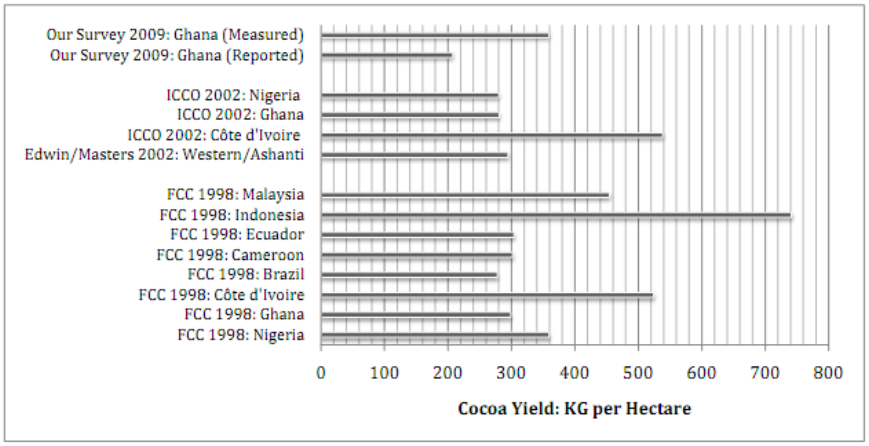
Benchmark productivity levels (Ingram et al. 2014)

Interventions and key assumptions

	Description	Key Assumptions	
Baseline	Farmers continue to farm current crop, productivity declines as trees age	• Farm size: 3.7 ha • Cost of labor: USD 4.2/day • Cocoa prices: stable at Sept 2014 prices and 2% annual increase each year (2 scenarios) • Farm gate price: 47% of world price • Fertilizer, pesticide, labors cost remain stable • Initial trees age: 10 years • Training costs excluded from analysis • Discount rate: 15%	• Yield: 500 kg/ha • Labor: 45 days/ha
GAP	Baseline + additional use of pesticides		• Max yield: 650 kg/ha • Labor: 67 days/ha • Pesticide cost: USD 58/ha
Fertilizer	GAP + additional use of (subsidized) fertilizer		• Max yield: 1,250 kg/ha • Labor: 100 days/ha • Fertilizer cost: USD 300/ha (unsubsidized)
Planting Material	Farmers replant 100% of their farm		• Max yield: 1,600 kg/ha • Labor: 140 days/ha • Replanting cost: USD 380/ha

Different scenarios under which yield can increase (Blackmore & Heilbron, 2015).

Figure 14: Comparison of Measures of Cocoa Yields



Hainmueller et al. (2011)

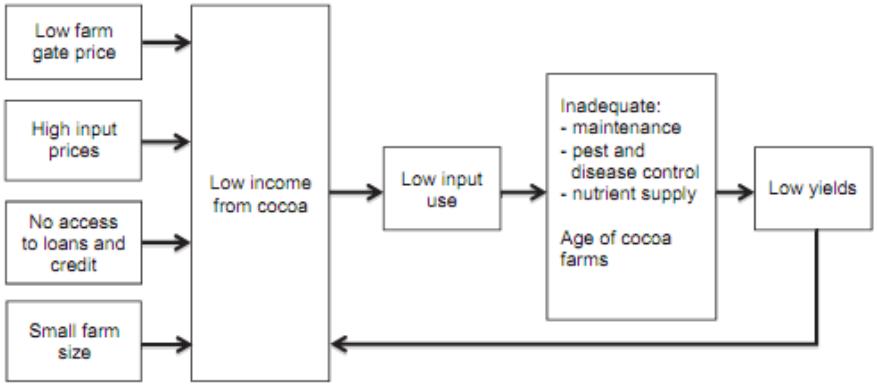


Fig. 1. Causes of low yield in farmers' cocoa in West Africa.

Causes of low yields (Wessel & Quint-Wessel, 2015).

Tableau 3 : Rendement moyen (kg ha^{-1} an^{-1}) des champs écoles paysans (CEP) en 2005-2006, après un an de réhabilitation

Département	Plantation témoin (PP)	Plantation en réhabilitation (GID)	Accroissement de production (%)
Adzopé	246	334	36
Alépé	271	425	57
Abengourou	279	751	169
Aboisso	325	450	38
M'batto	330	1058	221
Agboville	356	426	20
Agnibilékrou	371	552	49
Daoukro	428	534	25
Divo	614	962	57
Moyenne pondérée**	333,0	611,0	83

Source : Assi (2006), ** : Différence hautement significative (P < 1 %) entre PP et GID.

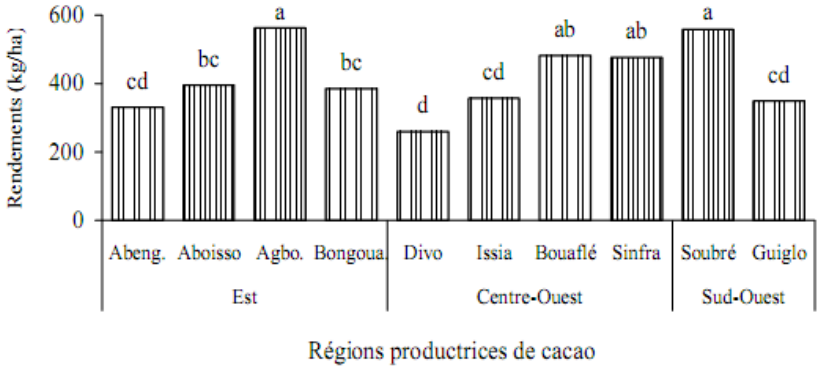
Difference between old and replanted plantations (GID=GAP) (Assiri et al. 2012)

Tableau 4 : Évolution des rendements moyens et des accroissements de production dans les plantations soumises à la réhabilitation, de 2005 à 2008

Année	Rendement réel (kg ha^{-1} an^{-1})			Accroissement de production (en %)		
	PP	GID	GID+	GID / PP	GID+ / PP	GID+ / GID
2005	425,0 b	628,0 a	-	47,5	-	-
2006	509,2 b	788,1 a	836,4 a	54,7	64,2	6,1
2007	578,0 c	800,8 b	1 084,9 a	38,5	87,7	35,6
2008	450,0 c	606,5 b	1 000,3 a	34,8	122,3	64,9

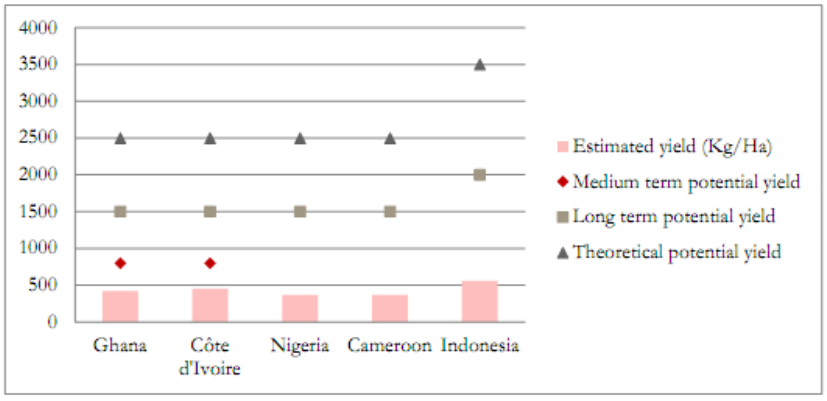
Source : Assiri (2010)
PP : Pratique paysanne d'entretien des vergers de cacaoyers ; GID : Réhabilitation basée sur des travaux d'entretien recommandés et la lutte intégrée contre les maladies et les insectes nuisibles du cacaoyer ;
GID+ : traitement GID + fertilisation minérale ; a, b, c : Sur une même ligne, les moyennes suivies de la même lettre ne sont pas statistiquement différentes (test de Bonferroni au seuil de 5 %).

Farm productivity under different scenarios (Assiri et al. 2012)



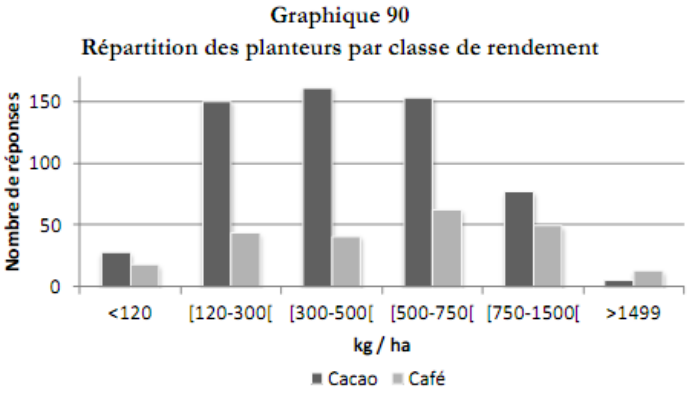
Differences in productivity between regions (Deheuvels et al. 2009)

Figure 6.4 Estimated yields are far from potential yields

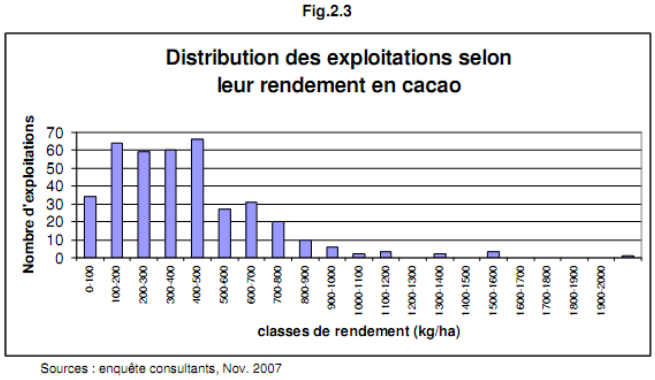


Source: Asamoah et al., 2015; Zabawi et al., 2009.

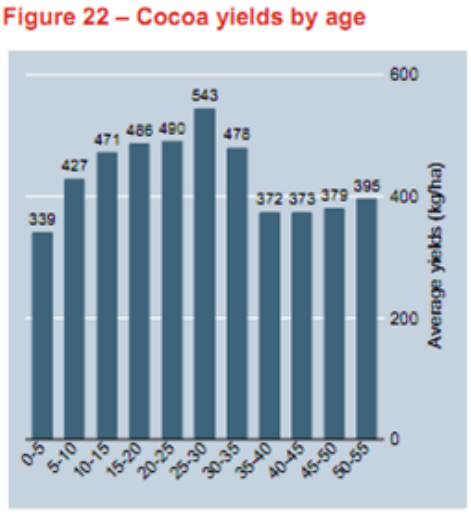
Gap between actual and potential yields (Oomes et al. 2016).



Distribution of farmers per production class (Varlet & Kouamé, 2013)

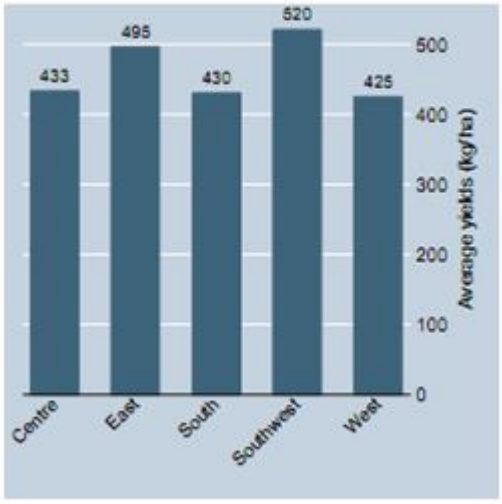


Distribution of farms based on productivity (Ruf & Agkpo, 2008)



Balineau et al. (2017).

Figure 23 – Cocoa yields by region



2Balineau et al. (2017).

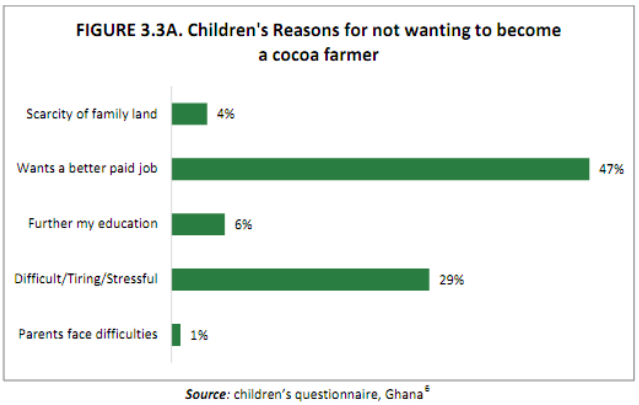
Future of cocoa

Ghana

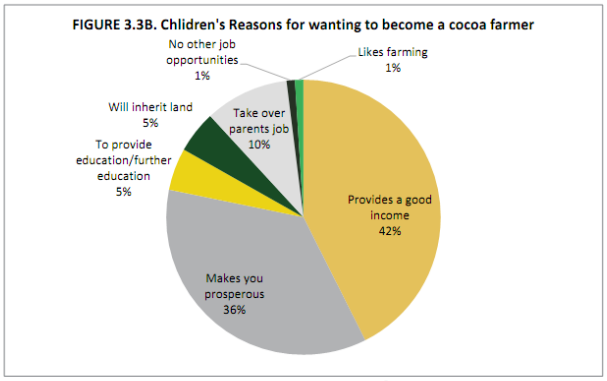
- Cocoa held varying degrees of importance within people's life plans. In the survey of 217 adult cocoa farmers, the perception of cocoa farming as an occupation was generally positive. Respondents said that cocoa farming was 'a lucrative venture', 'a lifelong investment', 'source of income security' and a 'source of collateral'. (To a lesser extent, respondents also said that farming was 'tedious', unrewarding and increasingly tenuous as land for farming becomes more and more scarce.) Some farmers use income from cocoa to finance major investment expenditures such as homes, or as capital for re-investment in their farms or as a means to finance education for family members.. They did believe cocoa would go some way to helping them fulfil their aspirations (cocoa farming was their livelihood, after all, and for some, it had afforded them a better standard of living than they would otherwise have had). On the other hand, there was still the feeling that the gains from cocoa were much less than they could be (Barrientos & Akyere, 2012).
- Problems of inheritance, farm fragmentation and litigation often deter youth from venturing in cocoa (Baah & Anchinirah, 2010).
- The inability of cocoa to attract youth to the sector poses a serious threat to the future supply of Ghanaian cocoa (Baah & Anchinirah, 2010).
- Only 22% of farmers reported that their children would continue in cocoa. This percentage is similar across regions. Most farmers do not want their children to work in cocoa because the work is too hard and because there are better opportunities in other fields (Hainmueller et al. 2011).
- Farmers have increasingly switched from agroforestry to zero shade cocoa plantations. The zero shade system requires more attention and not all farmers have the knowledge or

financial means to take care of their plantation. This usually results in the early death of cocoa trees. This leads to farmers moving out of cocoa into other cash crops after the death of their trees (also for **CdI**) (Wessel & Quint-Wessel, 2015).

- Both climate change and growing population pose constraints on land availability in the future. Furthermore, increasing population can lead to an increase in food prices, making food crops more attractive to produce than cocoa (Also for **CdI**)(Wessel & Quint-Wessel, 2015).
- Often neither parents nor children in cocoa households view cultivation as a long term occupation. Many cocoa growers think it is a good source of income to provide for and educate their children, but not an occupation for their children to engage in. The low-status of cocoa farming work, little prospect of upgrading, and the risks associated with the physically demanding tasks were reported as significant disincentives to farm cocoa. More generally, low productivity, lack of innovation and low incomes were among the key reasons given in Ghana's policy documents as to why young people do not want to enter agriculture. Young people in cocoa areas note the sheer drudgery of cocoa with little reward as well as what they see as the socially inferior status of farming and rural life (Kolavalli et al. 2016).
- Older farmers state they are stuck in cocoa, and cannot move into another livelihood. Young farmers, however, are more adventurous and often move to larger towns and cities in search for other livelihoods (Baah et al. 2012).
- The migration of youth to cities leads to labour availability constraints for existing cocoa farmers. The scarcity of labour makes labour more expensive (Oomes et al. 2016).



Vigneri et al. (2016).



Vigneri et al. (2016).

Côte d'Ivoire

- Most young men seem to regard cocoa farming (at least in theory) as a desirable option, but feel there are two main types of constraints. First, land access is mostly through inheritance, and also many young men believe they will have very little land passed onto them as the older generation have supposedly sold out land to migrants and foreigners, without thinking of their offspring's needs, thus causing conflicts between migrants and local youth. Secondly, young farmers have limited access to inputs, and according to the youth interviewed, this is aggravated by the absence of agricultural programmes specifically targeting young cocoa farmers (Vigneri et al. 2016).
- Almost none of the farmers interviewed (1%) told the surveyor that they wanted to stop farming cocoa (Barry Callebaut, 2017).

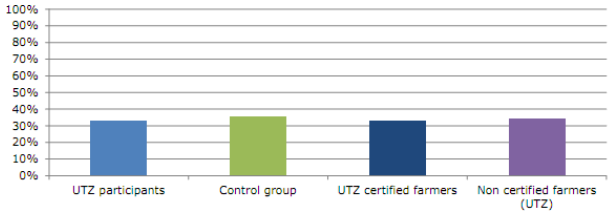


Figure 52 *Farmers wishing their children to continue cocoa farming.*

Ingram et al. (2014).

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