

Strategies for improving farmer living conditions for sustainable cacao production , Côte d'Ivoire



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MOTIVATION



Challenges

Ivorian cocoa farming faces an accumulation of economic, ecological and societal challenges, raising concerns about its sustainability and resilience to shocks and constraints (Kouadio et al., 2021, Andres et al., 2016, Jagoret et al., 2006)

Actions

In 2010, the Ivorian government adopted policies to promote agroforestry, zero deforestation and crop diversification (Gyau et al., 2014; Matissek et al., 2012)



Picture 1: Cocoa plantation with subsistence crops, Abengourou @ TOKOU 2022

- Indeed, agricultural diversification is a strategy to add functional diversity to cropping systems, focusing on the production of range plants, animals and their products (Stilmant et al., 2020).
- Lack of data on diversification models on cocoa farms makes it difficult to assess ecological and economic effects.



MOTIVATION



In the frame of our study, we focused on internal and external agricultural diversification, that is diversification from crop and non-crop diversification (livestock diversity)

- Evaluate the profitability of cocoa production
- Classify the level of diversification producers adopt on the farms
- Estimate the income of the level diversification

❑ Data collection methods include:

- Household surveys (303 households), focus groups, semi-structured interviews

Table1: Sampling

Regions	Cooperatives	N=303	Sampling
Agboville	05	51	Random sampling from the database of the End-line Study for PRO-PLANTEURS Phase I, 2020
Aboisso	05	60	
Abengourou	03	47	
Divo	05	75	Random sample based on the list of PRO-PLANTEURS Phase II targeted coops
Yamoussoukro	04	69	

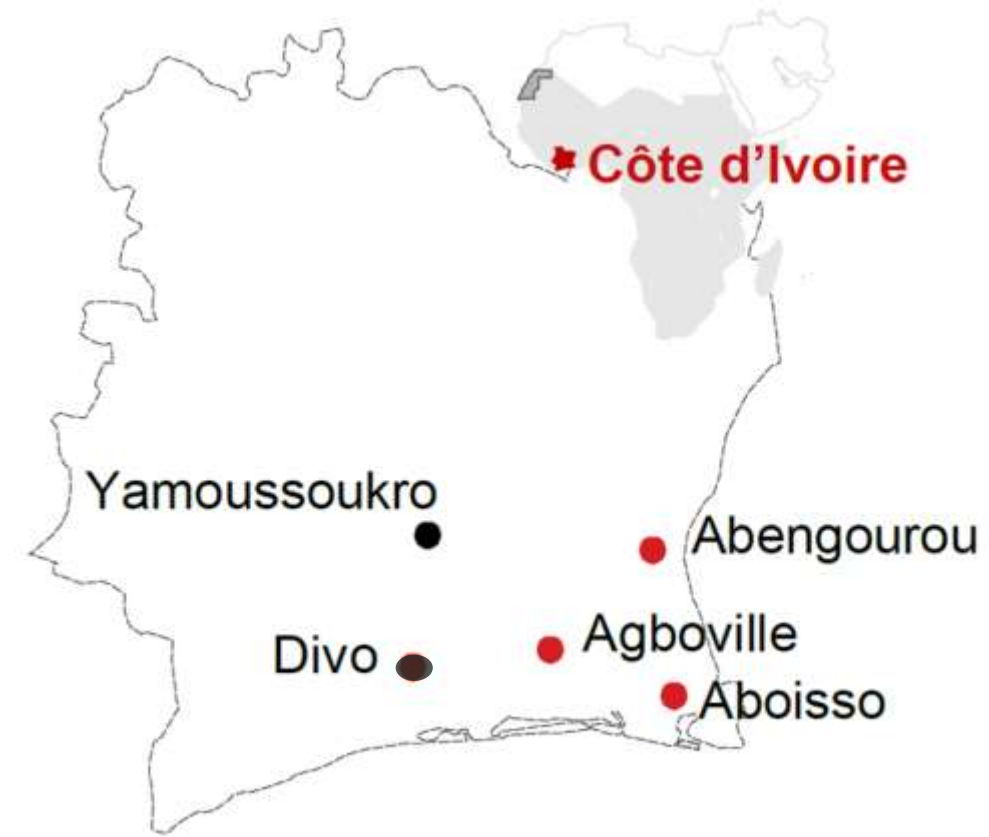


Figure1: Intervention areas @ PRO-PLANTEURS, Phase I and II

- Descriptive analysis (SPSS)
- Based of **Pinoargote et al. (2016)**, **Kpenavoun et al. (2018)** and **Kouadio et al. (2021)**

Table 2: Parameters of profitability and income

Income and profitability	Description
Total production costs of cocoa	Sum of wage labor, input costs, and other costs
Mean annual yield of cocoa (kg year ⁻¹ ha ⁻¹)	Ratio between the total cocoa production and the total area in hectare
Mean gross revenue from cocoa production	Product of the mean annual yield and the mean purchase price per kilogram during the 2021-2022 season
Profitability of cocoa	Subtraction cocoa income and the cost of production and add by the premium given by the cooperative
Gross income from other crops	Sum of the income from each crop and each type of livestock

Table 3: Profile of farmers

Variables		Overall
Gender (%)	Women	14,9
	Men	85,1
Age (%)	> 81	0,7
	20-40	17,8
	41-60	62,7
	61-80	18,8
Household size (Person)	Mean	10,6
	Standard error	6.3
	Median	10
	Minimum	1
	Maximum	33

- Majority of producers : men (85.1%) compared to women (14.9%)
- Age: 62.7% of producers (41 - 60 years old) ; 0.7% of them are above 80 years
- Mean household size : 10,6 persons

Table 4: Average areas and yields of cocoa

Overall	Mean area cocoa ha N=263	Mean area other crop ha	Yield season 2021-2022 Kg/ha
Mean	4,39	3,59	528,13
Standard error	0,25	0,25	23,29
Median	3,00	2,50	437,50
Minimum	1	0,2	85,00
Maximum	32	21	1.625,00

- Mean of cultivated cocoa area : 4.39 ha
- Mean area of other crops: 3.59 ha

Mean yield of cocoa : 528 kg/ha

Average yield of cocoa in the CIV : 450 and 550 kg/ha ;
Makhloufi et al. 2019

- Performance could be explained by
 - 82.14% of producers applying good agricultural practices,
 - 83.65% of producers using insecticides,
 - 42.21% using chemical fertilizers

Table 5: Producers perception of evolution of their production over the last five years

Development of production	Overall
Climatic variations	
increased	12,66
decreased	86,08
stayed the same	1,27
New agricultural techniques	
increased	82,14
decreased	10,71
stayed the same	7,14
Cocoa diseases	
decreased	90,82
stayed the same	0,00
Age of cocoa (young plantation)	
increased	90,32
decreased	0,00
stayed the same	9,68

- 86,08% of the producers noted irregular rainfall patterns as a cause for decreased production, this also causes diseases such as the huge brown rot
- 90,82% of the producers attribute the decrease in production to insects that destroy the flower, the young pods, the leaves and even the trunk
- 90,32% of the producers attribute the increase in production to the age of cocoa, as the plantation is at its optimum production stage

Table 6: Income of cocoa by ha (1 US Dollar= 630 FCFA)

	Costs cacao by ha	Income cacao by ha	Profit cacao by ha
Overall	160.31	642.34	502.16
Descriptive statistics	Costs cacao by ha	Income cacao by ha	Profit cacao by ha
Standard Error	14.74	28.47	28.51
Median	95.24	542.33	420.63
Minimum	1.79	81.85	-967.46
Maximum	1.884.13	3.273.81	2.903.97

- The mean costs for the total sample are 160,31 US Dollar/ha and an the mean income is 642,34 Dollar/ha
- The benefit for the total sample is 502.16 US Dollar per hectare that is 45.65 US Dollar per household per year and 0.12 US Dollar per day per person

RESULTS: Frequency of Diversity

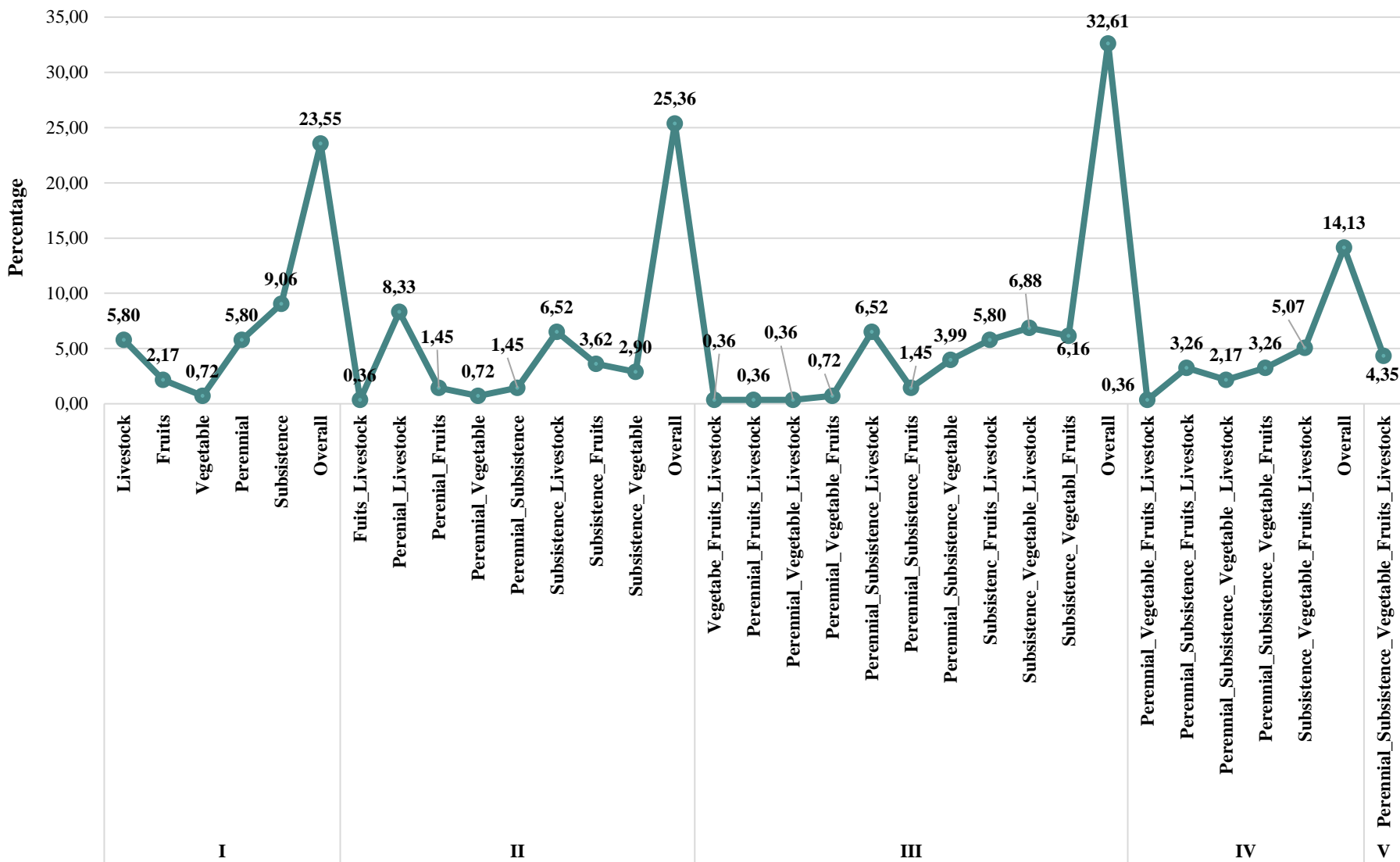
Table 7: Diversity of crops

Perennial income declared	Coffee	Hevea	Palm oil	Cashw tree					
41%	45%	32%	32%	15%					
Subsistence income declared	Cassava	Banana	Maze	Rice	Yam	Peanut	Taro	Beans	Sweet potato
67%	62%	59%	51%	25%	24%	6%	3%	1%	1%
Vegetable income declared	Gombo	Aubergine	Pepper	Tomato	cabbage	Carot	cucumber		
35%	80%	66%	63%	19%	2%	1%	1%		
Fruits income declared	Orange	Avocado	Lemon	Pamplemousse	Mango	Papaya			
36%	66%	59%	26%	10%	6%	3%			
Livestock income declared	Chicken	Sheep	Cabri	Beef	Pork	Guinea fowl	Duck		
51%	79%	34%	11%	4%	3%	1%	1%		



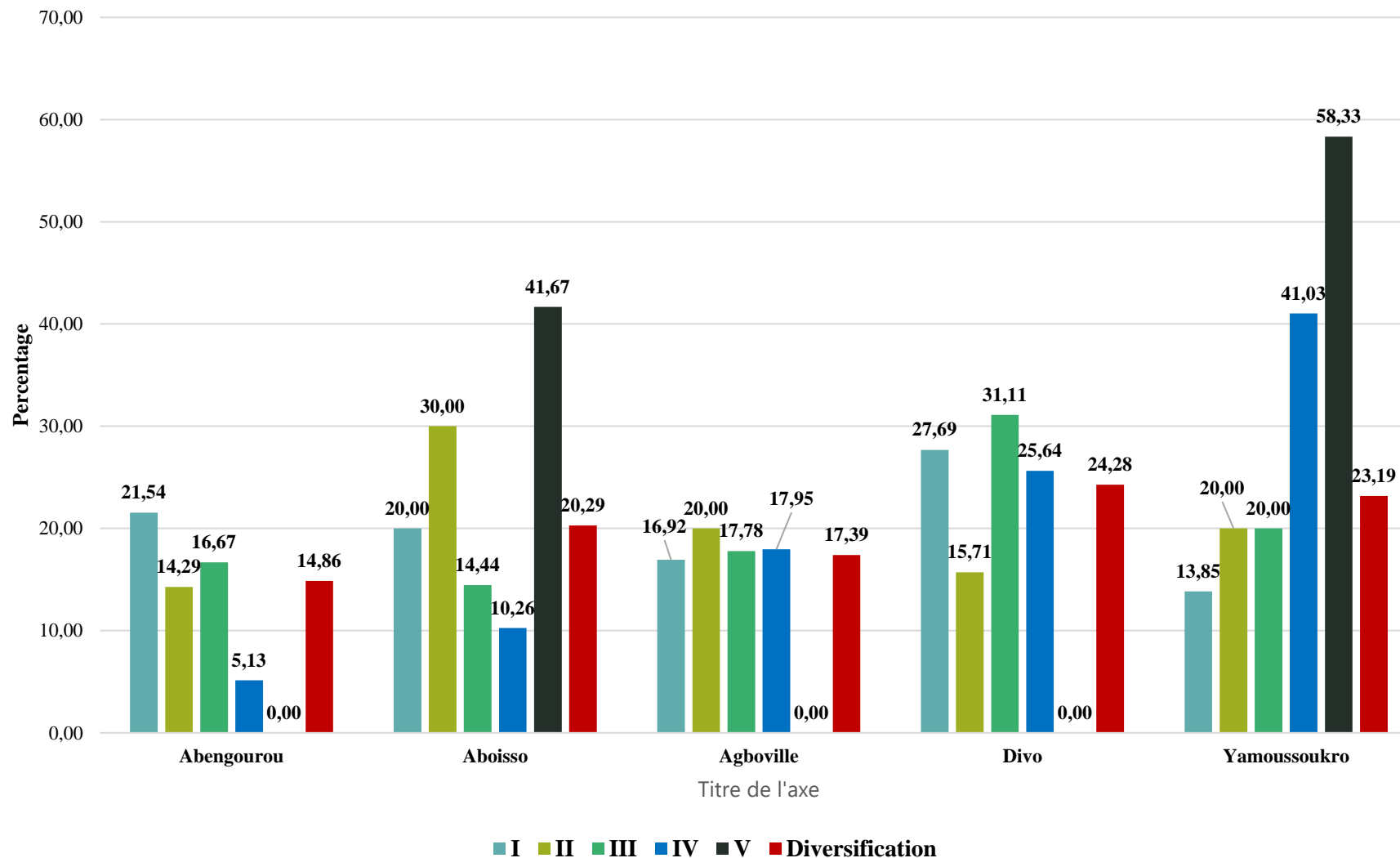
Picture 3: Cabri and Fowl in the farm of a producer @LAMRHARI,TOKOU 2022

- In terms of diversification crops, it is perennial, subsistence, vegetables, fruits crops and livestock
- With more adopted subsistence 67% and low adopted vegetable 35%



- 29 diversification combinations practiced by producers were classified into five levels according to the number of crops grown
- Of these levels, level three is the most adopted with 32.61% and weakly adopted level five 4.35%

Figure 2: Combination and level of diversification



- In terms of diversification by region, the producers of Divo diversify more (24.28%) against the producers of Abengourou (14.86%)
- For the level of diversification, only producers in Aboisso and Yamoussoukro adopt the five levels of diversification

Figure 3: Level of diversification by region

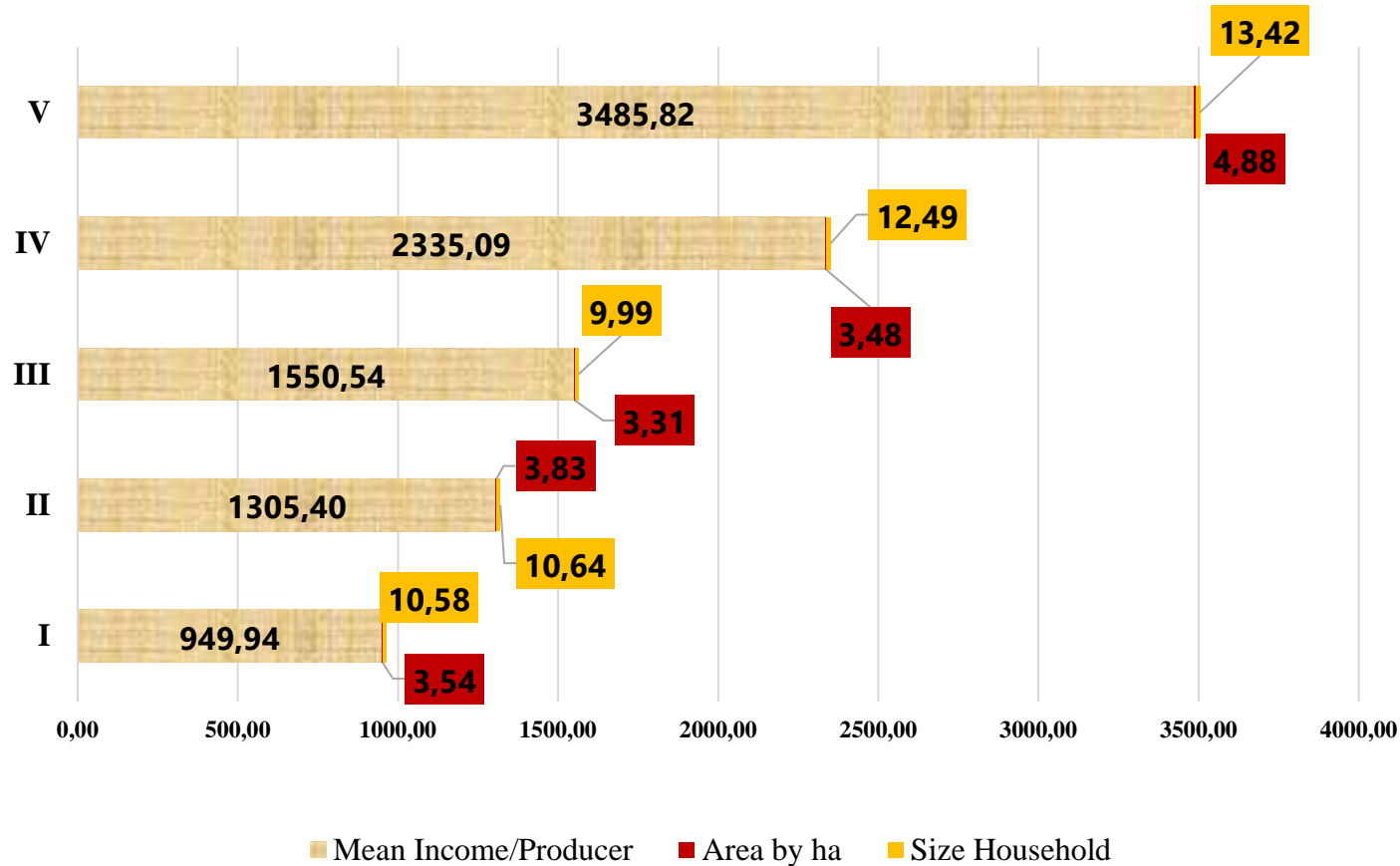


Figure 4: Income of each level of diversification by producer (in US Dollar)

- Producers with more diversification have a higher income. Income from diversification is a function of the level of diversification.
- In contrast to size area, level five and two have a larger area than the others. The level of diversification is not a function of the area
- These results are similar to the work of (Folefack et al., 2015) who report that the more diversified a system is, the higher its income
- Producers adopting diversification level five, four, two and one have a large household size
- The level of diversification is a function of the household size with the exception of level three which does not follow this trend



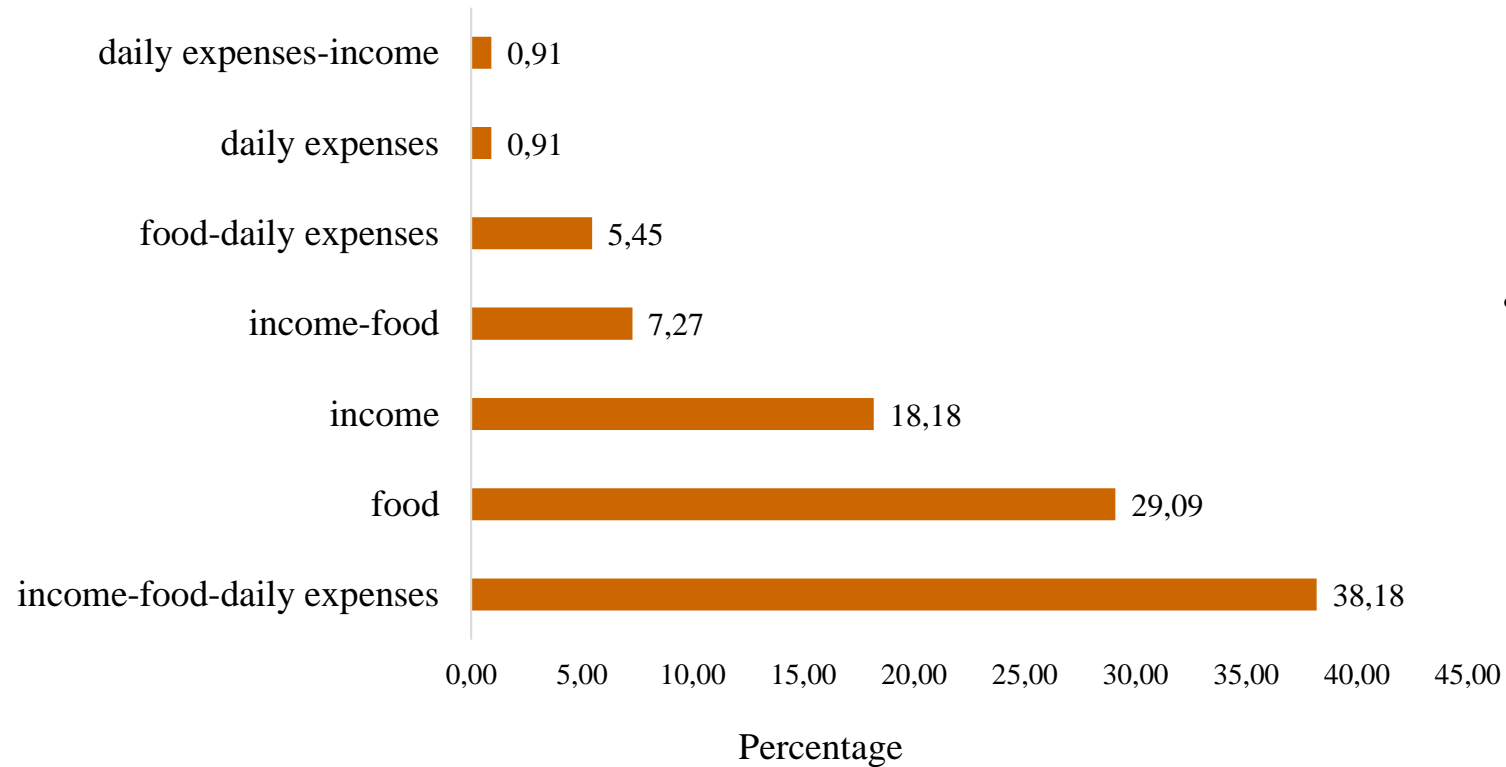
RESULTS: Income cocoa and diversification



Table 8: Income by household

	Income of producer with cocoa and diversification	Income of producers with only cocoa
Percentage	74,14%	26%
Income (US Dollar)	3779.22	2033.85

- Of the producers surveyed, 74.14 practiced diversification compared to 26 who lived solely from cocoa. Thus, in terms of income, producers who adopt diversification have two times higher than the producers that do not diversify



- Food represents the most dominant motivation with 29% in addition to other combination of motivations

Figure 5: Motivation for crop diversification



Conclusions



- The farmers surveyed practiced five levels of diversification in terms of perennial crops, food crops, vegetable crops, fruit and livestock.
- Moreover, the producers practicing diversification have two times higher income than producers who only produce cocoa.
- Motivation to diversify relates primarily to food security, as well as the payment for daily expenses and additional income



Recommendations



- There is a need to deepen public agricultural research in diversification models that suit regional differences, market and food security interests.
- Investigate how crop diversification and association influence the work organization and re-arrange agricultural practices.
- For projects there is a need to better accompany the producers to improve land use for more efficient diversified farming systems.




PRO-PLANTEURS

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Forum Nachhaltiger Kakao

German Initiative on Sustainable Cocoa



Bundesministerium für Ernährung und Landwirtschaft
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Le Conseil du Café-Cacao

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