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## Diversification of Income Sources for Cocoa Farm Households : A Case Study of the Central West of Côte d'Ivoire

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**Diversification of Income Sources for Cocoa Farm Households :  
A Case Study of the Central West of Côte d'Ivoire**

By

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# Diversification of Income Sources for Cocoa Farm Households: A Case Study of the Central West of Côte d'Ivoire\*

B. G. Jean-Jacques Iritié<sup>†</sup> and Fabrice S. Djaléga<sup>‡</sup>

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## Abstract

This paper is aimed at identifying complementary sources of income for cocoa farm households in the Central West of Côte d'Ivoire. Our methodology consists of four successive stages: (i) a need assessment of cocoa households and specificities of the study area through a participatory diagnosis in order to propose potential income generating activities; (ii) a technical qualitative analysis of these activities; (iii) an analysis of the profitability and (iv) an analysis of their social acceptability. It appears that beekeeping and snail breeding are the most appropriate activities for this cocoa producing region. However, the results show that the lack of information and technical knowledge, the religious burdens and the high local illiteracy rate can constitute barriers to the implementation of IGAs. Finally, as future prospects, we discuss the opportunity to combine horizontal diversification and vertical diversification (especially, cocoa processing) in order to give more added value to the sustainable cocoa production and to contribute to the industrial development of Ivorian economy.

*Keywords:* Cocoa farm households; vulnerability; income generating activities; diversification; Côte d'Ivoire.

*JEL classification:* O13 ; Q12 ; Q13

## 1 Introduction

Cocoa is a speculation that is the subject of major interest worldwide. According to the programme "Trade for Development Centre" of the Belgian Development

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Agency, the world cocoa market represents on average 10 billion US \$ per year (Belgium Development Agency, 2011); it is the third largest market after oil and coffee and is mostly supplied by South America, Southeast Asia, the Caribbean and Africa (Wamba, 2009; Fadipe et al., 2012; Owusu and Frimpong, 2014). Africa alone produces over 70% of world cocoa whose granary remains the countries of West Africa, the most important being Côte d'Ivoire (41%), Ghana (17%), Nigeria (5%) and Cameroon (5%) (Obiri et al., 2007; Nkamleu et al., 2010).

In Côte d'Ivoire, the world leader in cocoa production, the total planted area is 2,300,000 ha; the farms are generally family-type with an average size of between 3 and 5 ha and average yields of 500 kg/ha (FIRCA, 2013b). The production of cocoa beans stood at over 1.7 million tonnes against 1.5 million tonnes in 2012/2013, so an increase of 13.3% (Conseil Café-Cacao, 2014). The revenues derived from the cocoa activity contribute up to 20 % to the formation of Gross Domestic Product and accounts for 30 % of export earnings (IMF, 2013). The sector employs almost 800,000 farmers and supports nearly 47% of the population; which represents approximately 8 million people (Conseil Café-Cacao, 2014). So, the cocoa sector contributes significantly to economic and social development. This is the result of a combination of previous policies, more or less currently maintained, including the maintenance of incentive prices to producers through a public mechanism of stabilization and price support (called Caistab)<sup>1</sup>, free access to land, opening up to foreign labor, regeneration of orchards, opening up of production areas (Tano, 2012).

The Ivorian cocoa sector is the perfect example of the strong dependence of small farmers to a cash crop; in fact, 97.6% of producers derive most of their income from cocoa (CARE International, 2012). This dependence is even stronger for cocoa households as one has not yet identified any major substitutes to cocoa for the chocolate industry (Talbot, 2002; Gilbert, 2007). The reliance of producers and their household incomes expose them to price fluctuations. Indeed, some authors such as Cashin et al. (1999), Cashin and McDermott (2001), Brown and Gibson (2006) and Gibson (2007) showed that world cocoa prices are both highly volatiles in short term and long-term decreasing. Therefore, the price volatility of producers automatically creates volatility in income and a regular adjustment of their consumption expenditures (Brown and Gibson, 2006; Ruf and Agpko, 2008). According to Gibson (2007),

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<sup>1</sup>The Caistab was the main public management instrument of coffee and cocoa sector since independence of Côte d'Ivoire; its purpose was to oversee the entire process of marketing these two products to ensure remunerative prices to producers and to smooth their income. It has worked as an intermediary between producers and the international market. However in the 90's, under pressure from the Bretton Woods institutions (IMF and World Bank), the State has withdrawn from sale thus making it free. Then liberalisation of marketing system intervened in 1998 for coffee and cocoa in 1999 with the objective of removing distortions created by the central government and improve the efficiency of supply chain and prices received by producers. According to some authors such as Araujo-Bonjean and Chambas (2001) and Gibson (2007), it is clear that this liberalisation has been at the expense of producers. After the dismantling, several institutions were created to regulate, fund and develop the sector. These structural post-Caistab reforms led to mixed results due to dysfunctions and poor governance that characterized these structures (Ruf, 2009; Tano, 2012). Since the end of the post-election political crisis in 2011, the State conducted a new reform of the coffee-cocoa sector which resulted by establishment of a unique management structure called "Coffee and Cocoa Council (CCC)." This new structure whose functioning draws on stabilised system promotes a sustainable cocoa economy (voir Conseil Café-Cacao (2012)).

volatility of short-term price is mainly due to the dynamics of supply (climatic and natural conditions, political conflicts) and demand (requirements of international markets, increasing stock market speculation). As for the decline in long-term price, it is the result of market distortions introduced by previous stabilization systems but also by structural overproduction of cocoa due to the low marginal costs of harvests. Both trends, volatility and falling prices, are likely to threaten the security of household livelihoods and living conditions.

Note that the Ivorian cocoa marketing campaign involves two main steps: the peak season from October to March and the little season from April to September. During the little season which coincides with the lean period, the harvested beans are not abundant because of the poor condition of the orchards (FIRCA, 2013a). In other words, there is an unequal distribution of cocoa revenues throughout the year; this contributes to vulnerability and impoverishment of cocoa producing households. Moreover, the Poverty Reduction Strategy Paper (PRSP) shows that poverty rates in the Ivorian cocoa sector were 60% for the 2006/2007 marketing year (IMF, 2009). In addition, the vulnerability of households is much felt by young men and women in households. An exploratory study commissioned by the NGO CARE International with Ivorian cocoa communities shows that women and young men do not often have their own activities to generate income (Koula et al., 2014); they are devoted exclusively to cocoa farming and housework and often have limited access to land; all these constraints reduce their autonomy and create a dependency vis-à-vis the head of household.

To deal with the instability of household incomes and the challenge of a regular supply of cocoa, some chocolate manufacturers do not hesitate to intervene directly with producer households. For them, the support of cocoa industry requires improvement of living conditions of cocoa smallholders and the practise of sustainable cocoa farming. Thus in recent years, several projects have been initiated by industry in Côte d'Ivoire. These include for example the programme "CocoaAction" involving eleven multinational <sup>2</sup>, the project "Vision for Change or V4C" initiated by the chocolatier Mars Inc <sup>3</sup> and The project "Cocoa Life" of Mondelez International <sup>4</sup>. Regarding specifically the Cocoa Life project implemented by the NGO CARE International, the focus is on promoting more diversified and stable sources of income for cocoa smallholders households. Indeed, there is a consensus in the literature that diversification of activities allows the dependant farmer on a single agricultural

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<sup>2</sup>The CocoaAction programme set up in 2014 by 11 multinational companies including ADM, Nestlé, Mars, Mondelez, Ferrero, Hershey, Blommer, etc under the auspices of the World Cocoa Foundation (see <http://worldcocoaoundation.org/about-wcf/cocoaaction/>, retrieved on July 15, 2015).

<sup>3</sup>The Vision for Change (V4C) project initiated by the chocolate maker Mars Inc. in 2010 is implemented until 2020 by World Agroforestry Centre (see [http://cocoasustainability.com/2012/11/projet-vision-for-change-v4c-pour-une-cacaoculture-durable-en-cote-divoire/?doing\\_wp\\_cron=1437131552.3815870285034179687500](http://cocoasustainability.com/2012/11/projet-vision-for-change-v4c-pour-une-cacaoculture-durable-en-cote-divoire/?doing_wp_cron=1437131552.3815870285034179687500), retrieved on July 15, 2015).

<sup>4</sup>The Cocoa Life project was initiated in 2012 by the Mondelez International for a period of 10 years; it is implemented in Côte d'Ivoire by the Non Government Organization CARE International (see <http://www.mondelezinternational.com/Newsroom/Multimedia-Releases/Mondelez-International--LaunchesCocoa-Life-Sustainability-Program-in-Cote-dIvoire>, retrieved on July 15, 2015).

commodity to hedge against price volatility effects (Gibson, 2007). The implementation of additional income generating activities through diversification projects can be done either by the transformation of the downstream product (vertical diversification), or by the production of other crops (horizontal diversification). For the non-governmental organization International Action Against Hunger (ACF International), the promotion of income-generating activities (IGAs) actually helps to fight considerably against poverty (ACF International, 2009).

This paper is aimed at identifying additional sources of income for cocoa farming households in cocoa growing communities in the Central West of Côte d’Ivoire. The focus will be to propose innovative income generating activities other than cocoa for women and young men to reinforce the total income of cocoa households. Our methodological approach involves four steps; first, a need assessment of cocoa households and specificities of study area through a participatory diagnosis in order to propose potential income generating activities, then a technical evaluation of these potential activities, in the third step we perform the measure of profitability and in the last step we do an analysis of their social acceptability. It appears that beekeeping and snail breeding are the most appropriate activities for this cocoa producing region. However, the results show that the lack of information and technical knowledge, the religious burdens and the high local illiteracy rate can constitute barriers to the implementation of IGAs. Finally, as future prospects, we discuss the opportunity to combine horizontal diversification and vertical diversification (especially, cocoa processing) in order to give more added value to the sustainable cocoa production and to contribute to the industrial development of Ivorian economy.

The rest of the paper is organized as follows. The section 2 focuses on the literature review on the concept of income-generating activities and discusses some analysis approaches. Section 3 develops the methodology. We present the results in section 4 and the section 5 is dedicated to discussions and policy implications. Finally, section 6 concludes the paper.

## 2 Income generating activities: an overview

According to International Labour Organization (2013, p. 2), household income consists of all receipts whether monetary or in kind (goods and services) that are received by the household or by individual members of the household at annual or more frequent intervals, but excludes windfall gains and other such irregular and typically one-time receipts. Income generating activities (IGAs) therefore refer to opportunities based on the use of available local resources and generating a useful income to the household (Van Niekerk and Van Niekerk, 2009). They must be profitable and sustainable regardless of place of performance. IGAs also aim at improving social welfare, promoting gender and women’s empowerment, strengthening of solidarity within communities in order to fight significantly against poverty (National Development Agency, 2013).

IGAs are classified according to the type of activity (agricultural and non-agricultural activities) and the number of people involved (individual or collective activities) (Bebbington, 1999; Carletto et al., 2007). When IGAs are individual,

they require a low initial investment but remain fragile because they depend on a single person and often have low returns. As for collective activities, they generally require significant investments but are stronger (shared risk) and offer more stable jobs. Whatever the type and number of people involved, the implementation of an IGA depends on the socio-economic context of beneficiaries. In addition, it can be done in three ways: (1) conversion towards other activities, (2) improvement of existing activities to make them more profitable (i.e introduction of new technologies, promoting access financial markets, training support) and (3) the diversification of income sources ([ACF International, 2009](#)).

In the literature of agricultural economics, the diversification of sources of rural households income in developing countries is central to much studies (see for example [Lay and Schüler \(2008\)](#), [Winters et al. \(2009\)](#), [Babatunde and Qaim \(2009\)](#), [Davis et al. \(2010\)](#), [Ayanwuyi and Akintonde \(2011\)](#), [Ibekwe et al. \(2012\)](#), [Combary \(2015\)](#)). The concept of diversification reflects the differentiation of production trajectories of a productive unit. In other words, it refers to the allocation of productive resources among different activities, agricultural or non-agricultural ([Babatunde and Qaim, 2009](#)). For example in the agricultural sector, it means extension of the range of animal and plant productions (horizontal diversification) or enlargement of the function via supply (vertical diversification). The decision to diversify is often led by the desire to raise constraints or rather to enjoy additional rents opportunities. [Babatunde and Qaim \(2009\)](#) summarize the main reasons of diversification: increase income in case of insufficient resources, reduce income risk in case of absence of insurance market, use strategic complementarities and positive interactions between activities, fund agricultural investments in the presence of market failure.

The diversification of income sources is used by many NGOs such as Shiree and ACF International as part of their mission to support vulnerable populations. The conceptual model developed for the implementation of IGAs projects in the diversification purpose depends on each implementing agency. But in general the choice of IGAs is based on a qualitative analysis (evaluation of environmental, beneficiaries preferences, resources availability, technical feasibility, etc.) and quantitative analysis of profitability (see guides of [ACF International \(2009\)](#) and [Shiree \(2011\)](#)). A detailed analysis of the guides of these NGOs show that the model developed by Shiree places particular emphasis on identifying the beneficiaries preferences as guarantee of their participation to IGAs projects while ACF International model gives priority to participatory analysis of implementation areas and its relevance to income-generating activities. So, the participation of beneficiary population is differently appreciated by these two agencies, but it appears to be very important for the choice of AGRs. The analysis of the determinants of participation of beneficiaries has also been the subject of much researches and provided a better guide to income generation initiatives and public policy decisions ([Abdulai and CroleRees, 2001](#); [Babatunde and Qaim, 2009](#); [Ayanwuyi and Akintonde, 2011](#); [Ibekwe et al., 2012](#); [Combary, 2015](#)).

In a general way, diversification in cocoa farming is done outside of the value chain by introducing new activities that can be agricultural or non-agricultural (horizontal diversification). In a study involving 6 Ghanaian cocoa grower districts, [Aneani et al.](#)



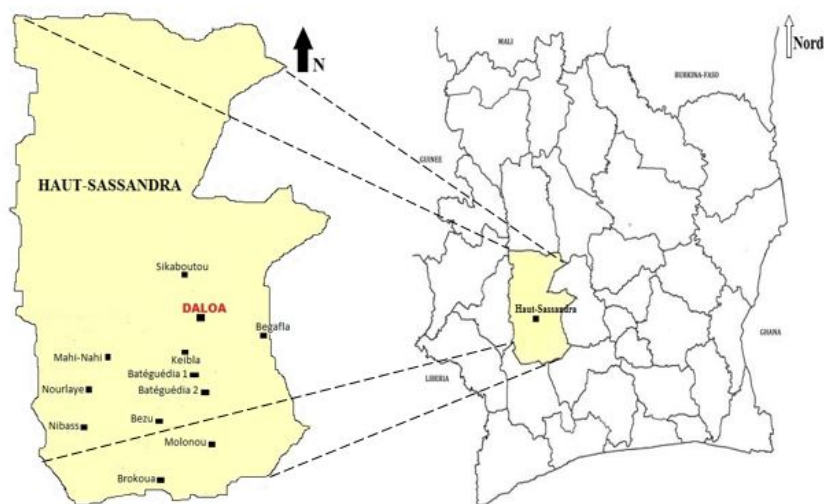
(2011) show that 79% of cocoa farmers diversify their income sources with at least one culture other than cocoa. These cultures can be done either in combination with cocoa or outside cocoa plantations. In particular, this concerns rubber trees, oil palm, banana trees and food crops. Moreover, in some countries of central Africa like Cameroon, cocoa is through development of the natural forest; we speak of cocoa agroforests. The trees introduced in plantations have a dual objective: conservation of biodiversity and marketing of wood. Trees are often introduced exotic species that meet the needs of the market (Del Greco et al., 2012) or local species already grown in the region (Jagoret et al., 2009). When cocoa farmers choose to diversify their income sources through off-farm activities, they invest in real estate, trade, transport or in small traditional livestock such as poultry, sheep, rabbits, etc. (Ruf and Agpko, 2008; Tano, 2012).

On vertical diversification in cocoa value chain, it is not common at producers level. However, in the Central West region of Côte d'Ivoire for example, some foreign producers especially generate 10% to 14% of their non-agricultural income through activities such as cocoa tracking, collecting cocoa between plantations and cities, cooperative management or weighing (Ruf and Tanoh, 2009).

### 3 Methodology

The study covers eleven (11) communities or cocoa-growing localities including seven villages (Batéguédia 1, Batéguédia 2, Begaffa, Bezu, Brokoua, Keiba, Mahi-Nahi) and four camps (Molonou, Nourlaye, Nibass, Sikaboutou) in the Central West of Côte d'Ivoire also region "Haut-Sassandra" (Figure 1).

Figure 1: Region of Central West with studied localities



The Central West of Côte d'Ivoire is a hot, sunny and humid zone. It also has a major water systems and agro-ecological and climatic characteristics favorable to

cocoa and other agricultural activities (ANADER, 2004). It is a high level cocoa producing area which earned it the denomination of the former "cocoa belt". According to the Ministry of Agriculture, production in this area has increased from 92,000 tonnes in 2008-2009 to more than 136,400 tonnes during 2010-2011 campaign, that to say an increase rate of about 48%; it represents 7-10% of the national cocoa production (Ministère de l'Agriculture, 2011). Because of the intensity of its cocoa activity, the Central West area attracts large marketing industrial groups, structures of development and many agricultural cooperatives of cocoa. Besides, as part of this study, the surveyed households are members of four agricultural cooperatives present in the area: Coopaths, Ecafhs, Case Planter and Casahs.

Our methodological approach is inspired by the model of ACF International and the NGO Shiree. It consists of four successive stages: (i) a need assessment of cocoa households and specificities of study area through a participatory diagnosis in order to propose potential income generating activities (IGAs); (ii) a technical qualitative analysis of these activities; (iii) an analysis of their profitability and (iv) an analysis of their social acceptability. At each step, some income-generating activities are eliminated to allow us to identify appropriate activities for cocoa farming communities. Therefore, the four successive steps act as four fishing nets with mesh sizes ranging from the largest to smallest.

### 3.1 Needs assessment

In this first step, we analyse the needs of cocoa communities and characteristics of the study area. The aim here is to provide a list of potential income generating activities that better meet both communities needs and specificities of area. To do this, we carried out a participatory diagnosis through the so-called active participatory research approach involving the beneficiary communities. It is a collaborative research, education and action approach used to gather information necessary in order to effect social and environmental changes (Khanlou and Peter, 2005; Pain et al., 2010). It combines several tools. In each locality we used "priority-ranking matrix", "village map", "trade flows diagram" and "Venn diagram" to analyse needs of communities, socio-cultural organization, basic infrastructure and economic activities (see Appendices 2 and 3 for a description of these tools). At the end of the diagnosis and other discussions with beneficiaries, we proposed a first list of potential income-generating activities.

### 3.2 Technical evaluation

We will first identify indicators allowing analyse the technical feasibility of potential IGAs; an evaluation grid structured around these indicators and their assessment criteria will be developed. It will be based on the results of the previous diagnostic analysis. In a second phase, we will conduct, strictly speaking, the technical qualitative analysis. Each potential income-generating activity will be assessed through the evaluation grid; it is a kind of a matching analysis between IGAs and indicators. After that, we will retain activities which better match technically to the needs and realities of the beneficiaries.

### 3.3 Financial analysis

We will proceed by an assessment of benefits and financial profitability of each activity retained after the above step 2. To do this, we use traditional criteria of financial analysis of project such as gross margin and break-even point. There is no standard definition of gross margin (GM); here we will use  $GM = P_v - P_a$  where  $P_v$  is the selling price and  $P_a$  the purchase price. As for break-even point (BP), it is calculated by the following formula:  $BP = \frac{FC}{CM/SR}$  where FC represents fixed costs, CM contribution margin and SR sales revenue. After this quantitative analysis, we will retain the most profitable activities.

### 3.4 Analysis of acceptability

This step is to analyse the acceptability of beneficiaries for activities selected after the financial analysis. It should be noted that the beneficiaries of IGAs projects will be mainly women and young men. Indeed, one shows that increased of women income in developing countries has a more significant impact on household (FAO, 2005). As for young men, they are an important workforce for cocoa producing households; however, they are often plagued by rural exodus. Therefore IGAs are aimed to make young men autonomous, secure the work force and strengthening total income of the cocoa households. For this purpose, a sample of women and young men has been investigated. The survey questionnaire was structured around questions allowing to assess the level of adhesion and reasons for any refusal of activities.

### 3.5 Data collection

We conducted a survey of 200 cocoa households randomly drawn from a population of 1,618 households cocoa study area. The total population of households consists of all households cocoa members of four cocoa cooperatives present in the study area. In each household of sample, we interviewed initially household heads and then a woman (F) or a young man (M). The interview of the 200 household heads has allowed us to characterize the household and cocoa production. The survey of 200 women and young men was to analyse the acceptability described in the previous section. Sampling is presented in Table 1 below.

Table 1: Sampling

Cooperatives	Localities	Households	%	Theoretical sample	Effectif sample	M	F
Coopaths	Bateguedea 1	83	5.12	10	10	5	5
	Bateguedea 2	275	17.0	34	34	17	17
	Keibla	86	5.3	11	11	5	6
Ecafhs	Brokoua	96	5.9	12	12	6	6
	Molonou	63	3.9	8	13	6	7
	Bezu	91	5.6	11	12	6	6
Case Planteur	Sikaboutou	388	24.0	48	39	23	16
	Bégafla	377	23.3	46	47	22	25
Casahs	Nibass	55	3.4	7	7	5	2
	Mahi-Nahi	32	2.0	4	5	3	2
	Nourlaye	72	4.4	9	10	5	5
Total (study area)		1618	100	200	200	103	97

## 4 Results

### 4.1 Organisation and needs of communities

From village maps, Venn diagrams and trade flows diagrams made in the eleven localities we characterized the study area and all the cocoa communities. It appears that the basic infrastructure is almost non-existent in all localities. The localities lack clean water supply networks and have little health and school infrastructures. Indeed, the majority of localities use water's wells except Keibla, Bégafla and Sikaboutou which have two functional hydraulic pumps. Moreover, the only four villages have rural electrification networks that unfortunately remain less dense. Finally, note that all roads are in poor condition, making difficult the escape of productions.

At the social and political organisation level, every locality has a head of village generally designated by the natives. The localities give equal space to all different resident communities (native and foreign). So, there is a harmony between different communities; this also promotes development of self-help groups for plantation maintenance operations and transport of agricultural commodities towards villages and towns. The characteristics of cocoa households are reported in Table 5 (Appendix 1). The average household size is 5 individuals in the study area with up to 12 in Sikaboutou and a minimum of 3 individuals in Mahi-Nahi. The religious beliefs of households are threefold: Christian (50.5%), Muslim (26.50 %) or animists (23%). However in detail as shown in Table 6 (Appendix 1), some localities have a very high percentage of Christians (Bezu, Nourlaye and Batéguédea 1), Muslims

(Nibass) or animists (Bégafra ). The results also show a high rate of illiteracy of heads of household (41.0%).

Economic activity is dominated by farming; cocoa farming represents the main activity. The average size of cocoa plantations is 3.4 ha. Cocoa farming and other agricultural activities require lot of working time, about eight hours of work per day with five days present in plantation out of seven<sup>5</sup>. So, communities have few time to devote to other activities. Futhermore, they face the rarity of farmland and have difficulty to access nursery cocoa plants. Apart from cocoa, study area is producer of food crops such as yams, rice, cassava, banana and vegetable cultivations and indulges at small traditional pig farm, chickens, goats and sheep. There are also services such as hairdressing, selling clothing, etc. Trade between localities are dense.

The household survey showed that 80.5% of households are engaged exclusively in cocoa production (see Table 7, Appendix 1). But cocoa farming does not provide sufficient income during little campaign (lean season) due to insufficient of bean crops; this creates an unequal distribution of cocoa households income along year and therefore, an income insecurity. Because of that, there is a require of diversification of income sources for households. To realise we analysed from focus groups and priority-ranking matrices, preferences of local communities for diversification. Table 8 (Appendix 2) summarizes the ranks given to "diversification needs" in each locality. It appears that all communities actually express a willingness to diversify income sources.

## 4.2 Potential income generating activities

The diagnostic analysis of needs and specificities of study area and other discussions with communities have helped usto suggest a first list of potential IGAs. This includes:

(a) *Beekeeping*: this is the breeding of edible honey bees. The breeder brings hives and cares and commercializes productions. Besides honey, beekeeping offers other products such as wax, pollen, royal jelly, propolis. These products are marketable and can generate revenue.

(b) *Cocoa plants nursery* : this will be the cultivation of improved variety of cocoa seeds commonly known as "Cacao Mercedes"<sup>6</sup> in local parlance and harvesting of nursery plants. These plants will be marketed in local communities and even outside.

(c) *Transport of agricultural commodity*: it is to transport production from plantations to villages and cities. Indeed, the poor state of roads mean that farmers have difficulty to transport their entire production to villages and on markets; which re-

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<sup>5</sup>During 'market days' and days dedicated to religious activities (Friday for Muslims and Sunday for Christians), farming activities are less intense.

<sup>6</sup>The seed "Cacao Mercedes" has been developed by the National Center for Agricultural Research (CNRA) in 2013; this is an improved hybrid variety with high yield (2-3 tons per hectare) which produces from 18 months against 36 months for old varieties.

sults in a loss of production. So, this activity will allow farmers to be free of the constraints of transport.

(d) *Money transfer office*: it is an office of monetary transactions via mobile phone accounts. This activity is growing in Africa and particularly in Côte d'Ivoire. Generally, the subscriber opens a virtual account via his mobile phone number. From this account, it performs deposits, withdrawals and even money transfers. The transfer office's manager is charged to facilitate these operations and receives commissions for each transaction made.

(e) *Snail breeding or Achatiniculture*: this is the breeding of snails, especially Achatina genus and Achatina achatina species, commonly called the "African giant snail". These species are highly valued in eating habits of urban and rural populations in Côte d'Ivoire. The breeder brings snaileries, cares, maintenance, food and markets production.

(f) *Sale of (worn) clothing*: This activity is not new in the study area because it is practised by a few women of communities. These traders buy clothes at wholesale price and sell in retail. The demand of clothes is high in festive or crops seasons.

### 4.3 Indicators and evaluation grid

After the diagnostic analysis and the analysis of specificities of study areas, we suggest the following indicators for a technical evaluation of potential IGAs:

*Input facilities*: this indicator is related to the availability of inputs in order to implemente of the IGA. First, we analyse the existence of market of inputs as well as ease of its access and second, to appreciate the general level of inputs prices.

*Time and space consumingness*: given the limited time of households and insufficient space at the community level, the proposed activity should be less time and farmland consuming.

*Market opportunities*: here, it is to know whether there exists a market (in size and accessibility) for the flow of products and if there are opportunities of its expansion. In the absence of a market for AGR outputs, we appreciate the opportunities, creation and development conditions and accessibility of a new market.

*Complementarity with cocoa farming*: this indicator refers to the cultural complementarity between the potential AGR and cocoa; the AGR should not be in competition with cocoa. Furthermore, we analyse the annual distribution of the estimated income generated by the AGR and cocoa income distribution. The ideal activity would be one that generates more income during the lean season of cocoa farming.

*Eco-friendliness*: IGAs should be part of a sustainable development objective; they should be environmentally friendly, especially with low negative impacts on soil and air.

The evaluation grid below (see Table 2) is constructed on indicators and criteria defined on the basis of the result of the diagnostic analysis and our technical appraisals. Each indicator has two criteria; each criteria is weighted on 2 points. In

other words, each indicator is scored on 4 points (an equi-weighting). Therefore, each potential IGA will be assessed on a total of 20 points.

Indicators	Criteria	Scores
Input facilities	input markets	2 if yes, 1 if weak, 0 if no
	affordability of prices	2 if yes, 1 if medium , 0 if no
Time and space consumingness	time consumingness	2 if low, 1 if medium, 0 if high
	space consumingness	2 if low, 1 if medium, 0 if high
Market opportunities	existing markets	2 if great, 1 if small, 0 if no
	potential markets	2 if strong, 1 if weak, 0 if no
Complementarity with cocoa farming	competition	2 if no, 1 if weak, 0 if strong
	income distribution	2 if only during lean season, 1 if throughout year, 0 if sporadic
Eco-friendliness	soil degradation	2 if no, 1 if weak, 0 if high
	air pollution	2 if no, 1 if weak, 0 if high

Table 2: Evaluation grid of activities

#### 4.4 Technical evaluation

Each activity will be discussed according to the five indicators (and their respective criteria). At the end of discussions, we assign notes as follows: "name of the potential IGA [ $x_1$  and  $x_2$ ]" where  $x_1$  and  $x_2$  represent the score of criteria 1 and 2 of studied indicator as defined in the evaluation grid.

- *Input facilities*

The inputs market exists and is accessible for beekeeping and snail breeding activities for which it is easier to use local materials; however prices of inputs are moderately high: Beekeeping [2 and 1] and Snail breeding [2 and 1].

In term of mobile money transfer office, the main input is the set of information to be collected for its implementation in localities. Indeed, requested information in structured documents are requested by parent companies. However while information are available, the cost of gathering information and conducting market research remains very high for rural population whose educational level is very low; in addition, we must pay a deposit of about 1 million F.CFA<sup>7</sup> to the parent companies : Money transfer office [2 and 0].

Regarding the cocoa plants nursery, we note that access to improved seeds would be difficult. Indeed, the national structure that produce seeds is far from studied localities. In addition, application and reception process of seeds is very long because of structural deficiencies. Thus, while seed prices are affordable for communities,

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<sup>7</sup>1 \$ US  $\simeq$  550 F.CFA

their delivery may require several months with the risk of receiving a less quantity than what was commanded: Cocoa plant nursery [1 and 2].

Regarding the activity of transport of agricultural commodities, the market for inputs exists since it consists in buying motorcycles equipped with luggage rack; these vehicles are available locally and in neighboring towns but the price is very high: Transport of products [2 and 0].

Finally for the sale of worn clothing activity, the inputs market exists but is often away from studied areas; Indeed, to purchase clothes, women must go to the Capital (Abidjan) or to neighboring towns where they are cheaper: Worn clothing sale [1 and 2].

- *Time and space consumingness*

The two livestock activities do not require much time nor much agricultural space even if the snail breeding consumes a little more space than the bee breeding: Beekeeping [2 and 2] and Snail breeding [2 and 2].

Both activities of money transfer office and transport of products have the same profile in terms of use of time and space. Indeed, they require the presence of the manager, so much time but little or no agricultural land: Transport of products [0 and 2] and Money transfer office [0 and 2].

The cocoa plants nursery requires an average space for planting and an average working time in general: Cocoa plant nursery [1 and 1].

The worn clothing sale activity does not require agricultural land nor a lot of time dedicated to farming practise. Indeed, sales are intense during market days where there is no agricultural activities and less intense during days dedicated to rural activities: Worn clothing sale [1 and 2].

- *Market opportunities*

There are existing product market for beekeeping and snail breeding activities; but they are tiny because of little quantities sold. However there is a strong demand for honey and snails, so a strong opportunity to develop these markets: Beekeeping [1 and 2] and Snail breeding [1 and 2].

The markets of plant nurseries and money transfer are still lacking in the localities. Particularly for plan nursery, cocoa households generally receive seeds and cocoa plants with their cooperatives and from neighboring countries; but the quantities received are unable to cover communities needs. These two activities can be developed because of the enormous need for cocoa plants and money transfer services. Furthermore, the development of the market of money transfer services can contribute to rural savings: Cocoa plant nursery [0 and 2] and Money transfer office [0 and 2].

The clothing market already exists albeit small. The opportunities to expand this market are real. However they remain average because highly dependent on harvest period: Worn clothing sale [1 and 1].

As for transport of products activity, the existing market is small. Indeed, some people already practise this activity with food crops. But it remains weak and poorly



organised. Opportunities to expand the market are very strong because of the needs expressed by cocoa communities in all localities: Transport of products [1 and 2].

- *Complementarity with cocoa farming*

Livestock activities (ie bees and snails) and nursery have good complementarity with cocoa cultivation. Beekeeping and snail breeding are often in the dry season, so there is really no competition with cocoa. As for the nursery activity, it can be done inside or around cocoa plantation. The distribution of income generated by these activities allows cocoa households to get additional resources during the lean season: Beekeeping [2 and 2] Snail breeding [2 and 2] and Cocoa plant nursery [2 and 2].

There is a weak complementarity between the transport of products activity and cocoa farming in the sense that the former allows to carry the farmgate cocoa beans but also other agricultural products. The generated income is almost equally distributed throughout the year: Transport of products [1 and 1].

Finally, as for worn clothing sales and money transfer activities, they are in competition with cocoa production since they are practised outside agricultural space and require continued presence of managers. In terms of generated income, these activities are almost equally distributed throughout the year: Worn clothing sales [0 and 1] and money transfer office [0 and 1].

- *Eco-friendliness*

The three non-agricultural activities (clothing sale, transport of products and money transfer office) have no negative effects on soil and air; so these are clean activities: Worn clothing sales [2 and 2], Money transfer office [2 and 2] and Transport of products [2 and 2].

Regarding agricultural activities, we note that beekeeping and snail breeding do not degrade soil and air. On the contrary, bees act positively by participating in flowers pollination by foraging; snail breeding emit no odors nor waste: Beekeeping [2 and 2] and Snail breeding [2 and 2].

Only cocoa plants nursery activity can, a priori, degrade local environment because of phytosanitary products; indeed poor producers often used pesticides which are not approved by national regulations. But given the local living conditions, the use of unlicensed pesticides, regularly available and cheaper is likely and this will have a negative impact especially on air: Cocoa plants nursery [2 and 1].

The following Table 3 summarizes the scoring of activities. We will retain the top three activities, that is to say, beekeeping, snail breeding and cocoa plants nursery.

Indicators and criteria		Beekeeping	Cocoa plants Nursery	Transport of commodity	Money transfer Office	Snail breeding	Sale of (worn) clothing
Inputs facilities	inputs market	2	1	2	2	2	1
	affordability of prices	1	2	0	0	1	2
Times and space consumingness	time consumingness	2	1	0	0	2	1
	space consumingness	2	1	2	2	2	2
Market opportunities	existing markets	1	0	1	0	1	1
	potential market	2	2	2	2	2	1
Complementarity with cocoa farming	competition	2	2	1	0	2	0
	income distribution	2	2	1	1	2	1
Eco-friendliness	soil degradation	2	2	2	2	2	2
	air pollution	2	1	2	2	2	2
Total score		<b>18</b>	<b>14</b>	13	11	<b>18</b>	13

Table 3: Scoring of activities

## 4.5 Financial analysis

We perform a previsual assessment of profits (gross margin) and financial profitability (break even) of the three projects of IGAs retained in the previous step. Here we will only present the results. The calculations were deferred in Appendices 4 to 6. Each activity is supposed to be implemented by a woman or a young man of farm household; so there is no need for additional salaried work force. Prices and costs used for calculations are those applied in the study area.

### 4.5.1 Beekeeping project

Full details of calculations are in the tables in Appendix 4. We assume that the activity will start with five hives. Fixed costs are composed primarily of depreciation charges of equipments. The initial investment in equipment amounted to 256,500 F.CFA and amortization for the first year is 58,467 F.CFA (see Table 9). As for variable costs, they are estimated at 108,000 F.CFA (see Table 10). thus, the total cost (or operating expenses) thus amounts to 166,467 F.CFA.

The main beekeeping products are honey, propolis, royal jelly and wax. For five hives, one estimates at 200 liters the amount of harvested honey sold on the market

with 2,000 F.CFA per liter; so the annual estimated turnover is 400,000 F.CFA. We ignore the other products because it generally requires an experienced beekeeper. The operating result shows a profit of 233,533 F.CFA (see Table 11), that is to say a gross margin of 1,168 F.FCA per liter of honey marketed.

Moreover, we note that the ratio "Turnover (or sales)/Operating Expenses (OE)" is equal to 2.4 (greater than 1); i.e the beekeeping project is profitable. Calculating the breakeven point shows that once entered production, the project only becomes profitable from a turnover of 80,091 FCFA or when production reaches 40 liters of honey (see Table 12); this corresponds to a production time of 72 days or 2 months and 12 days.

#### 4.5.2 Snail breeding project

Full details of calculations were reported in the tables in Appendix 5. Here we assume that the project start with six snaileries. Fixed costs are composed primarily of depreciation costs of snaileries, appatam and small equipment. They amount 45,000 F.CFA for an initial investment of 225,000 F.CFA (see Table 13). Variable costs are composed of breeding snails purchasing costs, food, etc. Note also that the snail eats local fruits such as papaya. Variables costs are estimated to 31,500 F.CFA (see Table 14); so operating expenses amount to 76,500 F.CFA.

At the product level, we estimate a production of 160 kg of snails with 1,500 F.CFA per kg sold on the market. The turnover is then established to 240,000 FCFA. The operating result shows a profit of 163,500 for the first year (see Table 15) and a gross margin of 1,021 F.CFA per kg of marketed snail.

The ratio Turnover/Operating Expenses is equal to 3.13 which is higher than the unit. The activity is profitable; however once entered production, the breakeven point is reached when the breeder produces 34.53 kg of snails corresponding to a turnover of 51.798 F.CFA (see Table 16). This equates to a production duration of 78 days, or 2 months and 18 days.

#### 4.5.3 Cocoa plants nursery Project

All details of the calculations for this project are in tables in Appendix 6. We assume that the nursery project starts with two bags of high efficiency cocoa seeds named "Mercedes". This generally corresponds to 2,400 cocoa plants in the nursery. The key operation in this project consists of site preparation (layonnage, land clearing, burning, plowing, etc.). The initial investment is therefore limited to the purchase of small tools (watering can, secateurs, wheelbarrow, etc.). Depreciation of these small materials constitute fixed costs. They are estimated at 54,500 F.CFA (see Table 17). Variable costs include seed costs, plant protection products and lump-sums for transport and irrigation water. Indeed, here, watering is done by traditional way. Variables costs are estimated to 178,000 F.CFA (see Table 18). Thus, all operating expenses therefore amount to 232,500 F.CFA.

At the product level, the sale of 2,400 plants using 125 F.CFA per unit gives a turnover of 300,000 F.CFA. The operating result therefore shows a positive profit of

67,500 F.CFA for first year (see Table 19), so a gross margin of 28.125 F.CFA per cocoa plant harvested.

The ratio Turnover/Operating Expenses for the first exercise year is equal to 1.29. The activity is profitable; the calculation of the breakeven point shows that the activity begins profitable when it reaches a turnover of 134,016 F.CFA (see Table 20), i.e if production exceeds 1,072 plants. This is equivalent to a production period of about 161 days, or 5 months and 11 days.

The following Table 4 summarizes main results of the financial analysis of the three income-generating activities projects selected at the end of the technical evaluation in step 2.

Activities	Initial investment	Gross margin	Ratio Sales/OE	Breakeven point
Beekeeping	256,000	+1,168	2.40	80,091
Snail breeding	225,000	+1,021	3.13	51,798
Cocoa nursery	54,500	+28.125	1.29	134,016

Table 4: Financial Indicators (in F.CFA)

At the end of the financial analysis, we note that both livestock activities require significant investment although operating costs are relatively low. However, they have a high profitability. The nursery activity project requires low initial investment but carries a low profitability at the end of the first year; its breakeven point is much higher than the other two activities. So, we retain beekeeping and Snail breeding projects with gross margins are higher and are starting to be profitable only two months after their entry into production.

#### 4.6 Analysis of the acceptability of activities

The sample of women and young men of surveyed households is characterized by an illiteracy rate of 56%; in Molonou locality its represents 84.62%. However in the sample, there is more illiterate women than young men, about 71.2% against 41.8% (see Table 21, Appendix 7). In addition, the survey also shows that more women participate in associative groups than young men.

Regarding the level of acceptability or adhesion in planned activities, results showed that 52% of the surveyed population expressed their willingness to join the beekeeping project; the rate is 78% for the snail breeding project. However, a detailed analysis shows that especially with regard beekeeping, young men show more interest than women with a rate of 69% against 34%. The detail by locality however, shows that in some localities such as Sikaboutou, Nibass, Kéibla, Batéguédea 1 Bezu, Molonou and Nourlaye, almost all young men want the implementation of the project. Although women are reluctant to the beekeeping project in the study area, we see that the majority of women of two localities (Sikaboutou and Batéguédea 1) adheres to this activity (see Table 22 in Appendix 7). As for snail breeding project, it is much sought by women than men. The percentage of women ready to practise

snail breeding as additional source of income is 85.5% against approximately 71.0% for young men. In some localities as Brokoua, almost all women expressed their willingness for snail breeding (see Table 23, Appendix 7).

Overall, the results show that the majority of women and young men of cocoa households are in favor of the two IGAs projects as additional income sources. However, in order to deepen these results, we tried to understand the reasons of refusal expressed by a part of surveyed population. Generally, it is clear from our survey four basic reasons expressed: (1) the activity would have low profitability, (2) the activity would require too much time (3) the activity is prohibited by religion (4) the fear of bee stings or the fear of the morphology of snails.

As shown in Figure 2, the fear of bee stings is the major cause of refusals to beekeeping project (72%). This reason is mentioned by 81.2% of women and 53.1% of men opposed to this activity (see Table 24, Appendix 7).

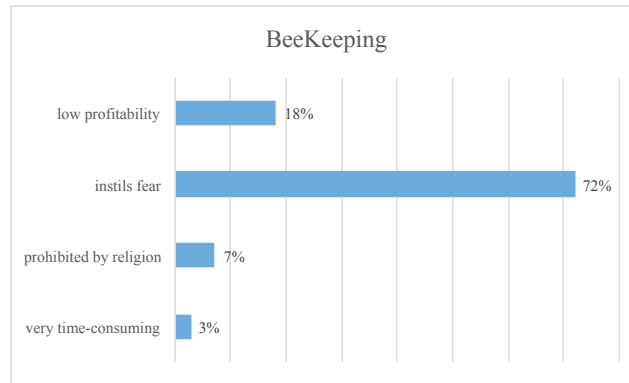


Figure 2: Reasons of refusal of Beekeeping project

Regarding the snail breeding project (see next Figure 3), the major refusal reason expressed by some women and young men is related to the supposed low profitability of this activity. In fact 52% of individuals believe that snail breeding generates low profit. The second mentioned reason is that of the religious ban. Indeed 39% of the target population argue their religion forbids the consumption of the snail (see Table 25, Annex 7).

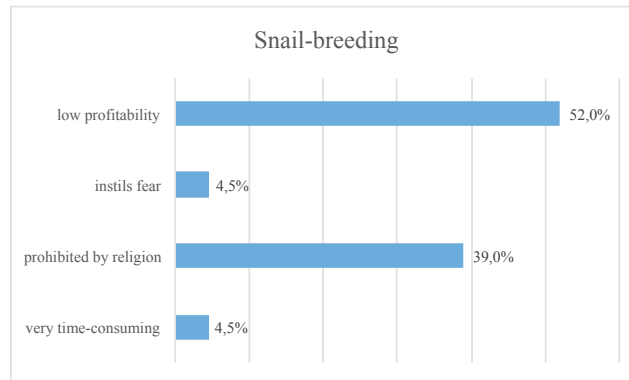


Figure 3: Reasons of refusal of Snail breeding project

In short, we can say that refusal motivations are attributable to the lack of information and technical knowledge about both activities. Indeed, previous analyses have shown that these activities are not very time-consuming, are complementary to cocoa farming and are profitable. Moreover, they are safe to the point of frightening because beekeeping is practised in a protective suit and tools that avoid bee stings. As for snail breeding, it is done in snaileries and almost no physical contact with snails. It is thus clear that the lack of knowledge and information can be serious barriers to the initiation of IGAs projects.

Concerning refusals for religious reasons, they are somewhat more difficult to resolve because they concern the individual beliefs and customs. As regarding beekeeping, refusal related to religious reasons is essentially the fact of animists and customary practises in Bégafila's locality; whereas at snail farming level it is mainly due to Muslims. However, a small informal survey of religious leaders showed that neither Islam nor Christianity is actually a lock for the practise of these activities and the consumption of their products.

## 5 Discussions and policy implications

This study implies some discussions and reflections at three levels: methodological approach; implementation of proposed AGRs; public policy and strategic interests of industrial chocolate.

### 5.1 Methodological approach

In this study, we developed a grid of qualitative technical assessment generating activities of additional income after diagnostic analysis and a household survey. This grid is essentially based on standards (indicators and criteria) appreciated by ourselves and according to our technical experience (as researchers). Therefore, the results may be different if other framework is selected by other researchers. However, our method has the advantage of being relatively objective, flexible and "self-adjustable" depending on the context and realities of investigative areas.

## 5.2 Implementation of IGAs projects

Beekeeping and snail breeding were identified as additional income generating activities for cocoa households in the study area. These two activities are almost new for communities as they are not really practised in localities. They are also innovating insofar as they can use local materials at lower costs and local technological innovations especially in beekeeping with a new more powerful hive developed by an Ivorian inventor (see [Iritié et al. \(2014\)](#)). Further, beekeeping and snail breeding are technically matched to cocoa household needs and specificities of localities. The financial analysis has also shown that they achieve significant gross margins and low profitability thresholds. They can therefore serve as additional sources of revenue to cocoa households especially during lean periods when cocoa incomes are almost nonexistent. The implementation of these activities will contribute firstly to reduce the dependence of women and young vis-à-vis household heads and also dramatically reduce the household vulnerability.

The analysis of social acceptability showed that the majority of women and young men are willing to do these two activities as additional household income sources. The reasons or "psychological" constraints that motivated some refusals can be easily lifted. Indeed, time, level of profitability and fear can not be factors limiting the implementation of these activities in cocoa communities of Central West; snail breeding and beekeeping require very little work time and are profitable; they are perfectly complementary to cocoa production without encroaching on his farming calendar. They use materials, combinations and protection tools avoiding bee stings and physical contact with snails. As for refusal related to religions, they are difficult to remove and should be taken into account in the implementation of activities even though in reality the religion does not prohibit the practise and consumption of products from these livestock farming.

In short, the refusal reasons mentioned by women and young men are attributable to the lack of knowledge and information on these farms. Indeed, the lack of knowledge and information, and illiteracy are usually barriers and reasons for the failure of development projects initiated for rural populations in Africa. Thus, for an effective implementation of these two income generating activities in communities, we propose three priority actions: sensitization, identification of beneficiaries and technical guidance.

Sensitization about beekeeping and snail breeding is an essential step of the process. It will be a general information on these IGAs and will aim to dispel fears and misappreciation of local communities. Particular emphasis should be put at some localities such as Bégafla and Nibass that record significant refusal rate. Sensitization should also involve community leaders and religious leaders for a better appropriation.

The second phase of the process will consist in identifying beneficiaries. It must take account of specific localities and communities. For example, for a first implementation, one could propose that beekeeping is developed for young men and snail breeding for women. To this end, localities of Bégafla and Nibass should receive special treatment because these two localities have the highest refusal rate of snail breeding due to customary and religious practises. Moreover, for the implementa-

tion of these AGRs, it is desirable to give priority to groups of ten people. These groups will benefit from the experience of existing groups, such as savings and credit association implemented by the NGO Care International in the Central West. This will reduce the risk of failure.

Finally, these groups should be trained and supervised regularly by specialists throughout the implementation of projects.

### 5.3 Public policies and strategic interests of industrials

In this study, we focused on horizontal diversification for two main reasons. The first is that this type of diversification is advocated by the chocolate industry supported by national policies. The second reason is that in the literature, we have recognized as a rule that vertical diversification (especially processing) is difficult in the context of Côte d'Ivoire because of structural constraints in production and processing of cocoa (see [Adebusuyi \(2004\)](#); [Gibson \(2007\)](#)).

Indeed, the western cocoa-related regulations constrain, rightly or wrongly, cocoa exporting countries to pay little attention to vertical diversification. A detailed analysis of tariffs applied by industrial cocoa importing countries show that these tariffs increase with the degree of processing of raw material. According to [Tano \(2012\)](#), FAO estimates these tariffs to more than 20% when it comes to cocoa beans processed into chocolate, 10% for cocoa mass and less than 2.5% when it is unprocessed cocoa beans, thus the eighth of the tax paid for the export of chocolate. These tariff policies protect western processing industries and promote the transfer of added value from poor to rich countries. So the developed country markets are less open to imports of processed products from producing countries and confine them in an exclusive role of cocoa bean suppliers.

It is true that horizontal diversification generate additional income to cocoa households. However it can cause a disinterest of cocoa farmers in long-term; this would result in poor control of the cocoa value chain by national authorities. There is, perhaps, a risk of greater control of production and the chain of cocoa values by buyers and chocolate industry . Indeed, the struggle against the volatility of cocoa prices and against the vulnerability of households cocoa farmers through crop diversification are not actually doing overshadow the strategic importance of the cocoa processing? In any case, the issue deserves to be discussed in depth.

Note however that the current Ivorian policy-makers recognize the importance of the transformation of cocoa beans. For example, the Government spokesman said about cocoa: "local transformation, it is creating more value locally, it is giving jobs to Ivorian, it is bringing more resources to the State, it is contributing to the development of our industry (*translated from French*)"<sup>8</sup>. Indeed, in recent years, Côte d'Ivoire increased its grinding up to 30% transformation of the annual production of beans with the objective to reach 50% in 2020 ([BCEAO, 2014](#)). It is for this reason that since 2013, two industrial chocolatiers, Olam and Cemoi, invested in

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<sup>8</sup>See the online article "La Côte d'Ivoire ne se contente plus de cultiver l'or brun" of Le Parisien: <http://www.leparisien.fr/flash-actualite-economie/cacao-la-cote-d-ivoire-ne-se-contente-plus-de-cultiver-l-or-brun-27-03-2015-4642997.php> (Accessed 30 June 2015).



Cote d'Ivoire to produce chocolate in a large scale.

## 6 Conclusion

This study showed that the promotion of diversification of income sources through innovative and profitable beekeeping and snail breeding projects can enable cocoa farmers households of the Central West of Côte d'Ivoire to be safe from any sudden shock that would occur in the cocoa sector. However, the lack of technical information and knowledge on IGAs, religious burdens and the illiteracy rate can be barriers to the implementation of these projects. To this end, the direct involvement of large industrial groups is welcomed because it compensate the lack of Government support to producers including training, financial and technical assistance. However, policymakers should think about better combine both horizontal diversification and vertical diversification (especially cocoa processing) to give more added value to sustainable cocoa farming. The final objective must be twofold, that is to say, reduce dependency and poverty of cocoa producing smallholder households but also contribute to the industrial development of the Ivorian economy.

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## 7 Appendices

### Appendix 1. Characterization of cocoa households

Characteristics	Cocoa households	Percentages (%)
<b>Origins</b>		
Natives	167	83,5
Foreign	34	16,5
<b>Religions</b>		
Christians	101	50,5
Muslims	53	26,5
Animists	46	23
<b>Households size</b>		
3-6	164	82,0
7-10	31	15,5
11-12	5	2,5
Mean	5	
<b>Farms size</b>		
1-3	120	60,0
4-6	75	37,5
7-8	5	2,5
Mean	3,4	
<b>Age of household heads</b>		
21-30	33	16,5
31-40	80	40,0
41-70	87	43,5
Mean	43	
<b>Education level</b>		
illiterates	82	41,0
literate	118	59,0

Table 5: Socioeconomic characteristics of households (N=200)

Localities	Respondents	Christians	Muslims	Animists
Bateguedea 1	10	<b>6</b>	1	3
Bateguedea 2	34	18	11	5
Keibla	11	6	4	1
Brokoua	12	7	5	0
Molonou	13	7	5	1
Bezu	12	<b>11</b>	1	0
Sikaboutou	39	23	11	5
Bégafila	47	13	8	<b>26</b>
Nibass	7	1	<b>4</b>	2
Mahi-Nahi	5	2	1	2
Nourlaye	10	<b>7</b>	2	1
<b>Total (study area)</b>	<b>200</b>	<b>101</b> <b>(50,5%)</b>	<b>53</b> <b>(26,5%)</b>	<b>46</b> <b>(23,0%)</b>

Table 6: Details on religion of households by localities

Localities	Respondents	Exclusive cocoa households	percentage (%)
Bateguedea 1	10	9	90
Bateguedea 2	34	28	82
Keibla	11	11	100
Brokoua	12	9	75
Molonou	13	8	61,5
Bezu	12	5	41,7
Sikaboutou	39	30	76,9
Bégafila	47	44	93,6
Nibass	7	6	85,7
Mahi-Nahi	5	4	80
Nourlaye	10	7	70
<b>Total (study area)</b>	<b>200</b>	<b>161</b>	<b>80,5</b>

Table 7: Number of households engaged exclusively in cocoa

## Appendix 2. Table of ranking of the need "diversification"

Localities	Ranking
Bateguedea 1	6/14
Bateguedea 2	5/15
Keibla	3/11
Brokoua	4/16
Molonou	9/18
Bezu	6/10
Sikaboutou	6/21
Bégafa	5/13
Mahi-Nahi	5/14
Nibass	8/15
Nourlaye	6/13

Table 8: Prioritization of "diversification" by locality

The priority-ranking matrix allows people to make a choice on priority issues to be resolved according to their preferences. In its implementation, populations carry a choice between needs by crossing inter-needs. In the end, a count allows a prioritization of needs. Table 8 summarizes results of all the priority-ranking matrices of the eleven localities about on the classification of the need "diversification".

### Appendix 3. Village map, Venn diagram and Trade flows diagram

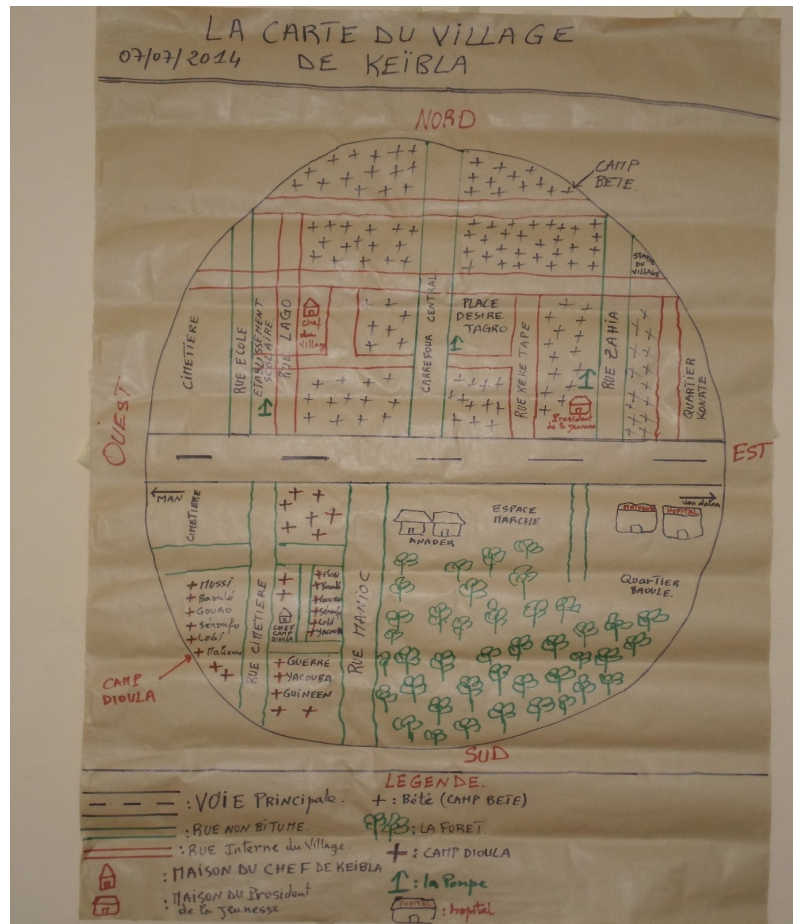


Figure 4: Example of a village map (Keibla)

Village map retraces space, cropping and social occupation in and around the village. This tool allows to become familiar with the socio-cultural of localities. In its implementation, an assembled member of the village stands the scheme and by mutual agreement, participants indicate the key elements of their localities.

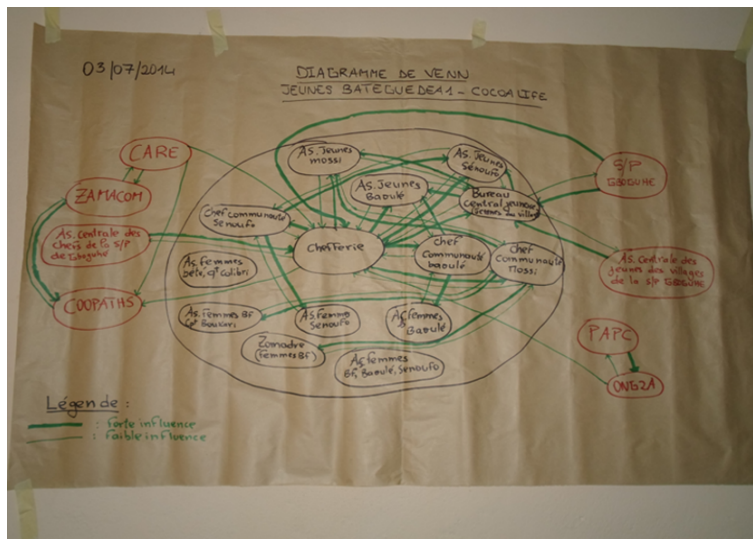


Figure 5: Example of a Venn diagram (Batéguedia 1)

The Venn diagram can be used to highlight organisations, associations or groups within a community. It allows to identify the different decision-making centers in a community and provides the level of interaction between different organisations.

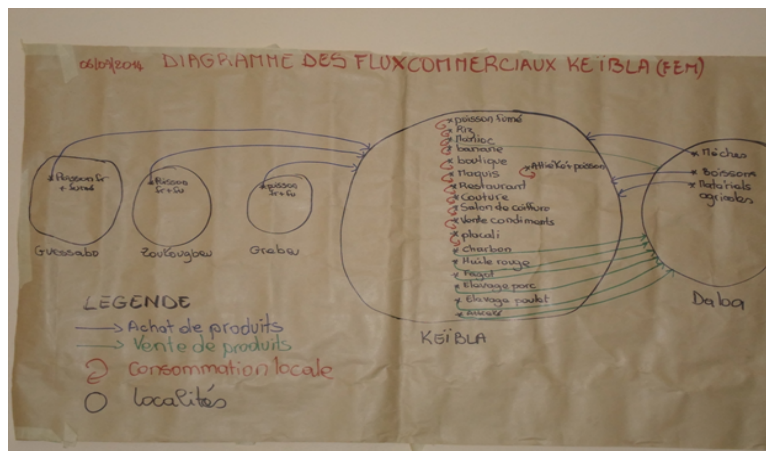


Figure 6: Example of a Trade flow diagram (Keibla)

The trade flows diagram studies flows of incoming and outgoing goods and services at a locality level. It is an instrument to assess marketing networks. In its implementation, participants draw up a list of all products sold in and outside the village and the various existing markets.



#### Appendix 4. Beekeeping Project - Financial Calculations

Designations	Quantities	Unit cost	Total cost	Depreciation time	Annual depreciation
Beehives	5	40,000	200,000	5 years	40,000
Feeders	5	4,000	20,000	3 years	6,667
Protective workwear	1	15,000	15,000	5 years	3,000
Hive tool	1	1,500	1,500	5 years	300
Smoker	1	5,000	5,000	5 years	1.000
Bee brush	1	5,000	5,000	2 years	2.500
Bucket with lid of 20 liters	2	5,000	10,000	2 years	5,000
Total			256.500		58.467

Table 9: Investment costs (in F.FCA)

Designations	Quantities	Unit cost	Total cost
Suggar	30 Kg	600	18,000
packing	250	100	25,000
small materials	1	15,000	15,000
lump sum of transport	1	50,000	50,000
Total			108.000

Table 10: Operating costs (in F.FCA)

Expenses		Revenues	
Labels	Amounts	Labels	Amounts
<b>Fix costs</b>		<b>Sales (200 l)</b>	400,000
* Depreciation	58,467		
<b>Variable costs</b>			
* Sugar and packaging	43.000		
* Materials	15,000		
* Transport charges	50,000		
Total Expenses	166,467	Total Revenues	400,000
<b>Gross operating margin</b>	<b>233,533</b>		
Total	400.000	Total	400.000

Table 11: Provisional exploitation account (in F.FCA)

<b>Designations</b>	<b>Results</b>
Projected turnover (1)	400,000
Variable costs (2)	108,000
Fix costs (3)	58,467
Contribution margin (4)=(1)-(2)	292,000
Margin rate on variable costs (5)=(4)/(1)	0.73
<b>Breakeven point (6)=(3)/(5)</b>	<b>80,091</b>

Table 12: Breakeven calculation (in F.FCA)

### Appendix 5. Snail breeding Project - Financial Calculations

<b>Designations</b>	<b>Quantities</b>	<b>Unit cost</b>	<b>Total cost</b>	<b>Depreciation time</b>	<b>Annual depreciation</b>
Snaileries	6	30,000	180,000	5 years	36,000
Appatam	1	20,000	20,000	5 years	4,000
small materials	1	25,000	25,000	5 years	5,000
Total			225,000		45,000

Table 13: Investment costs (in F.FCA)

<b>Designations</b>	<b>Quantities</b>	<b>Unit cost</b>	<b>Total costs</b>
Breeding snails	50	250	12,500
Concentrated feed	20	200	4,000
Fruits	1	5,000	5,000
Water	1	10,000	10,000
Total			31,500

Table 14: Operating costs (in F.FCA)

Expenses		Revenues	
Labels	Amounts	Labels	Amounts
<b>Fix costs</b>		<b>Sales (160 kg)</b>	240,000
* Depreciations	45,000		
<b>Variables costs</b>			
* Breeding snails	12,500		
* Concentrated feed	4,000		
* lump sum for fruits and water	15,000		
Total Expenses	76,500	Total Revenues	240,000
<b>Gross operating margin</b>	<b>163,500</b>		
Total	240,000	Total	240,000

Table 15: Provisional exploitation account (in F.FCA)

Designations	Results
Projected turnover (1)	240,000
Variable costs (2)	31,500
Fix costs (3)	45,000
Contribution margin (4)=(1)-(2)	208,500
Margin rate on variable costs (5)=(4)/(1)	0.86
<b>Breakeven point (6)=(3)/(5)</b>	<b>51,798</b>

Table 16: Breakeven calculation (in F.FCA)

## Appendix 6. Cocoa Plants nursery - Financial Calculations

Designations	Quantities	Unit cost	Total cost	Depreciation time	Annual depreciation
Machetes	3	2,500	7,500	1 year	7,500
Hoes	2	1,000	2,000	1 year	2,000
Lime	1	1,000	1,000	1 year	1,000
Rake	1	3,000	3,000	1 year	3,000
Shovel	1	2,500	2,500	1 year	2,500
Watering can	2	7,000	14,000	1 year	14,000
secateurs	1	4,500	4,500	1 year	4,500
Wheelbarrow	1	15,000	15,000	1 year	15,000
Bucket	2	2,500	5,000	1 year	5,000
Total			54,500		54,500

Table 17: Investment costs (in F.FCA)

Designations	Quantities	Unit cost	Total costs
Seed package	2	50,000	100,000
Pesticides	2	14,000	28,000
lump sum for water	1	30,000	30,000
lump sum for transport	1	20,000	20,000
Total			178,000

Table 18: Operating costs (in F.FCA)

Expenses		Revenues	
Labels	Amounts	Labels	Amounts
<b>Fix costs</b>		<b>Sales (2,400 plants)</b>	300,000
* Depreciation	54,500		
<b>Variable costs</b>			
* Seed packages	100,000		
* Pesticides	28,000		
* lump sum for water and transport	50,000		
Total Expenses	232,500	Total Revenues	300,000
<b>Gross operating margin</b>	<b>67,500</b>		
Total	300,000	Total	300,000

Table 19: Provisional exploitation account (in F.FCA)

Designations	Results
Projected turnover (1)	300,000
Variable costs (2)	178,000
Fix costs (3)	54,500
Contribution margin (4)=(1)-(2)	122,000
Margin rate on variable costs (5)=(4)/(1)	0.40
<b>Breakeven point (6)=(3)/(5)</b>	<b>134,016</b>

Table 20: Breakeven calculation (in F.FCA)

## Appendix 7. Statistics tables of analysis of acceptability

Localities	Gender	Respondents	litterates	illiterates
Batéguédia 1	Young men	5	5	0
	Women	5	2	3
	Total	10	7	3
Batéguédia 2	Young men	17	10	7
	Women	17	1	16
	Total	34	11	23
Kéibla	Young men	5	5	0
	Women	6	1	5
	Total	11	6	5
Brokoua	Young men	6	2	4
	Women	3	3	3
	Total	12	5	7
Molonou	Young men	6	2	4
	Women	7	0	7
	Total	13	2	11
Bézu	Young men	6	5	1
	Women	6	1	5
	Total	12	6	6
Sikaboutou	Young men	23	12	11
	Women	16	5	11
	Total	39	17	22
Bégafla	Young men	22	12	10
	Women	25	8	17
	Total	47	20	27
Nibass	Young men	5	4	1
	Women	2	2	0
	Total	7	6	1
Mahi-Nahi	Young men	3	2	1
	Women	2	1	1
	Total	5	3	2
Nourlaye	Young men	5	1	4
	Women	5	4	1
	Total	10	5	5
<b>Grand Total</b>	<b>Young men</b>	<b>103</b>	<b>60 (58.2%)</b>	<b>43 (41.8%)</b>
	<b>Women</b>	<b>97</b>	<b>28 (28.8%)</b>	<b>69 (71.2%)</b>
	<b>Total</b>	<b>200</b>	<b>88 (44.0%)</b>	<b>112 (56.0%)</b>

Table 21: Details on the education level of beneficiaries

Localities	Gender	Respondents	accept	refuse
Batéguédia 1	Young men	5	5	0
	Women	5	4	1
	Total	10	9	1
Batéguédia 2	Young men	17	10	7
	Women	17	9	8
	Total	34	19	15
Kéibla	Young men	5	4	1
	Women	6	0	6
	Total	11	4	7
Brokoua	Young men	6	2	4
	Women	6	1	5
	Total	12	3	9
Molonou	Young men	6	6	0
	Women	7	1	6
	Total	13	7	6
Bézu	Young men	6	6	0
	Women	6	1	5
	Total	12	7	5
Sikaboutou	Young men	23	20	3
	Women	16	12	4
	Total	39	32	7
Bégafla	Young men	22	7	15
	Women	25	2	23
	Total	47	9	38
Nibass	Young men	5	4	1
	Women	2	0	2
	Total	7	4	3
Mahi-Nahi	Young men	3	2	1
	Women	2	1	1
	Total	5	3	2
Nourlaye	Young men	5	5	0
	Women	5	2	3
	Total	10	7	3
<b>Grand Total</b>	<b>Young men</b>	<b>103</b>	<b>71 (69,0%)</b>	<b>32 (31.0%)</b>
	<b>Women</b>	<b>97</b>	<b>33 (34.0%)</b>	<b>64 (66.0%)</b>
	<b>Total</b>	<b>200</b>	<b>104 (52.0%)</b>	<b>96 (48.0%)</b>

Table 22: Statistics on the acceptability of Beekeeping project

Localities	Gender	Respondents	accept	refuse
Batéguédia 1	Young men	5	4	1
	Women	5	5	0
	Total	10	9	1
Batéguédia 2	Young men	17	14	3
	Women	17	12	5
	Total	34	26	8
Kéibla	Young men	5	2	3
	Women	6	3	3
	Total	11	5	6
Brokoua	Young men	6	2	4
	Women	6	6	0
	Total	12	8	4
Molonou	Young men	6	5	1
	Women	7	6	1
	Total	13	11	2
Bézu	Young men	6	6	0
	Women	6	6	0
	Total	12	12	0
Sikaboutou	Young men	23	17	6
	Women	16	14	2
	Total	39	31	8
Bégafla	Young men	22	14	8
	Women	25	24	1
	Total	47	38	9
Nibass	Young men	5	4	1
	Women	2	0	2
	Total	7	4	3
Mahi-Nahi	Young men	3	2	1
	Women	2	2	0
	Total	5	4	1
Nourlaye	Young men	5	3	2
	Women	5	5	0
	Total	10	8	2
<b>Grand Total</b>	<b>Young men</b>	<b>103</b>	<b>73 (71.0%)</b>	<b>30 (29.0%)</b>
	<b>Women</b>	<b>97</b>	<b>83 (85.6%)</b>	<b>14 (14.4%)</b>
	<b>Total</b>	<b>200</b>	<b>156 (78.0%)</b>	<b>44 (22.0%)</b>

Table 23: Statistics on the acceptability of Snail breeding project

Localities	Gender	Respon- dents	Instils fear	Religion	Very time- consuming	low prof- itability
Batéguédia 1	Young men	0	0	0	0	0
	Women	1	0	0	0	1
	Total	1	0	0	0	1
Batéguédia 2	Young men	7	5	1	1	0
	Women	8	7	0	1	0
	Total	15	12	1	2	0
Keibla	Young men	1	1	0	0	0
	Women	6	6	0	0	0
	Total	7	7	0	0	0
Brokoua	Young men	4	3	1	0	0
	Women	5	5	0	0	0
	Total	9	8	1	0	0
Molonou	Young men	0	0	0	0	0
	Women	6	6	0	0	0
	Total	6	6	0	0	0
Bézu	Young men	0	0	0	0	0
	Women	5	5	0	0	0
	Total	5	5	0	0	0
Sikaboutou	Young men	3	2	1	0	0
	Women	4	4	0	0	0
	Total	7	6	1	0	0
Bégafila	Young men	15	4	3	1	7
	Women	23	14	1	0	8
	Total	38	18	4	1	15
Nibass	Young men	1	1	0	0	0
	Women	2	2	0	0	0
	Total	3	3	0	0	0
Mahi-Nahi	Young men	1	1	0	0	0
	Women	1	1	0	0	0
	Total	2	2	0	0	0
Nourlaye	Young men	0	0	0	0	0
	Women	3	2	0	0	1
	Total	3	2	0	0	1
<b>Grand Total</b>	<b>Young men</b>	<b>32</b>	<b>17</b> <b>(53.1%)</b>	<b>3</b>	<b>2</b>	<b>7</b>
	<b>Women</b>	<b>64</b>	<b>52</b> <b>(81.2%)</b>	<b>1</b>	<b>1</b>	<b>10</b>
	<b>Total</b>	<b>96</b>	<b>69</b> <b>(72.0%)</b>	<b>7</b> <b>(7.0%)</b>	<b>3</b> <b>(3.0%)</b>	<b>17</b> <b>(18.0%)</b>

Table 24: Statistics on reasons for refusal of Beekeeping Project



Localities	Gender	Respon- dents	Instils fear	Religion	Very time- consuming	low prof- itability
Batéguédia 1	Young men	1	0	1	0	0
	Women	0	0	0	0	0
	Total	1	0	1	0	0
Batéguédia 2	Young men	3	0	2	0	1
	Women	5	2	0	0	3
	Total	5	2	0	0	3
Keibla	Young men	3	0	1	0	2
	Women	3	0	0	2	1
	Total	6	0	0	2	3
Brokoua	Young men	4	0	1	0	3
	Women	0	0	0	0	0
	Total	7	0	3	0	4
Molonou	Young men	1	0	1	0	0
	Women	1	0	1	0	0
	Total	2	0	2	0	0
Bézu	Young men	0	0	0	0	0
	Women	0	0	0	0	0
	Total	0	0	0	0	0
Sikaboutou	Young men	6	0	1	0	5
	Women	2	0	2	0	0
	Total	8	0	3	0	5
Bégafra	Young men	8	0	3	0	3
	Women	1	0	1	0	0
	Total	9	0	4	0	3
Nibass	Young men	1	0	1	0	0
	Women	2	0	1	0	1
	Total	3	0	2	0	1
Mahi-Nahi	Young men	1	0	0	0	1
	Women	0	0	0	0	0
	Total	1	0	0	0	1
Nourlaye	Young men	2	0	1	0	1
	Women	0	0	0	0	à
	Total	2	0	1	0	1
<b>Grand Total</b>	<b>Young men</b>	<b>30</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>17</b>
	<b>Women</b>	<b>14</b>	<b>2</b>	<b>7</b>	<b>2</b>	<b>6</b>
	<b>Total</b>	<b>44</b>	<b>2 (4.5%)</b>	<b>17 (39.0%)</b>	<b>2 (4.5%)</b>	<b>23 (52.0%)</b>

Table 25: Statistics on reasons for refusal of Snail breeding Project