



ADOPTION OF GOOD AGRICULTURAL PRACTICES (GAP) IN THE IVORIAN COCOA FARMS: REGENERATION TECHNOLOGIES PUT TO THE TEST OF FARMERS FIELD

Kouassi Kouadio Edouard¹ and Kouassi N'goran François²

¹Sociologist, PhD student, Alassane Ouattara University of Bouake.

² Sociologist, Senior Researcher, Research Center for Development (RCD) - Université Alassane Ouattara de Bouaké.

ABSTRACT

This paper aims at understanding and explaining the motivations underlying the adoption of Good Agricultural Practices (GAP) and the persistence of Traditional Cultural Practices (TCP). To do so, the study has adopted a Knowledge Attitudes, Practices (KAP) approach, to characterize and quantify the diffusion and adoption of cocoa regeneration technologies implemented by cocoa farmers in different production areas in Côte d'Ivoire. The results show that the adoption is difficult and selective with respect to several constraints, including economic and social constraints which farmers shall face.

KEYWORDS: *Ivory Coast - Adoption - Technologies - Good Agricultural Practices.*

RÉSUMÉ

Ce papier a pour objectif de comprendre et d'expliquer les motivations qui guident l'adoption des Bonnes Pratiques Agricoles (BPA) ou la persistance des Pratiques Culturelles Traditionnelles (PCT) dans la cacaoculture ivoirienne. Pour ce faire, il s'est inscrit dans une approche Connaissances, Attitudes, Pratiques (CAP) pour caractériser et quantifier la diffusion et l'adoption des technologies de régénération cacaoyère implémentées en milieu paysan dans les différentes régions de production. Les résultats montrent que l'adoption reste difficile et sélective eu égard aux nombreuses contraintes, notamment économiques et sociales, auxquelles doivent faire face les planteurs.

MOTS CLÉS : Côte d'Ivoire – Adoption – Technologies – Bonnes Pratiques Agricoles

I- INTRODUCTION

Cocoa is a strategic crop for Ivory Coast representing 40% of export earnings (CTB, 2011) and 10% of Gross Domestic Product (Assiri & al, 2012). However, many constraints threaten the sustainability of the Ivorian cocoa (Deheuvels, 2003 ; Assiri & al, 2009).

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To face these threats and establish a sustainable cocoa economy, the Coffee /Cocoa field has initiated the Program Quantity, Quality, Growth (2QG) since 2006/2007. In this context, several cocoa regeneration projects have been completed. But after more than 5 years of implementation, this field does not seem to have a clear evidence of the adoption of implemented technologies. Studies on the subject matter, including that of Assiri & al. (2012), limit themselves to experimental plots, and to agro-ecological and techno-economic aspects. Our study goes beyond these data by integrating socio-economic and cultural dimensions through a "fine qualitative analysis"¹ of the transformations brought by the agricultural advisory projects in terms of adoption of cocoa regeneration technologies among farmers. Moreover, this study emerges as an analyzer of agronomic innovations in agrarian communities that are undergoing full economic and social restructuring (Leonard & Vimard, 2007). Thus, this study aims at measuring the adoption of Good Agricultural Practices (GAP) in an interdisciplinary perspective.

II- ENLIGHTENING CONCEPTS

2.1. Discussing the concept of adoption

Adoption involves the full and continuous use of a new idea or knowledge as the only way to help solve a problem (Rogers, 1983). This definition is not precise enough. It does not indicate the origin of the decision-making process with regard to innovation. For Van Den Ban & al. (1994), adoption is a mental process that begins with a person's first contact with innovation to the step of rejection or acceptance. Therefore, researchers have conceptualized adoption as a process that occurs over time and which is made of a series of actions (Rogers, 1983). *Adoption* also requires a change in behavior. This change is characterized by the modification of an action and a way of behaving (Ajzen & Fishbein, 1980). Of all theories developed to account for people changing their behavior facing innovation, Davis Model of Technology Acceptance (MTA) (1986) seems to be closer to our object of study. Our study aiming at shedding light on the adoption of Good Agricultural Practices (GAP) in cocoa farms, the MAT not only helps us know what guides farmers choices for the implementation of projects, but also help predict and anticipate the probability of accepting the implemented technologies.

It should be noted that Davis's works, showed that the relationship between the intention to use an information system and the perception of its usefulness is stronger when the perception of ease of use is added. Are growers inclined to ease of use or are they guided by the sense of the usefulness of technologies offered in the framework of 2QG Program projects?

But Davis does not neglect the social environment. It analyzes the issue of the adoption of innovations by placing the individual in his social reality by taking into account both the personal will and the social influence network which he belongs to.

2.2. Concept of Good Agricultural Practices (GAP)

Promotion of Good Agricultural Practices (GAP) whose goal is to take concrete measures to achieve the sustainable agriculture and rural development (SARD) is part of the Millennium Development Goals (MDGs) [FAO, 2003]. This concept of GAP has evolved during recent years in the context of the globalization of agricultural economies facing three major challenges (FAO, 2004): i)

¹ For Chauveau (1999), "the fine qualitative analysis" in the study of change processes is based on a "constructivist" approach. This approach captures the objects of study (agrarian dynamics like innovations) in the very course of much wider processes. "

improving food security, livelihoods and incomes in rural areas; ii) meeting the growing and diverse requirements for the safety of food and other products, iii) conserving and protecting of natural resources. These challenges can be accepted in part through Good Agricultural Practices (GAP), an approach that aims at applying existing knowledge to improve the environmental, economic and social sustainability of production (FAO, 2003). Based on the principles of sustainability, the goal of GAP is to achieve specific desired results, taking into account farmers' constraints and incentives to implement practices in accordance with market demand in this particular context (FAO, 2005).

Key stakeholders must therefore be helped (farmers, processors, traders, consumers and governments) fully assume their role and responsibilities in the search for sustainable agricultural production systems that would be socially sustainable, economically profitable and productive while protecting humans and animals health and well-being, and environment (FAO, 2004). Therefore, methodologies such as integrated fight against pests and conservation agriculture have been developed to address some specific production problems. Food quality standards have been set up under the *Codex Alimentarius*² (FAO, 2005). In the context of cocoa farming (Sonii, 2005), especially in the Ivorian Cocoa/Coffee field, GAP cover three key dimensions: technical, social and environmental aspects. Technical aspects where efforts are particularly concentrated, for productivity's sake concern technical routes or technological packages from agricultural research whose proper application helps to improve cocoa productions. These technological packages or good production practices are grouped, according to Sonii (2005), into four main groups :

- 1- good practices of seedlings production ;
- 2- good practices of setting up or installing cocoa farms ;
- 3- good practices of conducting orchards ;
- 4- good practices of harvesting and post-harvesting.

III- METHODOLOGY

The study began in July 2012 with a preliminary phase devoted to documentary research, exploratory talks with the structures involved in the cocoa field. The study involved 24 departments out of 48 as follows:

Table 1: Distribution of the sample per region

ANADER area	Number of visited departments	Number of respondents
South	8	182
Central	8	250
East	4	84
Center	2	32
West	2	52
Total	24	600

The data collection instruments were the interview guides and questionnaires meant for 600 respondents. The survey used the Knowledge Attitudes, Practices (KAP) approach, which is based on

² The *codex alimentarius* aims to guarantee sure and safe food for everybody and everywhere.

three key questions: What knowledge, what attitudes, what practices should be evaluated (Gumucio & al., 2011) ?

IV- RESULTS AND DISCUSSION

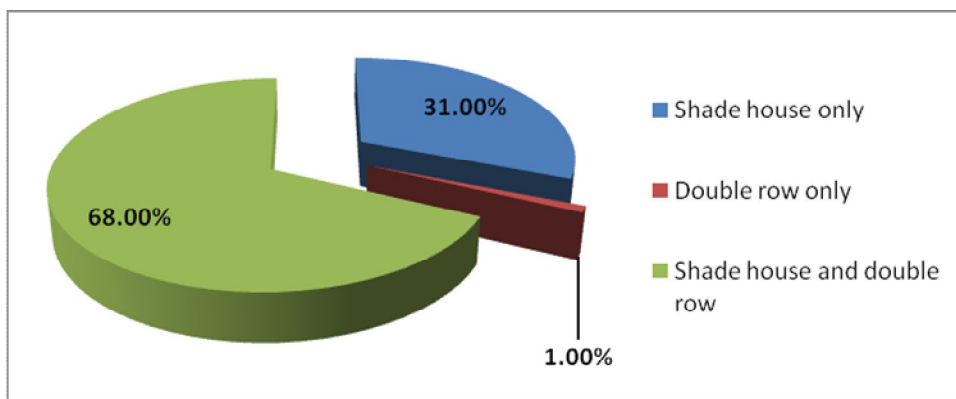
The results focus on three main points.

4-1- Application and adoption of technology

4-1-1. Farming practices of planting / replanting

The analysis focused on the production of seedlings and the establishment of the plantation.

The good practices of seedlings production concern recommended nursery techniques: shade house³ and double row of 20⁴ at a time. The analysis indicates that 76.71% of the farmers apply good practices of conducting nursery. More than 22% content themselves with putting their nursery under shade house (Chart 1).



Source: according to our survey (from April to May 2012)

Chart 1: Level of compliance with good nursery practices

These percentages show that bag nursery technique is widely adopted by farmers (about 77%). These positive results are due to time, since this technique has been brought in for decades. For time is a key factor to the adoption of technologies as the theories of diffusion state. Indeed, Rogers (1983) defines the process by which an innovation is conveyed over time through some channels among the members of a social system. This is a special type of communication where messages relate to new ideas. So the diffusion of an innovation depends on four elements: **innovation, the channels of communication, time and social system.**

The disappearance of the rainforest also justifies the adoption of the nursery technique (more than 12 million during the last century). Traditional techniques such as direct sowing⁵ and ground nursery⁶ have very little chance of succeeding today. This leads farmers to change their strategy. Although being more testing, they find it more useful to create plantings using nursery bag process. Here, we come along with Davis MAT when he identifies the utility the new thing represents to the individual as the essential element that determines the willingness to accept innovation. The more the

³ A device looking like sheds meant to cover nurseries

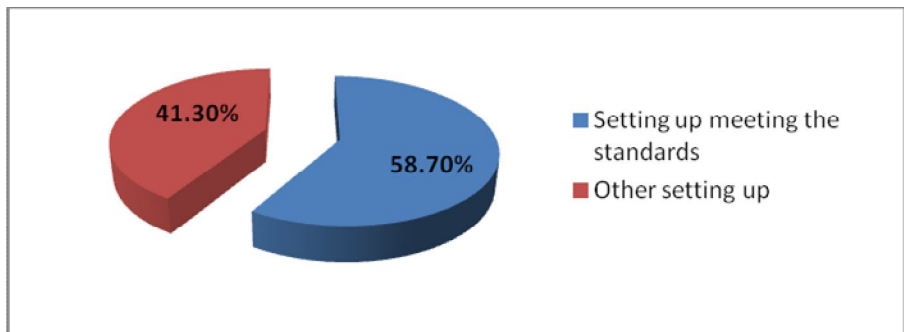
⁴ Arrangement of bags in two rows of 10 each.

⁵ Setting up a planting without including the nursery phase technology

⁶ Nursery Technique installed on open ground on beds

individual believes that innovation is likely to contribute to increase his performances, the more motivated he is to accept it.

Implementation techniques concern digging holes, cocoa density, association and density of bananas, pruning (Chart 2).



Source: according to our survey (from April to May 2013)

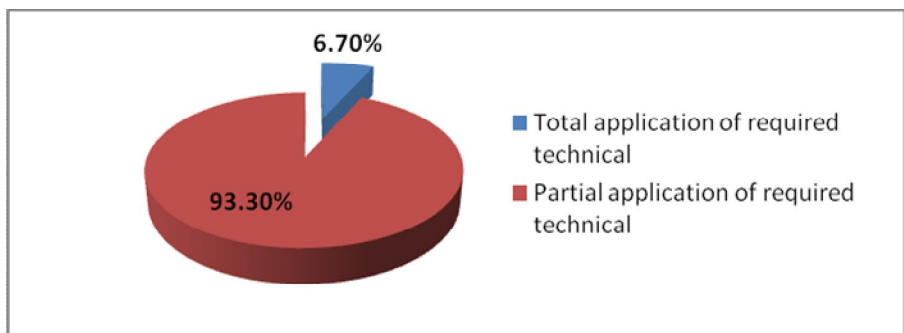
Chart 2: Proportion considering the level of good practices application for the setting up

The analysis shows that 58.70% of farmers apply good practices for the setting up. In fact, all the planters combine bananas and 50% do the pruning. However, among them, only 44.72% will comply with the banana density standards as recommended.

The cocoa-banana association is a process used by farmers for decades. In addition, only 22.67% of the growers apply the standards of planting (digging holes 40 cm cmx40 device 3 m x2.5 m). The challenge lies in the respect for the recommended banana device (3 m x2.5 m) for the association.

4.1.2. Farmers’ practices of conducting orchards

Good practices of conducting orchards is equivalent to pruning maintenance (suckering) sanitary harvesting (picking black pods and removing dead branches), the application of agro-chemicals (fertilizers and pesticides) and restoring size (removal of too many stems). Are reported to apply good practices for conducting orchards those planters who combine all these aforementioned techniques (Chart 3).



Source: according to our survey (from April to May 2013)

Chart 3: Application of Good Practices conduct orchards

In general, growers hardly apply good practices of conduct orchards. Only 6.70% of respondents fully apply it against 93.30% who only apply it partially. A proper conduct of orchards demands farmers

an optimal investment. Yet, they do not much include the concept of investment in their farm management strategies. Actually, they seek and always find ways to reduce the investment costs (Ruf, 2009). Thus, for Ivorian farmers, reducing the investment cost is a top priority and all the perennial crops confirm it (Ruf, 2007). Plantations are still considered as family and community heritages. As such, they have not yet been transformed into agricultural farms and individual enterprises that can add value to the training they received; especially in a context where vocational training is not part of farmers concerns (Oura, 2013).

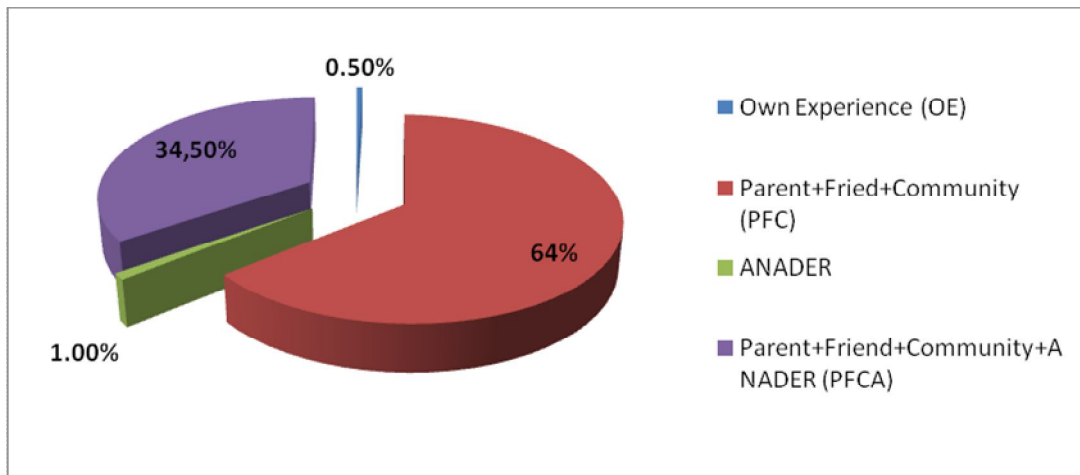
Farmers are not aware that training the labor is a profitable investment like the companies that train and retrain their staff. Cocoa farmers keep on using less expensive and unsuitable inputs. In other words, small farmers have not yet change their habits and have not yet gone beyond the stage of farmers having a budget, a skilled labor, adequate production tools, harvesting techniques and successful sales, etc. So they are still in the logic of a permanent assistance.

Farmers' reticence vis-à-vis good practices of conducting orchards is partly explained by the lack of edging measures (Kouassi, 2009). Indeed, having access to the necessary factors (seeds, fertilizers, small equipment ...) for the application of agricultural innovations and remunerative market, producers can find a favorable environment for investment in agricultural production, through the adoption of agricultural innovations (Zoundi & al., 2005).

4-2- The influence of social factors on technology adoption

4-2-1- The influence of social groups on agricultural decisions taken

The analysis shows that only 0.5% of farmers take decision based exclusively on their own experiences, 64% resort to what we called PFC (Parent, Friend, Community). For 1% of them, ANADER is their remedy in case of major decision-makings whereas 34,5% make use of PFCA guide (Parent, Friend, Community, ANADER). These results are better perceived through the following graph.



Source: according to our survey (from April to May 2013)

Figure 4: Proportion considering the mode of decision-making

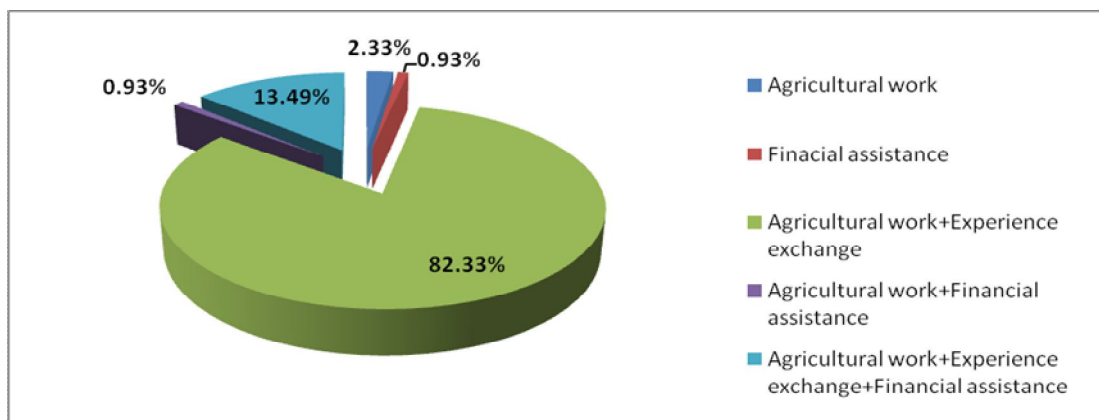
Community groups continue to exert a great influence on farmers' decision-making as regard to their farms. Moreover, the social capital plays a key role. Preferring the PFC or PFCA channel, cocoa farmers show that the concepts of networks and trust are at the heart of their agricultural choices. In

fact, they prefer trusting networks rather than rely exclusively on themselves or on ANADER. They are actually influenced by the standards of their social system and their interpersonal information network. Before taking decision, farmers want to make sure it is shared by many members of their network. So a planter would agree to adopt an innovation because he trusts his network, and because the members of the network have adopted it. This means that if their network resists innovation or a proposed technology, most of the farmers, except for a few curious people, will be influenced by the tendency or behavior of their network. For Sabourin & Barrel (1998), this implies that extension should seek to shed light on the following questions:

How does information flow among producers?- What factors favor the appropriation of technologies? Are they favored by proximity or neighborhood relationships, or by some producers' organizations?- What is the importance of information and knowledge production dissemination among producers: Who is consulted?- What is the operational role of dialogue and mutual aid networks?- Which monitoring and analyzing tools shall we call on for these processes?

4-2-2- The influence of social groups on the dissemination and application of GAP

The results presented by the following graph help understand the role of mutual aid groups in the dissemination of information among farmers. This role is perceived through rural work, sharing agricultural experiments as well as financial assistance.



Source: according to our survey (from April to May 2013)

Chart 5: Proportion of farmers regarding the mutual aid groups' role

Farmers claim (82.33%) that mutual aid groups contribute to the realization of rural works and agricultural experiences exchange. Mutual aid groups are therefore a powerful agricultural and technological diffusion channel for farmers and GAP application vectors. Groups are generally made of project participants and non-participants. Through these groups, they integrate what they learned in the Farmer Schools Fields (FSF) and the Trial Plots (TP). This is indeed an opportunity for best students of the FSF and TP to share their expertise with less frequent or worst students. Moreover, our results show that these groups seem to play an interesting role in the implementation of GAP (Table 2).

Table II: The role mutual aid groups in the application of Good Practices of establishment

Group membership	Application of good practices of establishment		Total (%)
	Establishment meeting the standards (%)	Other establishments (%)	
« With» mutual aid group”	69,37	30,63	100
« Without» mutual aid group”	53,08	46,92	100

Source: according to our surveys (from April to May 2013)

Good installation practices are applied by more than 69% of the growers belonging to a support group for field work against 53% with no support group.

Thus, beyond dialogue and technical exchanges, these groups constitute an undeniable labour that contributes to assist their members in the pastoral activities. These groups are therefore potential solutions against labor shortage which operations managers are more and more facing while implementing the GAP. But this very labour is not sufficiently exploited by farmers (only 36% adhere to groups) to address the shortage of labor and to increase the adoption of BPA.

4.3. Constraints of capitalizing and adopting knowledge

4.3.1. Farmers between innovation and satisfaction of basic needs

Farmers are routinely forced to make multiple choices regarding their priority needs (food, health, education, creation and maintenance of plantations, etc.). The introduction of innovations, with the requirements going with it, makes these choices even more difficult.

Ultimately, they opt for primary needs (food, health, school ...) at the expense of investment brought about by innovations. Indeed, interest in cocoa regeneration technologies necessarily entails in resolving food issues, then those of health and education.

According to our results, 77% of farmers are not self-sufficient. Thus, 41% of them buy food crops to make up food deficit during the food shortage, while 58% of these farmers simply do with what they have to cross food shortage. Based on this observation, we imagine how difficult it is for farmers to engage in the cocoa regeneration process as recommended by the results of agricultural research. For these farmers, the priority is absolutely the struggle for survival and their family balance. Thus, the lack of resources (human and financial) is primarily focused on creating food farms or buying food.

According to Maslow's theory of motivation (1954), needs create motivations. However, it is impossible to satisfy them all at the same time. Maslow defines human being as a whole having physiological, psychological, sociological and spiritual aspects. Each of these aspects is linked to some basic human needs, which he schematically shows inside a pyramid with five levels on a hierarchical base:

- 1- physiological needs: life keeping (hunger, thirst, sleep ...)
- 2- security needs (protection, order, confidence ...)
- 3- social needs (group membership, love, having a status ...)
- 4- esteem needs (achievement, recognition, feeling useful, to have value, development of autonomy and identity ...)
- 5- needs of self-realization (creativity, development of blossoming needs, exploiting one's creative potential, knowledge development, personal beliefs and values ...).

For Maslow, as long as a need is not satisfied, it is a source of motivation. As soon as it is satisfied, the need of the higher level will appear as a new source of motivation. Thus, he says, the satisfaction of a need cannot be achieved if the lower-level needs are not satisfied.

In this respect, a producer can only fully adhere to cocoa regeneration projects when he can unquestionably cope with his food needs and family responsibilities. Investing in planting becomes a secondary need that will be considered only after meeting basic needs. Farmers' difficulties are in many respects related to labor deficit.

4.3.2. Absence or labor deficit and farm equipment

The results show that the bulk of farmers do not have a wage-earning labor, for lack of funds. Indeed, 92% of respondents say they do not have funds. Labor is made of family members at 74.17%. The size of this labour is itself reduced, two people on average. With the reflex for the education of children, intra-family conflicts about the redistribution of resources and research pronounced personal careers, family labor is disappearing consistency. Sometimes finding one and tie between different activities, he finds little time for maintenance of cocoa plots testified as 82% of respondents. These difficulties relating to labor, there is the lack of equipment and farm equipment.

Our study indicates that farmers are under-equipped. Nearly 89% do not have an atomizer. As a consequence, not all of the farmers' crops receive phytosanitary treatments. Even those farmers who do treat their farms, fail to keep the recommendations. Sometimes, the required periods are not observed in the absence of atomizer. These remarks also apply to post-harvesting treatment. Indeed, only 34% of farmers have a rack or improved dryer. In addition, only 10% of them have a cemented area. But this equipment shortage is probably linked to the socio-cultural factors.

4.3.3. Pervasiveness of cultural constraints

Cultural constraints are one of the limiting factors in adopting Good Agricultural Practices. Prohibitions reducing the number of working days of pastoral activities, funerals are real obstacles to the optimum application of GAP.

In almost all villages or camps, farmers are subject to prohibitions that demand to stay at home to avoid the wrath of the protective spirits. Thus, to comply with tradition, there is/are 1, 2 or even 3 day(s) off during the week, according to the villages, with no pastoral work done. The lost days bear severely on farmers on the standpoint of accounting, especially for very demanding intensive culture in terms of consistency and monitoring. Reducing the number of working days affects expected performance, especially as labour is insufficient.

The question of the funeral has become over years an issue whose influence on agricultural activities is increasingly shared. In rural areas, funerals are a form of binding solidarity showed by reciprocity and respected by all the peers in case of death. For the sake of solidarity, people are forced to participate in, either physically or financially or both physically and financially when a member of the community dies. Over 95% of farmers report that funerals have a negative impact on farming activities. May it be time, as 99% of them state, or money as confirmed by 73% of them.

They are so strongly attached to death matters that they cannot be concerned about their own health.

4.3.4. Health degradation and labour reduction

Our observations allowed us to notice that most farmers, regardless of the regions, have poor health. The causes are multiple, but early retirement due to alcohol seems to be the main cause. Today, the bitter observation offered by the agricultural landscape is that of youths who are less hardworking and tend to be addicted to alcoholism. With such an attitude, agricultural activities are sidelined due to the loss of will and labor. Without labor, without money to hire labor, it is quite clear that GAP implementation can only be approximate, if not an illusion.

CONCLUSION

The application of cocoa regeneration technologies remains difficult. The issue of the adoption of Good Agricultural Practices remains a central concern. Farmers hardly apply technological packages; they rather make a selective application. As a result, the plantation yields remained low (about 400 kg / ha / year) and below the expected results (1 to 1.5 tones / ha / year).

These results show that innovation, in rural environment, depends on choices and decisions that are dependent on the farm as a whole. Cultural constraints, family responsibilities, the influence of local production practices, difficult access to inputs and labor deficit inhibit farmers' desire to innovate.

Given the complexity of family farms, agricultural advisory board and farmers must engage in a dialogue that will help adapt projects implementation strategies to farmers' real needs. From now on, the best bet would be to go beyond the agricultural plot by integrating farmers' daily lives to really influence farmers' strategies that still remain almost unchanged.

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