



Current Cocoa production and opportunities for re-investment in the rural sector. Côte d'Ivoire, Ghana and Indonesia.

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Beyond a 2006/07 year with poor climatic conditions that is at least temporarily pushing up prices, structurally, cocoa production could well be on the rise in several countries. In Ghana, Nigeria and Cameroon, policies, and especially liberalization of the cocoa sector, which occurred in the mid 1990s and was accompanied by an increase in producer price, have played a major role in production gains in the 2000s.

Although the production increase is still partially due to the 'old way' of producing cocoa, i.e. clearing forests, the increasing role of replanting and inputs, especially fertilizers is now clearly visible. This change in farming systems now approaches the concept of 'green revolution' applied to cocoa, with all positive and less positive impacts this implies.

Among the positive impacts, technical breakthroughs in replanting and adoption of inputs are reducing the overall dependency of cocoa production on forests. The hypothesis can also be put forward that less dependency on forests will reduce the amplitude of regional 'production cycles' and eventually that of price cycles.

However, despite this optimistic hypothesis, the cocoa sector will not avoid having to face pests and diseases and serious social and economic difficulties, including a possible reverse in the price trend.

Nevertheless, a relatively favourable trend in cocoa producing countries is exactly the right time for investment in two main areas.

On the one hand, public policies should certainly continue to help cocoa farmers to produce cocoa 'efficiently', with improved productivity and sustainability, which includes a certain degree of biodiversity and the use of environment-friendly systems.

On the other hand, or rather as a logical corollary, public policies should remain active in helping cocoa farmers to diversify. To a certain extent, the recovery of the cocoa sector in some countries can be interpreted as a partial failure in other sectors. Unless young people can cross the ocean and succeed in London, Paris or Washington if they cannot find work in Abidjan, Accra or Yaoundé, some young people will inevitably end up returning to the 'bush' and reinvesting in a cocoa farm.

This does not mean that diversification within and outside the agricultural sector is a miracle solution for public policies. Within the agricultural sector, many economists remind us that specialisation can be quite profitable. Although this may also come as a surprise to certain ministers and policy makers, many economists also believe that diversification is the farmers' business, not the government's. For instance "the creation of infrastructure that favours one product over another" is a policy issue but not the choice made by farmers after the infrastructure was constructed (World Bank 1990, Hayami 1991, quoted by Delgado and Siamwalla 1999).

More pragmatically, one can also find showcases of 'diversification' processes that end up with a complete conversion from 'cocoa monoculture' to another monoculture. Regional diversification may also involve the juxtaposition of specialized cocoa farmers and non-cocoa farmers, which does not necessarily match the objective of cocoa sustainability.

In short, a diversification process intuitively makes sense both in economic and environmental terms, and is likely to reduce certain risks, but also implies its own set of risks.

The main question is how public policies can help cocoa farmers to invest in the hope of encouraging stronger farming and marketing systems which will provide higher incomes and more security.

Our primary hypothesis is that inadequate information and imperfect capital markets justify governments' interaction in favour of diversification.

Our second main specific hypothesis is that farmers and countries need to combine agricultural investments within the cocoa sector and outside the sector.

Finally, under certain conditions, both investments can be combined on the same farm-plot, which is usually called 'agroforestry'. This is one option among others but certainly not the only one and 'experts' and 'developers' should listen to farmers if their preference is for diversification without 'agroforestry' at the farm plot level.

From one generation to another, from one country to another, from one regional cocoa cycle to the next, cocoa development issues are often a repetition of discoveries followed by a loss of memory and then the re-discovery of similar findings and recommendations. What follows is a 10-point presentation starting with an expert report written about Ghana in the 1940s.

1. Akokoaso in the 1930s (Beckett 1944) as an introduction to sustainability and investment in cocoa farming
2. Sustainability and investment in the cocoa sector
3. Current investment in cocoa inputs :
 - a. case of fertilizers
 - b. specific case of CPB/Pesticides in Sulawesi
4. Current investments in cocoa planting by farmers in the 2000s
5. Diversification is transformed into mere re-conversion
6. Diversification hovers between danger and success
7. Apparently successful tree-crop diversification
8. The specific case of timber
9. Potential risks in food self-sufficiency in the 2010s
10. Potential lessons in terms of public policies: towards which investments?

1. Akokoaso in the 1930s (Beckett 1944) as an introduction to sustainability and investment in cocoa farming: food self-sufficiency

1.1 Self-sufficiency in carbohydrates and fat

In the 1930s, Beckett, a former extension officer who subsequently became a social anthropologist, undertook an extensive monographic study of one village, Akokoaso in the Central region of Ghana. Although the final objective was to study the role of cocoa farming, one of the first chapters was devoted to food crops and food self-sufficiency.

“The bulk of the food -plantain and cocoyam are the staple foods- is produced in the village. The custom is to plant food crops for several years while the cocoa seedlings are growing.” (Beckett 1944, 18).

Table 1. Distribution of cocoa farms according to their food self-sufficiency level (Akokoaso, 1933)

Cocoa farmers	with surplus foodstuffs	32
	with sufficient foodstuffs	187
	inadequate foodstuffs	40
Food farmers with seasonal supply only		10

		269

Beckett 1944, 18.

Table 2. Consumption of foodstuffs and sources of supply in Akokoaso, 1933.

	Total consumption in tonnes	Grown in village %	Brought in %	Sold in market %
Carbohydrates	773	97.3	2.7	10.0
Vegetables	47	98.9	1.1	4.4
Fats	22	100	-	1.2
Fruit	7	100	-	11.0
Total	849	97.4	2.5	9.4

Beckett 1944, 21

The admirable capacity of family agriculture to guarantee self-sufficiency in carbohydrates, vegetables and fats, at least in the 1930s, is extremely important. It partially accounts for the continuing efficiency of family agriculture over decades, this being one of the major factors that enabled family agriculture to survive periods of low cocoa prices.

Seventy years later, we cannot present the equivalent quantitative data, but we can estimate that more and more families involved in cocoa farming around the world, including in Ghana and Côte d’Ivoire, now partially but increasingly rely on the market for part of their staple food.

Beyond a certain threshold, this may become dangerous for the families concerned, and in the long term, for cocoa production as well (See section 9). The first aspect to be taken into consideration concerning investments for improved sustainability of cocoa farming is thus to reconsider the role of food crops.

1.2 Dependence on proteins

“The **meat supply provides a different picture**, almost half the total consumption being brought in and about four fifths of the whole passing through the market.

“The sheep, goats, bush meat and snails together comprise the home grown meat supply, but over 45% of the total consumption is brought in, chiefly in the form of **dried fish** caught by fishermen from the coast towns” (Beckett 1944, 22).

This is a major testimony. Even in the 1930s, when the forest canopy and the bush meat were still abundant, cocoa farmers had to rely to a large extent on the market to meet their own protein requirements. This is partially explained by the difficulty involved in raising ruminants in the forest zone of West Africa, which is seriously infested by the Tse Tse fly.

Seventy years later, as large areas of forests and bush meat have disappeared, people’s dependence on the market and especially on dried fish is even greater. At the national scale, a country like Côte d’Ivoire has been importing 150,000 tonnes of fish for an estimated consumption of 230,000 tonnes. (Oswald *et al*, 1993). What are we waiting for to promote aquaculture?

There is a obvious need to promote fish ponds and aquaculture in general. Compared to real needs, very little is being done. Some farmers are trying on their own, as it is the case in the Soubré region in Côte d’Ivoire, (Photos 1 to 3) but these farmers would benefit from outside support and expertise.

Photo 1. Degraded land and water: all that is needed for fish ponds



Photo taken by Allagba Konan, CIRAD & ACV team, Côte d’Ivoire, Soubré 2006.

Photo 2. Plus some labour and farmers' organizations



Photo taken by Allagba Konan, CIRAD & ACV team, Côte d'Ivoire, Soubre 2006.

Photo 3. .. and some expertise from outside



Photo taken by Allagba Konan, CIRAD & ACV team, Côte d'Ivoire, Soubre 2006.

Among the (too few) cases of outstanding success, we would like to cite the work done in Côte d'Ivoire by Marc Oswald where a strategy of semi-extensive fish ponds proved to be highly successful. One showcase is the village of Lewonu, close to Daloa. Fish ponds not only increase protein self-sufficiency, income and the distribution of income throughout the year but also trigger further investment by farmers such as the creation of irrigated plots for vegetables around the pond (Oswald 2000).

1.3 From Indebtedness to Diversification

Indebtedness is another issue that was rightly raised by Beckett before he started talking about cocoa! (30-45). Lack of cash, late payments, seasonal payments lead to structural indebtedness

Decades later, some progress has been made, especially in Ghana, with the liberalisation of the cocoa sector and the current cash payment and competition between buyers, which encourage them to provide some services to smallholders, including some credit.

The historical development of the rural bank sector in Ghana, -certainly linked with the history of the cocobod monopoly- (possibly one of the few advantages of the monopoly) may be still an advantage for Ghanaian cocoa farmers. Investment in rural banks and micro-credits is certainly the right way to go. However the development of small financial organisations takes time and is not a guarantee of sustainability per se.

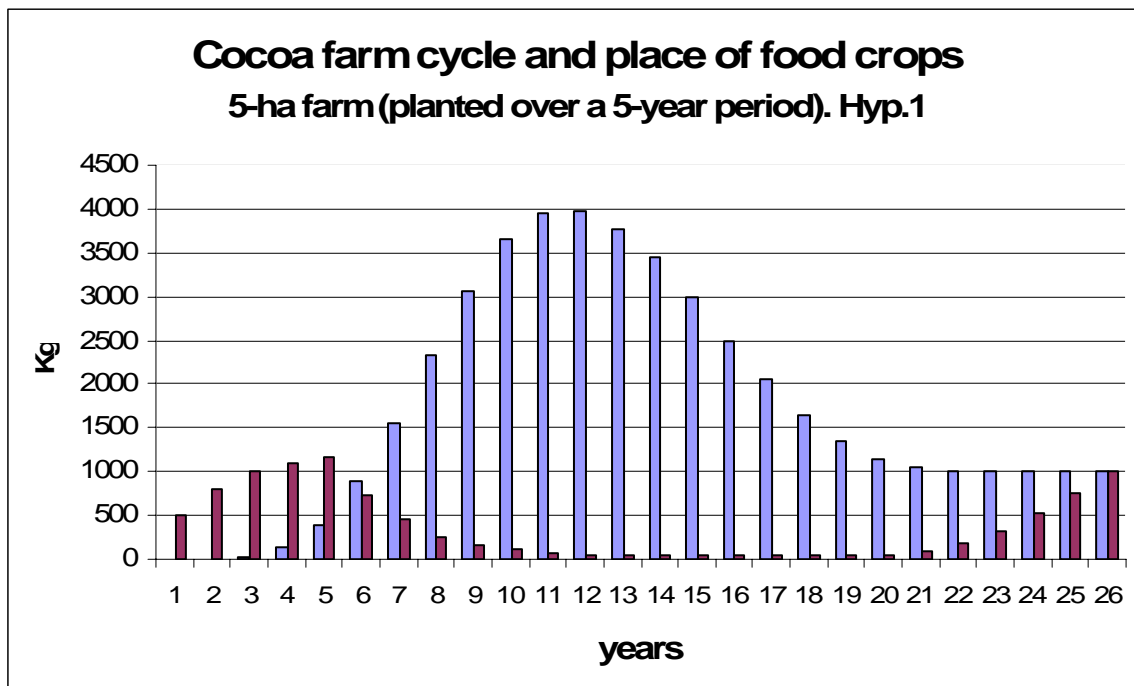
Finally, education and external help are useful, as already mentioned by Beckett in 1994, but the best strategy is to diversify activities and sources of income. The ultimate objective is to reduce the gaps in financing means by generating

- regular revenues to reduce the need for consumption credit
- and occasional windfalls,
 - o that may reduce credit linked to social consumption and investment
 - o that may favour saving and economic investment

2. Sustainability and investment in the cocoa sector

When it comes to the issues of investment and returns in tree crops, one cannot avoid the problems caused by the fact that the main capital is the tree itself, a biological capital, with a period of low revenues at both ends of the cycle (Fig.1).

Figure 1.



This is precisely where food crops can play a role, firstly at the very beginning of the cycle with planting of paddy, maize, cassava, yam, plantain and other crops combined with the young cocoa plants. At least theoretically, food crops can also play a role at the end of the cycle when cocoa starts dying and space thus becomes available for food crops and possibly for replanting.

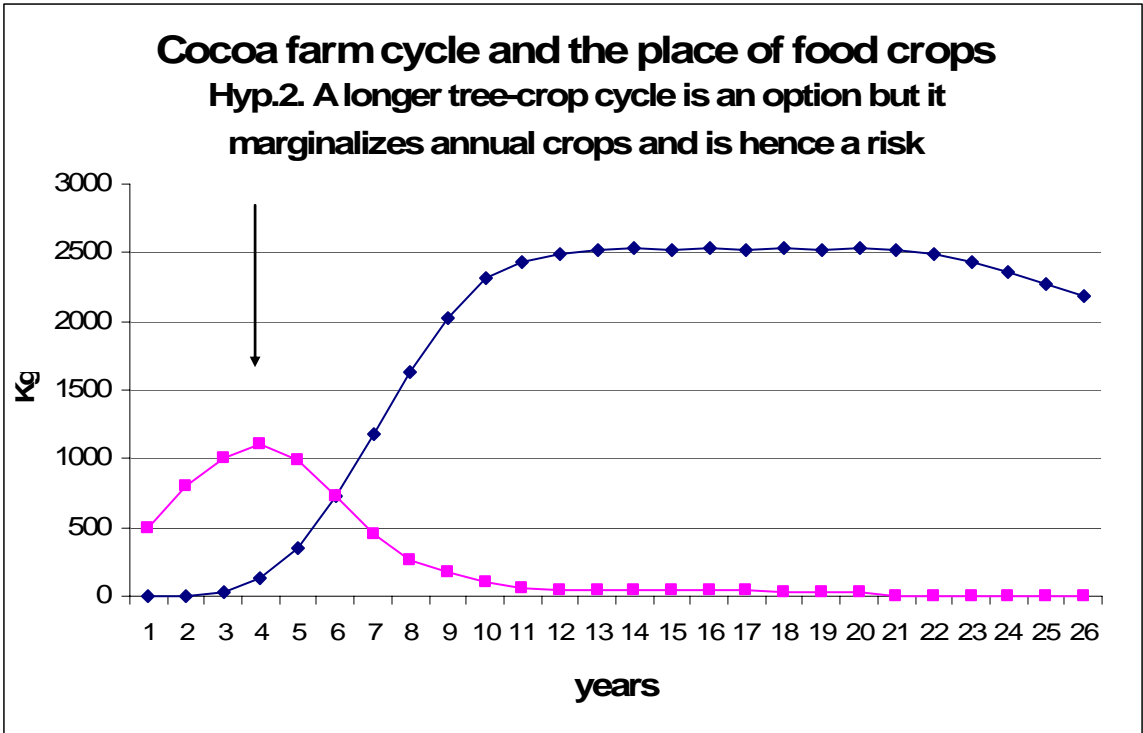
It is well known that replanting tree crops in general and cocoa in particular raises problems related to the decline of soil fertility, weed pressure, potential ecological change, etc. There is thus a specific need to fund this replanting phase. This is large component of the sustainability problem of cocoa. Several strategies can be used to address the problem.

2.1 First strategy: extend the tree crop cycle

One intuitive strategy is to try to extend the economic life cycle of the tree crop farm itself (Figure 2). This was probably part of the strategy followed in the past by many cocoa farmers in Ghana and Côte d’Ivoire, allowing a dense forest tree canopy to develop over the cocoa trees. Cocoa yields were quite low but that was not a problem in the past when land was abundant.

In the 21st century, in the context of land constraints, this strategy is probably less easy to implement. Low yields, low returns, less space and less opportunity to grow food crops may generate serious challenges to the sustainability of cocoa farming.

Figure 2

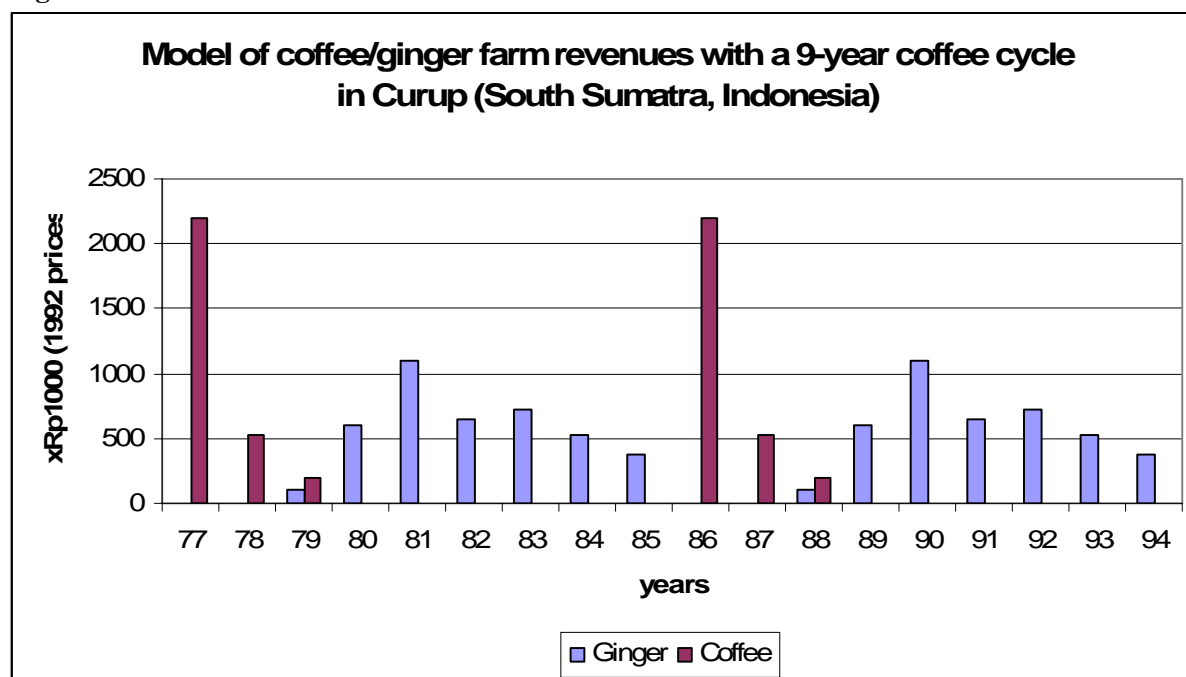


2.2 Second and opposite strategy: shortened cycles

Another possible strategy concerning the inevitable cocoa cycle is exactly the opposite: thanks to a longer plateau phase, better sustainability could be achieved by shortening the cycle, with frequent replanting partially funded by food crops. However, in this case, at the replanting stage, the yields of associated food crops would also be significantly lower for the same technical reasons.

In some cases, the first option is encouraged by a growing domestic or international market for annual crops. For instance, despite lower yields, financial returns on food crops may sometimes become attractive due to a growing population and demand, with a resulting increase in prices. In Côte d'Ivoire, this is true for cassava grown by cocoa farmers or ex-cocoa farmers who are located not too far from Abidjan. In some cases, annual crops grown for export (such as ginger) may provide impressive revenues during the period of reinvestment. This is the case in Indonesia for some coffee farmers who have adopted a strategy of rapid rotation of coffee farms, every 8-12 years, and who fund it by cultivating ginger and chilli for one year or two, possibly three (Figure 3).

Figure 3



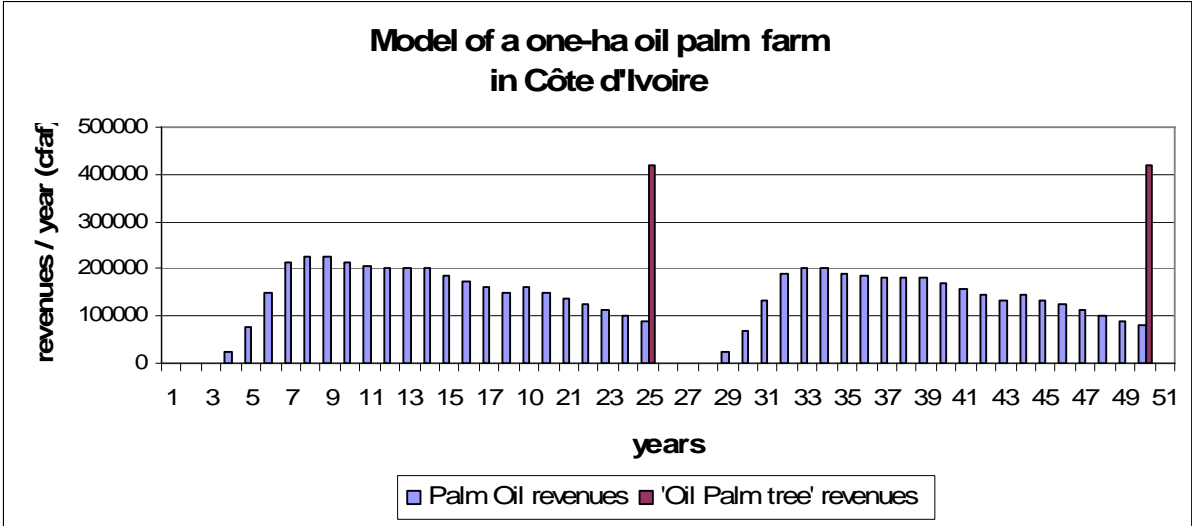
2.3 A third possible strategy: sell the 'capital' at the end of a tree crop cycle.

In this case, the objective is to generate a kind of 'windfall' or at least significant income at the end of a biological cycle of the tree crop, which facilitates re-investment and the start of a new cycle. For instance, the sale of an existing capital asset was common in the recent past in Europe when farmers used to rely not on tractors but on draft oxen. When the ox reached a certain age, the farmer had the opportunity to sell it for meat, usually at a higher price than he had paid for the young ox a few years previously. (It sometimes took years for Western farmers to accept the complete change introduced by tractors in the process of investment and returns. There was no way to resell the tractor above its original purchase price).

In the tropics, and in the tree crop sector, one showcase is oil palm in West Africa where the habit of consuming the palm wine and alcohols distilled from the palm wine generates a huge market for 25-year-old oil palms (Figure 4).

Oil palm trees have to be cut down before people can extract the wine. This is well accepted by the industry and farmers who know they will need to cut down oil palms at approximately 25 years of age, or well before.

Figure 4



The incentive to sell oil palm trees is sometimes so great that many small holders sell them much earlier than the '25 year' threshold. In Côte d'Ivoire and Ghana, felling and sale often occurs at the age of 12-15. To a lesser extent, the possibility to sell rubber or even coconut as timber may provide an opportunity to solve the same re-investment problem.

As there is not much wine or timber to extract from cocoa, one obvious option is to combine timber and cocoa. The timber could be a key resource when it comes to overcoming the problems that inevitably arise in the period of cocoa replanting (See section 8).

2.4 A fourth possible strategy: a more permanent association of food crops

In some cases, a more optimistic hypothesis on food crops can be proposed. In West Africa, when soils are deep and favourable for plantain, farmers usually grow this crop in the cocoa plantation for several years into the period of full cocoa maturity.¹

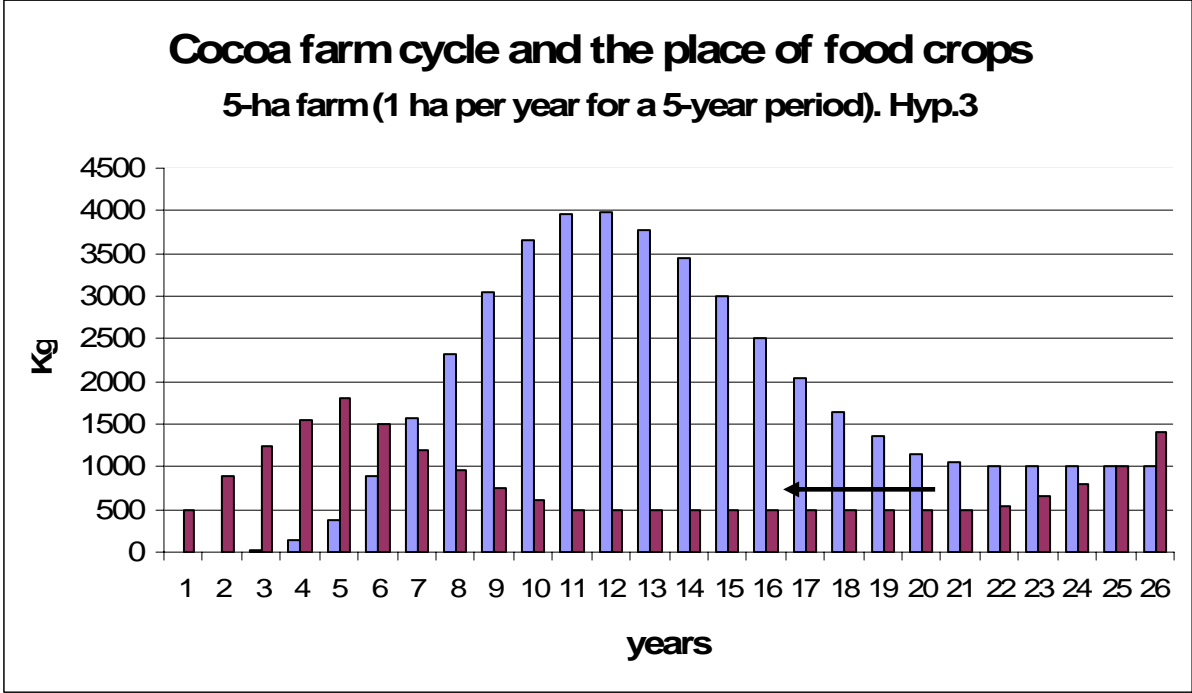
As they faced food problems, farmers also innovated and massively adopted a special kind local variety of yam, called 'kokoassie' or 'cocoa sié' which can grow without much light,

¹ However, the mortality of plantain after 10 to 15 years of cultivation often announces that of the cocoa farm itself.

and can be planted in mature cocoa plantations. This means a higher capacity to produce food and/or generate non-cocoa revenues on a mature cocoa farm (Figure 5)

This remarkable farmers’ innovation deserves support and research investment from National and International Research systems. This currently does not appear to be the case.

Figure 5



2.5 A fifth possible strategy: separate the areas for food crops and tree crops

Another possible strategy is to continue the historical trend of separating the areas where tree crops and food crops are grown.

Indonesia

This is an obvious historical trend in Southeast Asia where irrigated rice fields were established in the lowlands while tree crops and agroforestry systems were established on the slopes and ‘higher’ lands, around the homestead. Historians sometimes debate about the driving forces behind the adoption of labour-demanding irrigated rice that progressively replaced upland rice. In some cases, the driving force is access to market. Nevertheless, historians also acknowledge that demographic pressure remains a major historical factor (Boomgard and Henley 2004). When agricultural systems can no longer feed a population, the population will create innovations and will invest. In the case of rice, this often means an investment in irrigation, mostly in labour, which is coherent with the increase in population. An economist could translate this ‘boserupian’² mechanism through two curbs of returns to labour (Figure 6).

² According to E. Boserup who demonstrated the historical link between demographic pressure and population capacity to innovate and increase production (Boserup 1965).

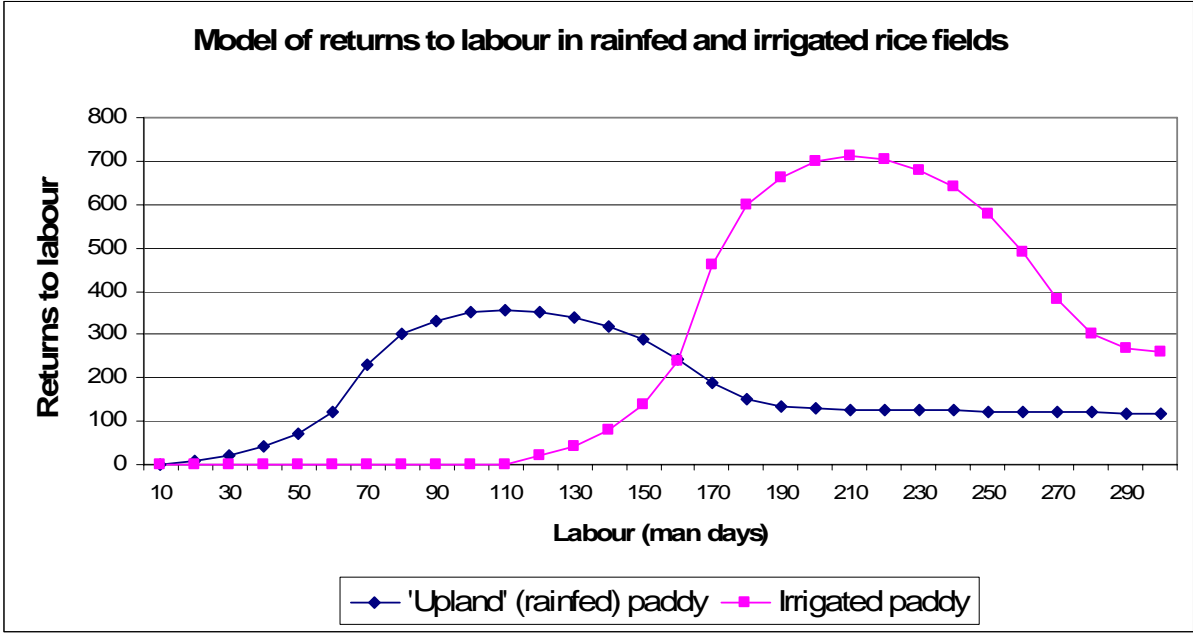
Nevertheless, the ‘historical’ trend of separating the areas of tree crops and food crops can be broken. Cocoa and rice can also compete for land. In Sulawesi, entire ‘transmigrant schemes’ organized and funded by public policies to create new rice fields granaries were recently and turned into cocoa farms by Balinese migrants (Ruf and Yoddang 2006).

Côte d’Ivoire and Ghana

To a certain extent, despite much lower population densities, the same shift in food production away from the cocoa farm and towards lowlands already exists in West Africa. Historically, lowlands were left almost untouched. This is now rapidly changing. It can be partially explained by the farmers’ strategy to reduce risks related to droughts and a decline in fertility in the uplands. It is also a way to manage land scarcity. All this reflects a boserupian mechanism.

In terms of investment strategies, this reminds us of the potentially high return on irrigated paddy fields on the condition of establishing them at the right time, i.e. when labour resources are available. For instance, when irrigated rice fields were promoted in Côte d’Ivoire through the ‘SODERIZ’ project in the 1970s, it was a little too early. The population density was often too low to benefit the project. In the 2000s, this type of project would probably be much more efficient.

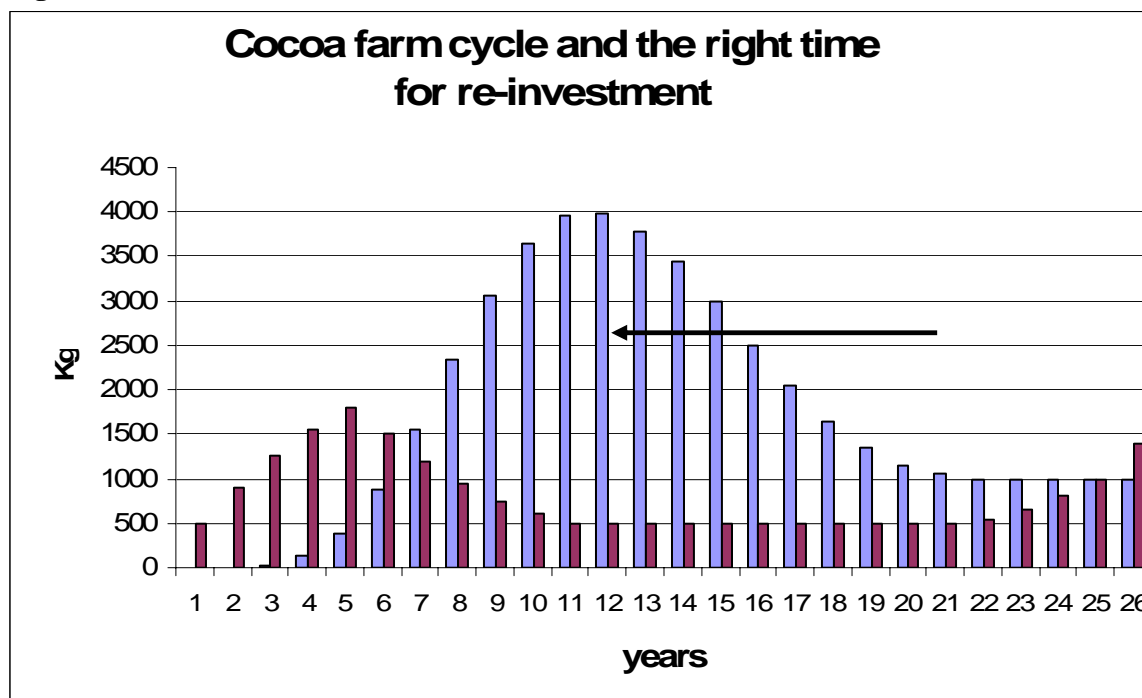
Figure 6



2.6 Finally, the major challenge: to re-invest at the right time

To round off this review of the investment required throughout the cocoa tree life cycle, one can stress the strategic need to invest cocoa revenues at the right time, when farms are at their optimal level of production. If a certain threshold is passed by too many years, it is too late to re-invest (Figure 7).

Figure 7



Finally, investment by farmers, by public policies and by the private sector can follow different strategies based on the cocoa cycle at the farm plot level

- strategies to extend the cycle and hopefully combine it with specific combinations of food crops on the mature cocoa farm
- strategies to reduce the cycle and reproduce it more frequently, combined with the production of food crops or of other annual crops by means of relay cropping
- strategies to separate the areas where tree crops and food crops are grown
- strategies to re-invest cocoa revenues at the right time, before it is too late

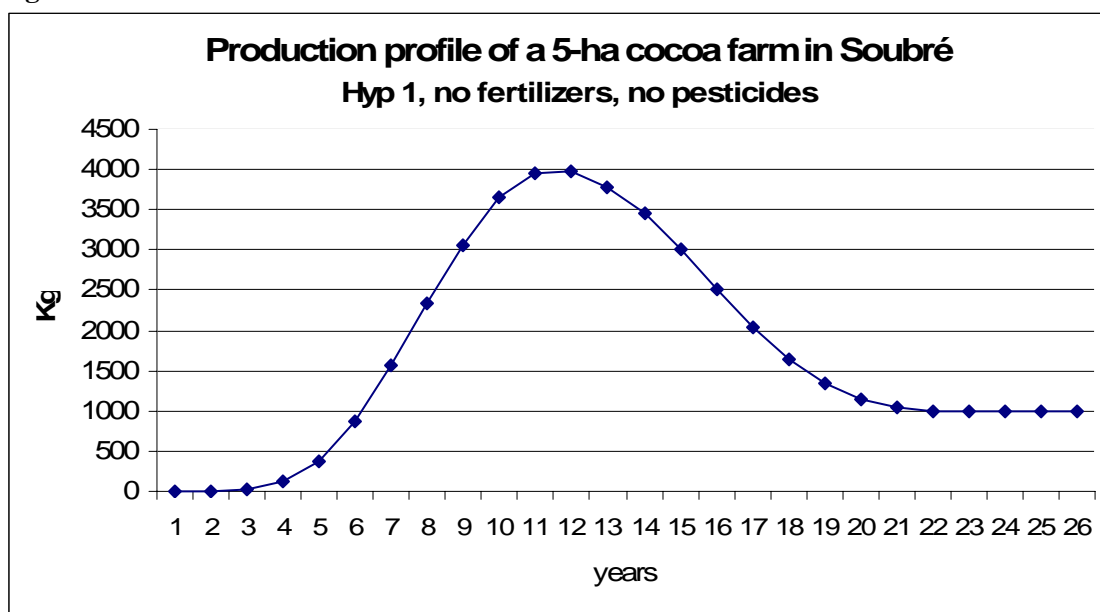
After the theory, let's have a look at farmers' practices

3. Current investments in inputs by cocoa farmers

3.1 Cocoa intensification: the showcase of fertilizers:

Historically, in West-Africa, the first cocoa farmers to have adopted fertilizers appear to be those of the Soubré region, in Côte d'Ivoire, who started in the late 1980s. Soubré was then a pioneer region and the scene of massive cocoa migrations. This 'geography' of early adoption of fertilizers in Côte d'Ivoire may come as a surprise to some cocoa experts. One might have imagined earlier adoption in the eastern region of Côte d'Ivoire, where cocoa farms were already ageing and on the decline. In fact, the dynamics first started in the Soubré region because the farmers had no choice. They had to find a solution. Soils were less suited to cocoa than in the eastern and central part of Côte d'Ivoire (Ruf 1999, 2000). Cocoa farms were beginning to die at 10-15 years, sometimes even earlier (Figure 8).

Figure 8



Initially, the innovations and the investment in fertilizers were not aimed at increasing yields but rather at saving the cocoa farms and extending their production plateau and life cycle. It finally proved very efficient not only in saving the trees but also in increasing yields (table 3).

Table 3 Average Profile of the cocoa production for 35 migrant farmers in Soubré and impact of fertilizers (in interaction with other inputs).

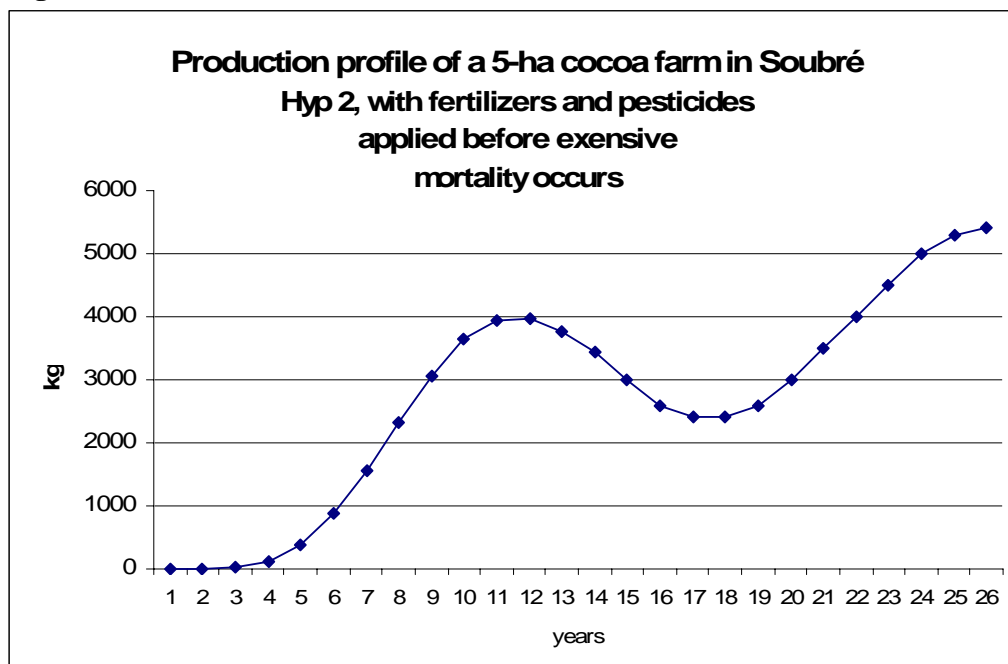
	Average date of arrival of migrants	Year with highest production after forest clearing	Production (kg)	Year with the lowest production	Production
35 migrants	1980	1991	2519	1994	1450

	The year of first use of fertilizer	Accumulated bags of fertilizer over years	Average production in 2002/03 and 2003/04
35 migrants	1996	85	4820

Sources: CIRAD, author's survey, 1996-2004

Finally, our findings show that fertilizers did enable Soubré smallholders to save their trees and rebound with a new cycle (Figure 9)

Figure 9



Smallholders were at least able to postpone the threshold of tree mortality in a region considered unsuitable for cocoa by agronomists in the early 1970s. Smallholders turned it into the major cocoa belt of the country, not only in the 1980s and 1990s, but still in the 2000s, mostly thanks to fertilizers (combined with the reasonable use of pesticides and maintenance of the farm). This was the real beginning of the green revolution in cocoa farming in West Africa

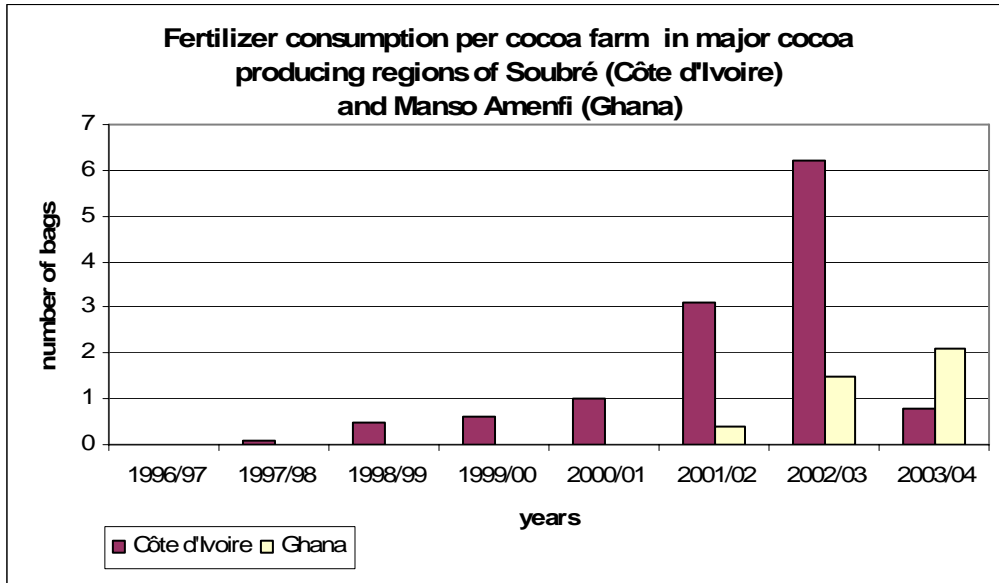
Unfortunately, the low price paid to producers since 2004 has taken its toll. The rapidly increasing use of fertilizers in the country has been affected by the low prices (Figure 10).

In terms of investment strategies in the cocoa sector of Côte d'Ivoire, fertilizers remain a useful tool to maintain or re-launch production. This is probably even truer in Ghana.

Ghana started to use fertilizers a little later, in 2002 and 2003, mostly owing to the Cocobod decision to promote it through a credit scheme.

Unfortunately, this promising momentum was temporarily interrupted by the brutal halt to the credit scheme. However, in 2007/08, a new programme to re-launch fertilizers at a subsidised price seems to be underway. We strongly believe that, in addition to new planting, fertilizers can easily help Ghana to pass the 1,000,000 tonne threshold in the coming years.

Figure 10



Sources: CIRAD, author's survey, 1996-2004

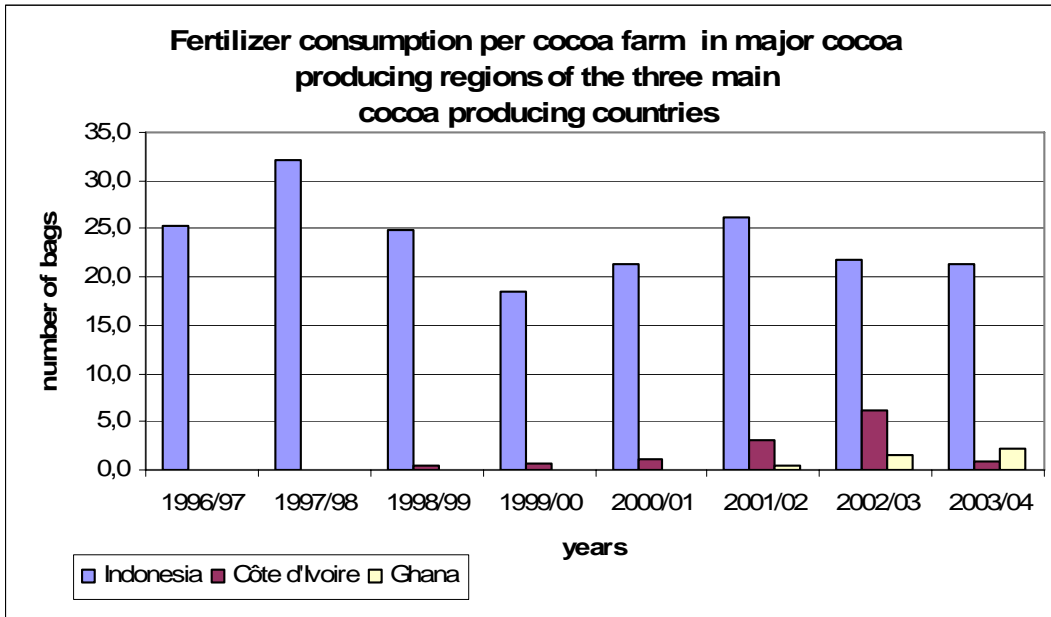
In Indonesia, the adoption of fertilizers followed a completely different pattern. For different reasons, the adoption of fertilizers in Sulawesi cocoa farms immediately followed the adoption of cocoa. Farmers instantly and massively started using fertilizers.

Although a slight decline in the use of fertilizer is now apparent, there is an enormous difference between the rate of fertilizer use per household in Indonesia and in West Africa. (Figure 11). And as farm acreages are generally lower in Sulawesi, the difference in rates of use per hectare are probably even higher.

In Indonesia, fertilizer cannot significantly increase production. It remains a necessary tool to ensure a certain threshold of yield and to help cocoa trees to resist drought in the hills.

In Sulawesi, the strategy of investment should be more to optimize the application of chemical fertilizer and how to combine it with organic fertilizers. In some villages in Sulawesi, farmers used to be great users of 'chicken manure' but this is currently somewhat limited by the emergence of avian flu, which, at least in theory, reduces the circulation of this product.

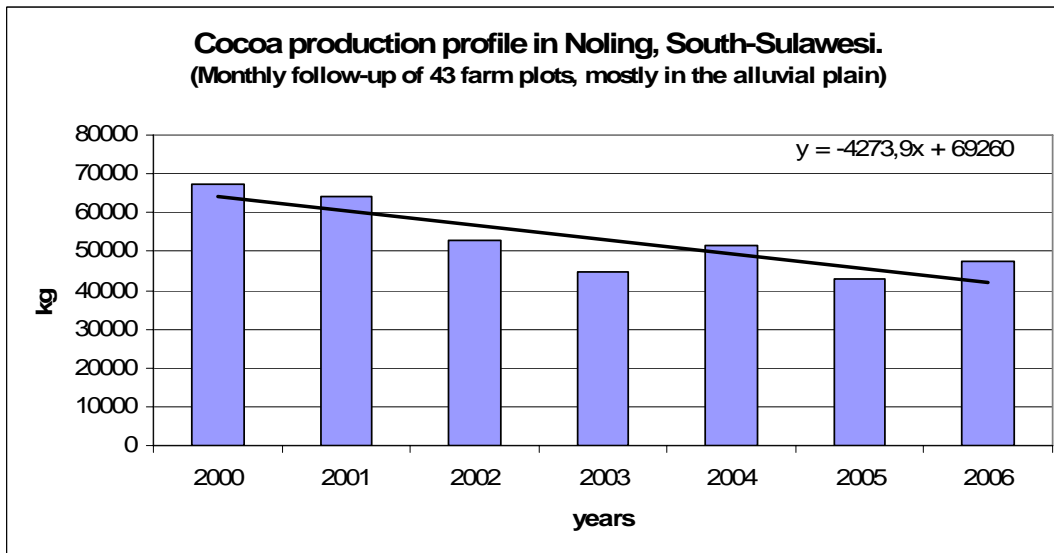
Figure 11



Sources: CIRAD, author's survey, 1996-2004.

Despite the more modern way of producing cocoa 'since the beginning of cocoa production', Sulawesi does not escape the 'sustainability problem'. In a well-established cocoa village such as Noling, production and yields have been declining for the last years, although one can notice a relative stabilisation since 2002 or 2003 (Figure 12). This stabilisation is achieved owing to the good soils of the alluvial plain, this intensive use of fertilizers and pesticide spraying. In the hills, with less favourable soils and less spraying facilities, the decline is more pronounced (Figure 28, p 31).

Figure 12



Sources: CIRAD, author's survey, 2000-2006.

The decreasing yields are partially the result of the ageing process of cocoa farms and a certain fatigue of highly productive trees. Nevertheless, infestation by the cocoa pod borer accounts for a large part of this decline. What Sulawesi farmers wish to do?

3.2 The case of CPB infestation and pesticides in Sulawesi

The problem raised by CPB infestation is serious enough to deserve strong support by public policies and the private sector. The problem is not an easy one to solve. In the 1990s and 2000s, projects and attempts mostly based on IPM techniques did not really alter the trend. More upstream research is required. (Ruf and Yoddang 2007).

Meantime, as new projects are starting in Indonesia, (e.g. 'AMARTA'), which are again promoting IPM techniques, it seems useful not only to teach farmers but also to use their own expertise, and to ask farmers what they wish to do.³

Table 4
Farmers' perception of the way to control CPB (Noling and Lewonu)
What do you suggest as the best method of controlling CPB?

No idea, does not know effective ways of controlling CPB	6%
Intensive spraying	12%
Intensive spraying + pruning	46%
Coordination of everybody's spraying	15%
Replanting (or possibly rehabilitation)	12%
Intensive spraying and high frequency of harvests	1%
More information about pesticides	1%
Add more fertilizers	3%
Side grafting	1%
Smoke	1%
Bury the husk or attractive price for the husk	2%
Total	100%

Sources: Survey by Ruf and Yoddang, 2007

Although farmers' perceptions and opinions are by definition quite subjective and should be interpreted with caution, their answers provide plenty of lessons for developers.

- They do confirm that pesticides just cannot be ignored in the fight against CPB. More than 50% of the farmers still firmly believe that the only option is intensive spraying.
- They do believe in pruning, which is not surprising since they were pruning experts for years before the arrival of the CPB.
- Still more interestingly, farmers raise the issue of coordinated spraying, i.e. the need for organisation between farmers. This has clearly something to do with the negative externalities caused by farmers who do nothing but merely benefit from neighbours' spraying.
- They are aware of the cocoa ageing problem

In terms of investment strategies, this should clearly encourage projects to reconsider some of their recommendations and actions, and especially

- consider the reasonable use of pesticides more positively
- pay attention to the organisation of labour for spraying, which appears to have been neglected in the past
- simultaneously tackle the replanting problem (as is rightly done in the PRIMA project, in Noling)

³ This research was undertaken in late 2006/early 2007 thanks to a 17,000 US \$ grant provided by USDA.

We went a little bit further by asking more detailed questions about how smallholders would like to be helped. (Table 5).

Table 5
Farmers' perception about the kind of help they need
to control CPB (Noling and Lewonu, South Sulawesi)

Some help in labour	27%
Some help in inputs	2%
Some help in labour and inputs	18%
Help to COORDINATE individual spraying	24%
Need information about effective pesticides	13%
Subsidies to cut down trees and replant	6%
Seasonal Credit to be refunded after the peak season	1%
Help to coordinate the sleeving operation and/or subsidy	2%
Need ... of cash to feed the family	5%
An attractive price for the pod husk	1%
Better regulation to prevent counterfeit pesticides	3%
	100%

Sources: Survey by Ruf and Yoddang, 2007

One surprising result is that the first constraint expressed (and expected) to solving the problem of the CPB does not appear to be the cost of pesticides but rather that of **labour** (cost and availability). Has the Sulawesi cocoa cycle reached the stage at which labour is becoming a limiting factor? In all cases, labour issues and coordination of labour for spraying are apparently major issues.

The problem of information about the pesticides available on the market (including counterfeits) is also raised and deserves attention by projects and extension services.

Finally, what are farmers telling us? Rather than recommendations on 'IPM' techniques, what they need is some help to optimize the use of pesticides by providing

- outside help in organizing and coordinating labour
- possibly some help in improving labour productivity (which may reduce or even condemn the chances of bagging and sleeving?)
- some information about the many new pesticides and counterfeits on the market

4. Current farmers' investment in cocoa planting

At the household level, the most obvious strategy to maintain a plateau of production and income would be to keep planting and replanting on a regular base. As shown in the case studies that follow, this proves to be difficult because of land shortage, the possible labour shortage as mentioned above, and lack of capital if farmers wait too long before re-investing.

4.1 Indonesia, modern cocoa farming that does not escape basic rules

The cases of Noling and Tampumea (in the South Sulawesi province) and that of Bungku (in the Central Sulawesi province) illustrate three fundamental issues regarding cocoa investment. Sulawesi follows three 'universal rules' of the cocoa history

- the 'bell' profile and the cycle principle described at the farm plot level are reproduced at the household and village levels. After rapid exponential adoption and investment in cocoa, many farmers face the problem of restricted access to land, and hence an unavoidable decline in planting at the village level. Although replanting may be somewhat easier in Sulawesi compared to West Africa, it is not sufficient to combat the ageing process at the local level.

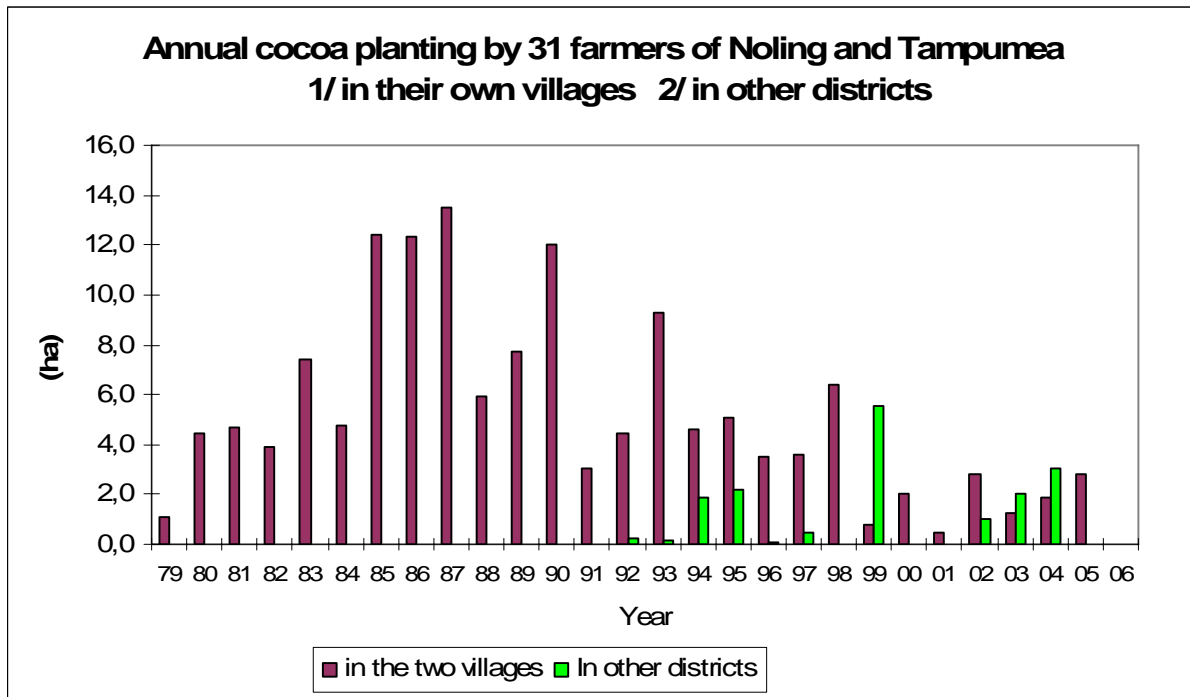
- the option to overcome that hurdle by looking for land in other districts and provinces is systematically explored. This was especially true in 1999 when cocoa farmers were among the few beneficiaries of the Asian monetary crisis. As producers of an export commodity, they enjoyed a windfall in local currency before the prices of 'non-tradable' factors such as land had time to adjust. They then start to invest in land in other districts and provinces.⁴

- A national cocoa development is made up of a succession of local waves of migration and cycles of cocoa adoption. Once a cocoa boom starts in one region, once the first farmers to adopt the crop show off their success, the mechanisms are in place to launch new waves of migration and adoption of cocoa. After two cocoa booms in South Sulawesi and in the north of Central Sulawesi provinces, a second started in the 1990s in the forested regions of Central Sulawesi. In other words, once investment and possible returns start declining in one region, a new one emerges thanks to new migrations. This is illustrated by the case of Bungku (Figure 14). At the national level, this universal process of production shifts seems now in place in Sumatra.

⁴ According to this small sample of 31 farmers who were monitored monthly, the process seems to have less importance than expected, due to land conflicts in 2000 and 2001. As it is also sometimes difficult to manage two farms that are located far away from each other, many investments in the form of land purchase were finally or provisionally abandoned or passed on to sons.

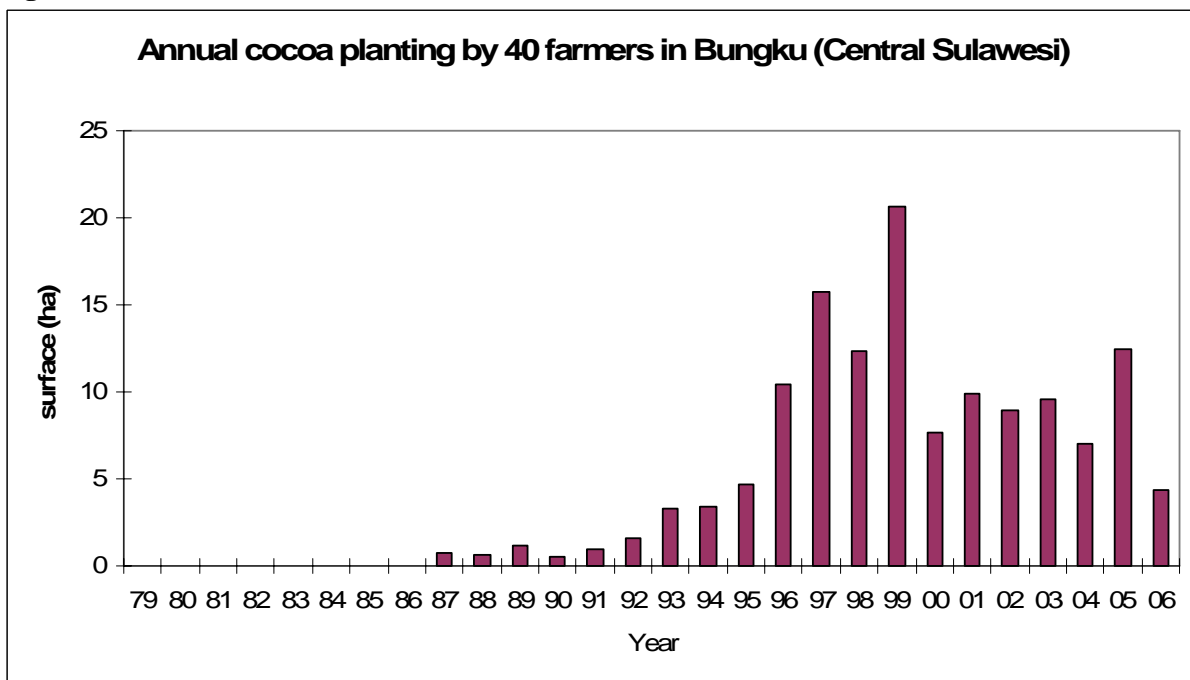
However, according to the PRIMA project, which also works in the village of Noling, out of a total of some 700 households in the village of Noling, around 130 chiefs of households are absent. A large percentage of these 'absentee farmers' are probably busy planting cocoa in other districts and provinces (Hussin and S. Lambert, Mars Inc., personal communication, July 2006).

Figure 13



Sources: survey by Ruf and Yoddang, 1992-2006.

Figure 14



Sources: survey by Ruf and Yoddang, 1997-2006.

4.2 Cote d'Ivoire and 'sustainable' shifting cultivation

The same universal principle applied to Côte d'Ivoire. In the 1980s, while cocoa production was collapsing in the eastern region of the country, in the former 'cocoa belt', the San Pedro department, in the Bas-Sassandra region was one of the major new areas to receive cocoa migrants and investments. Then, unavoidably, migrants faced the land constraint. Annual investments collapsed, at least in this region (Figure 15). At the same time, new investments started in other regions (Figure 16).

Figure 15

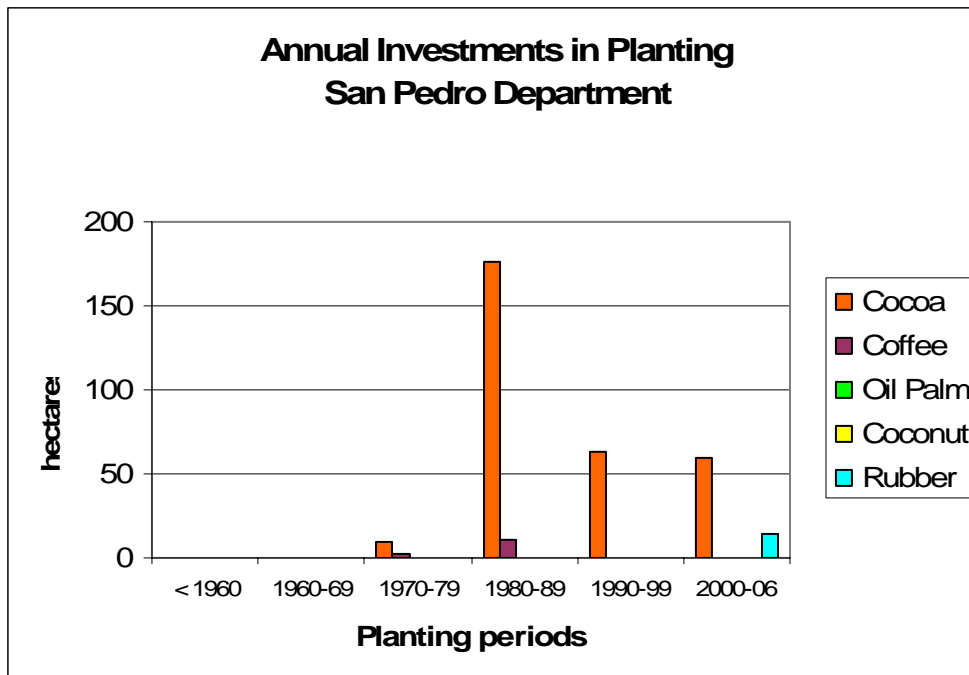
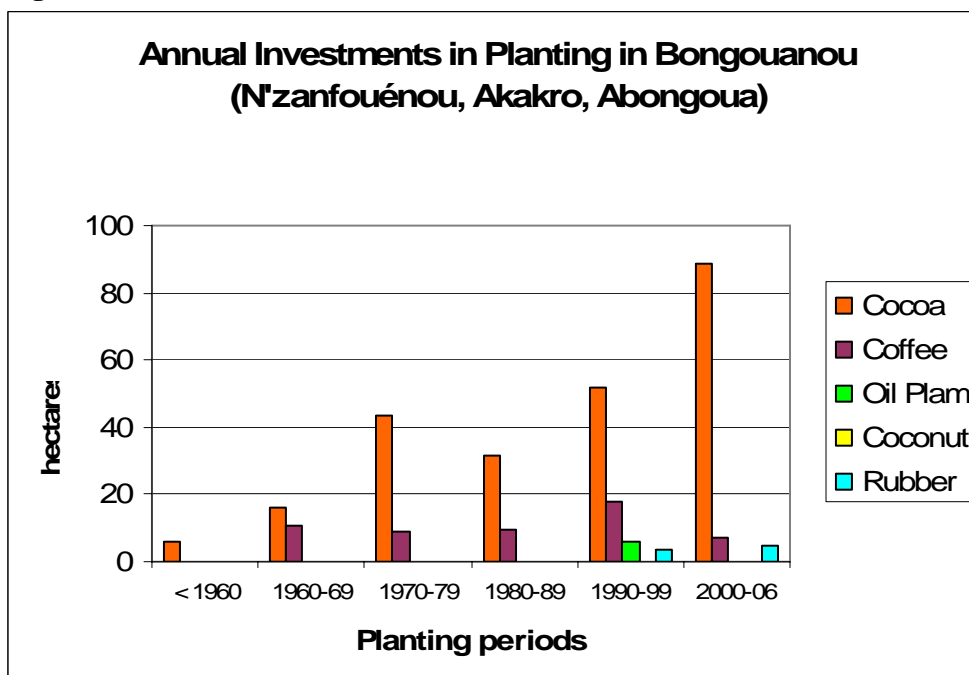


Figure 16



Sources: CIRAD, author's survey, 2006.

The good news connected with this mechanism of shifting investment (and shifting production) is that the department of Bongouanou, here considered to be a ‘new’ area of investment was actually the former cocoa belt in the 1950s and 1960s. It collapsed in the 1970s. It is now starting up again. Diversification, and especially rubber will certainly take their place in coming decades but for the time being, the impressive innovation is the “come back” of cocoa which started in the 1990s and is accelerating in the 2000s. How is it possible?

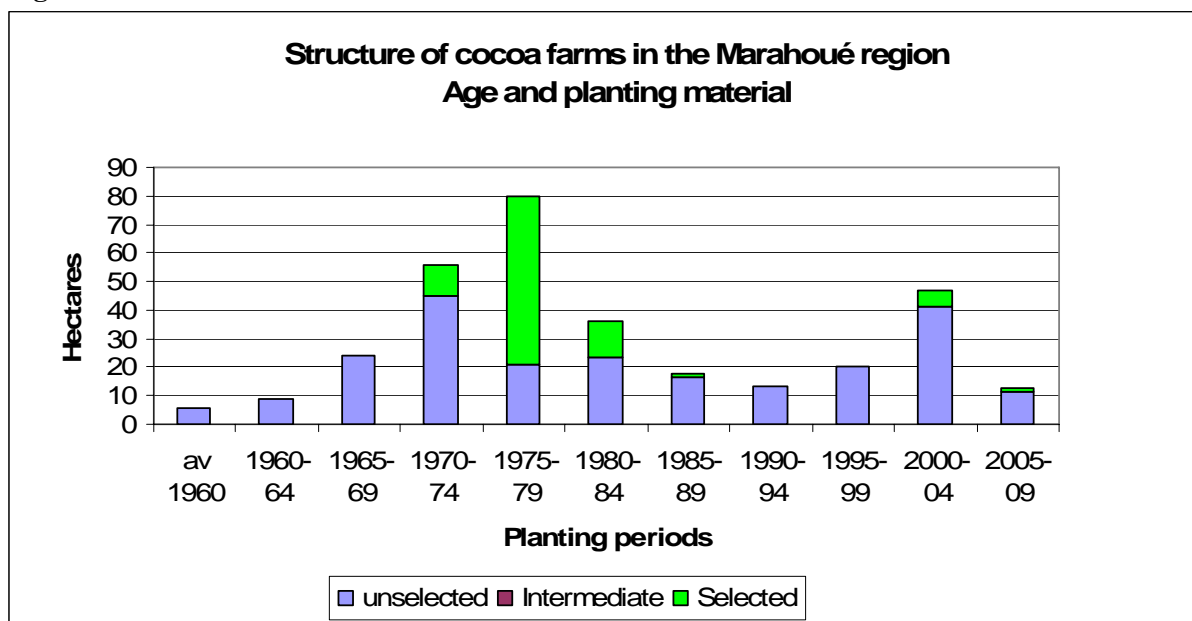
The main mechanism is shifting cultivation, which is too often considered to be a cause of non-sustainability. When a cocoa farmer left Bongouanou in the 1970s to start a new farm in Soubré or San Pedro, he was applying the principle of shifting cultivation to tree crops. By abandoning the old farm, he gave it the chance to regenerate into secondary forest. Thirty years later, when he or his son returns from Soubré, he can start ‘replanting’ more easily. This strategy of shifting cultivation applied to a tree crop such as cocoa is nothing new. It was already well understood in the 1960s (Blanckenburg 1964 quoted by Ruthenberg 1977).

However, today this principle does not always function successfully. Repeated fires can destroy the chances of forest regeneration. Massive migrations and demographic pressure also threaten the rationality of shifting cultivation, which can only work perfectly at low population densities.

Nevertheless, long-term analysis of the population and economic changes over a period of 30-50 years rather than short-term analysis, changes the perspective. We do not yet know the potential of re-investment in cocoa in the former cocoa belt of Bongouanou but the principle of shifting cultivation applied to cocoa can include some aspects of sustainability.

One weak point: planting material The efficiency of planting cocoa in Côte d’Ivoire is somewhat hampered by the shortage of selected planting material. As shown in the case of the Marahoué region, since the glorious 1970s when farmers really benefited from support from SATMACI (the former extension services), they have been more or less left to themselves, at least as far as access to selected planting material is concerned.

Figure 17



Source: CIRAD author’s survey, 2006.

4.3 Ghana, a “come back”

Like in Côte d’Ivoire and Indonesia, and as shown by the universal history of cocoa, Ghana’s ‘come back’, which almost doubled its production in recent years, is partly a trade-off between declining regions and new emerging ones, sometimes located quite close to each other.

Figure 18

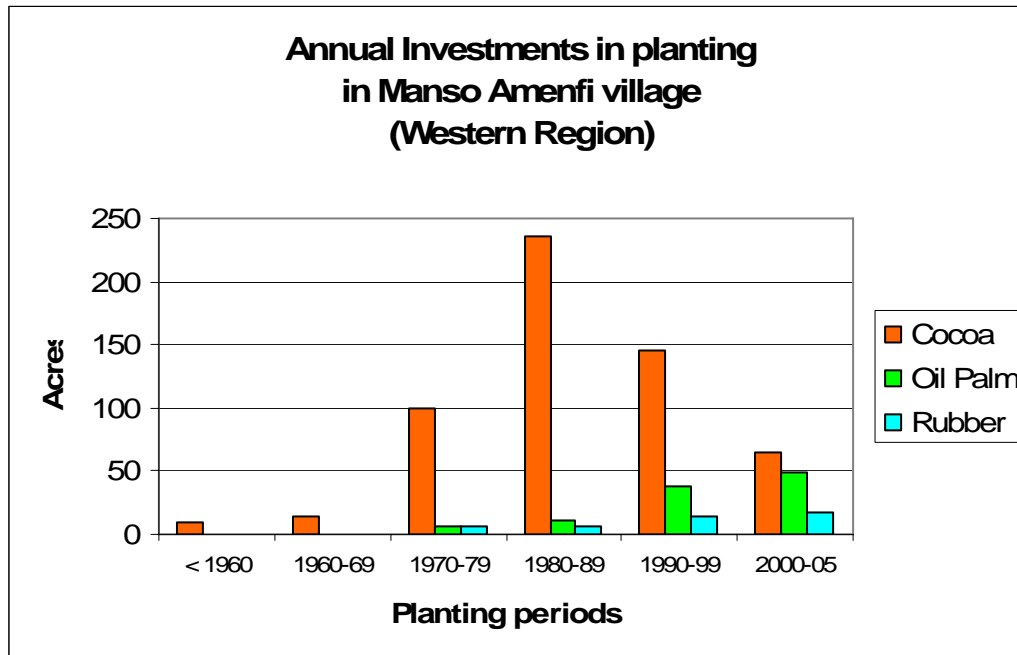
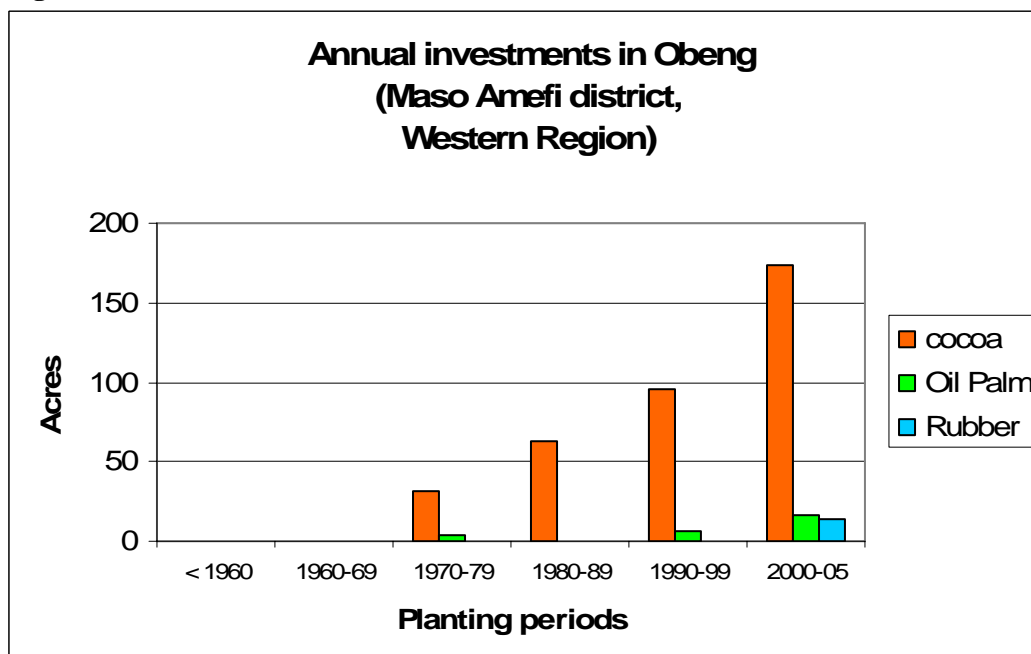


Figure 19



Sources: CIRAD, author’s survey, 2003 and 2005

The case of the town of Manso Amenfi illustrates the ‘exhaustion of a cocoa cycle’ and declining investments in many old cocoa regions of Ghana. (This ‘exhaustion’ is also one of

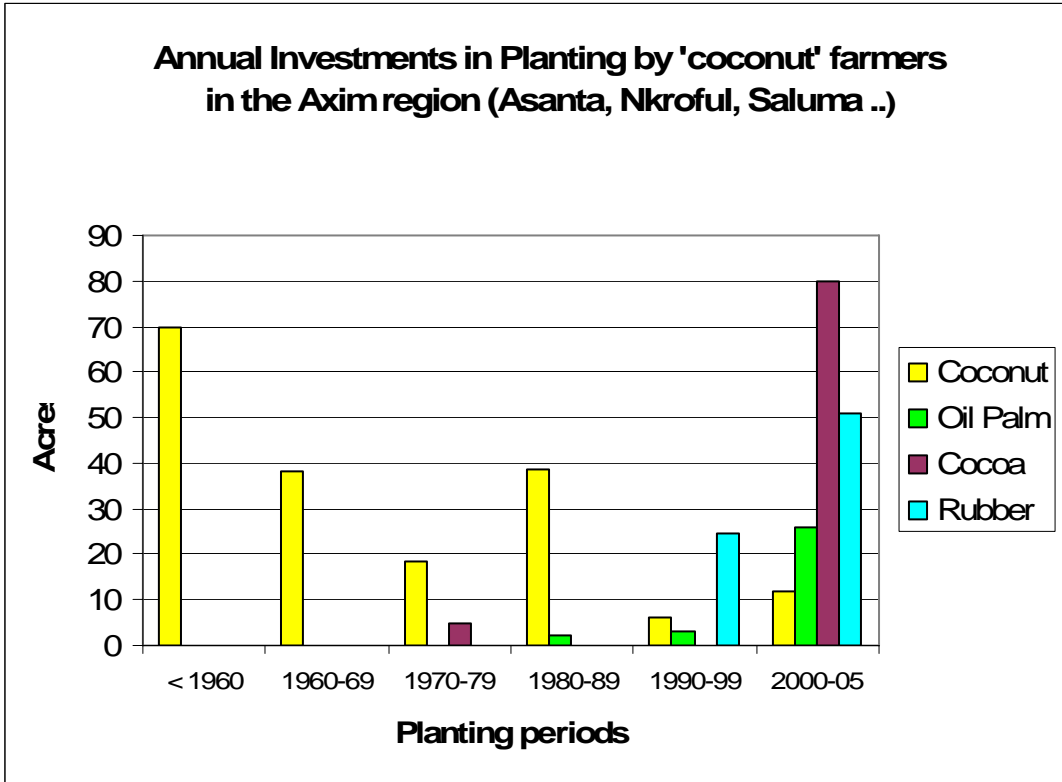
the drivers of diversification. See Section 5). At the same time, in other regions, here in the immediate vicinity of the main town, farmers, migrants and indigenous, can still get land and keep planting cocoa.

In the case of Ghana, the impressive come back appears to be linked to the sudden opening of large areas of the western region close to the border with Côte d'Ivoire (mostly in the 1990s), and more recently in the coastal region. For decades, this region, which enjoys abundant rainfall, was considered as unsuitable for cocoa production, but this is changing for a number of reasons:

- Economic change: liberalisation of the domestic marketing chain played a role. Compared to the cocobod and its former monopoly, new competing buyers may be less strict about bean quality.
- Technical change: more modern forms of growing cocoa, with hybrids and modern inputs help cocoa trees to grow well on soils that were previously considered as unsuitable for cocoa production.
- Ecological change: local changes in climate with less abundant rainfall, which are considered to be positive by smallholders since it reduces black pod infestation.

Finally, the coconut crisis on the coastal zone triggered by the yellow lethal disease, has enormously enhanced the very recent adoption of and investment in cocoa (Figure 20).

Figure 20

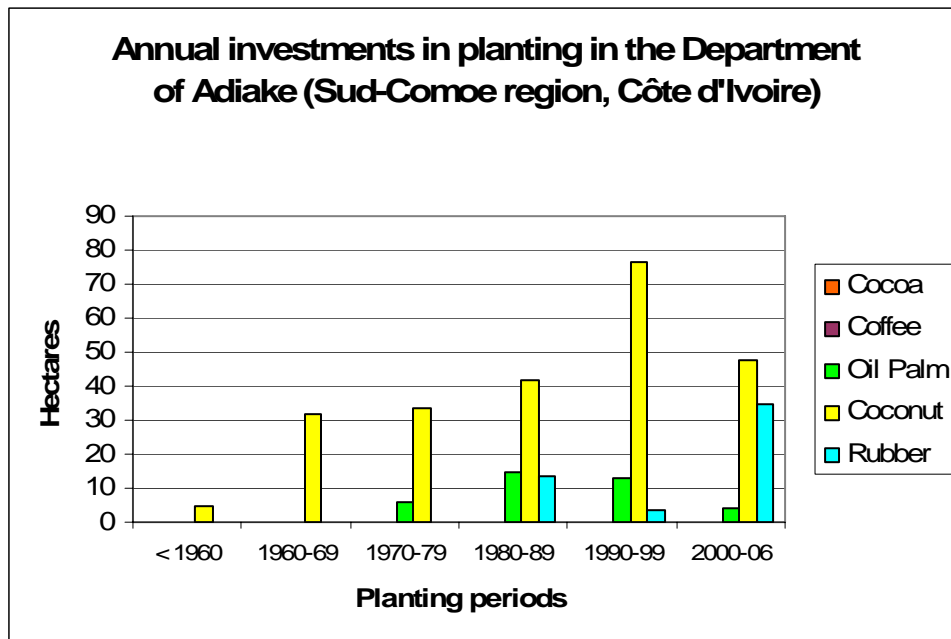


Source: CIRAD author's survey, 2006.

5. Diversification transformed into mere re-conversion

Diversification can be sometimes be transformed into mere re-conversion, which results in the total disappearance of cocoa farms. For instance, this is the case in the department of Adiake where cocoa and coffee farms were abundant in the 1950s. Nothing is left. All the land has been taken over by pineapple, coconuts, oil palm, and now rubber (Figure 21).

Figure 21



This is explained by a kind of 'ecological determinism'. Quite often, diversification starts just when a regional cocoa cycle is coming to its end. Farmers rediscover the difficulties involved in replanting and prefer to seize new opportunities, and diversification rapidly becomes re-conversion.

6. Diversification between danger and success

If land and labour resources are limited, any diversification in the tree crop sector will put the initial tree crop at risk. Two examples are given here, one in Ghana where rubber is starting to attract the cocoa farmers in some villages close to the border with Côte d'Ivoire (Figure 22) and one in Côte d'Ivoire, in the South Bandama region, with oil palm (Figure 23)

Figure 22

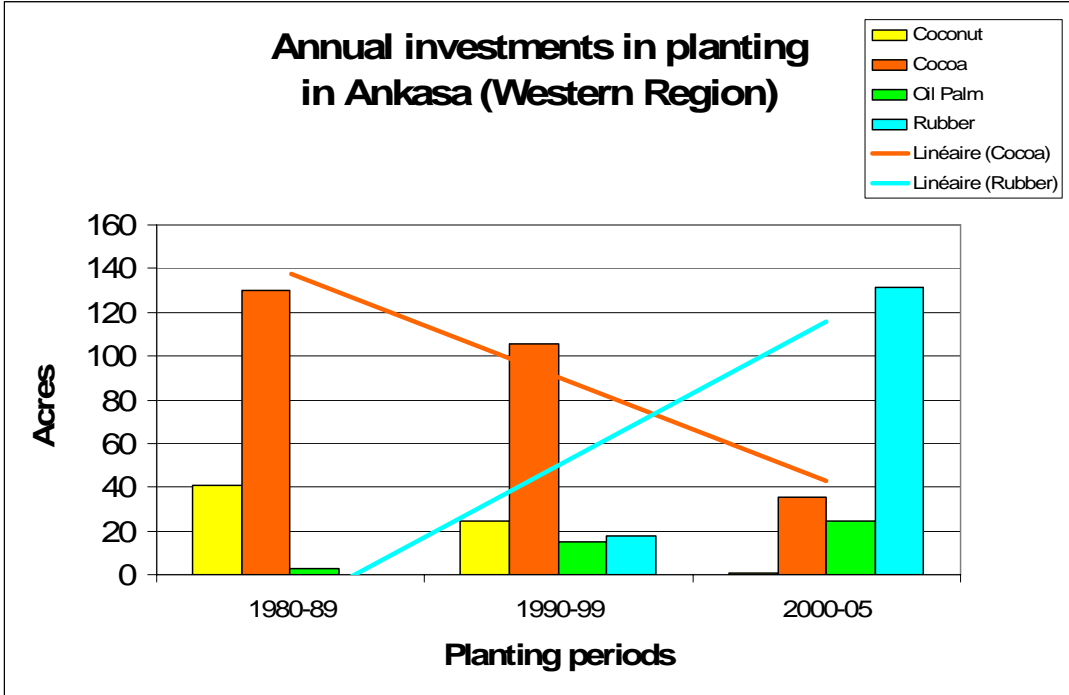
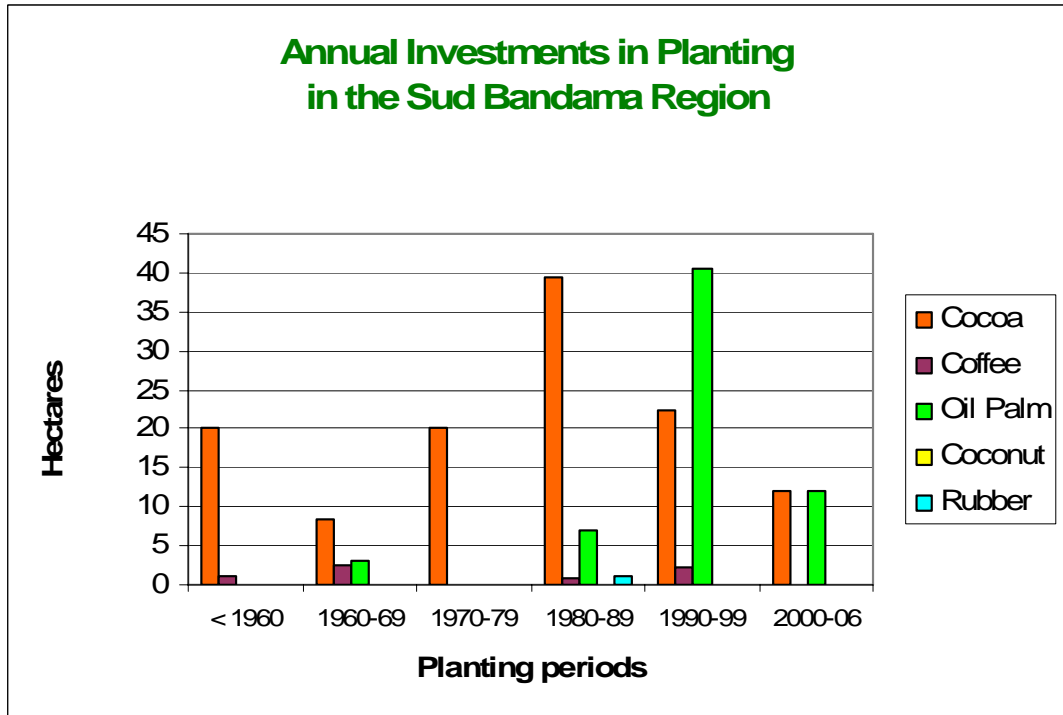


Figure 23



Sources : CIRAD, author's survey, 2006.

In South Bandama, despite relatively low prices for oil palm bunches, most farmers are happy with this diversification (initially supported by public programmes), mostly because oil palm provides:

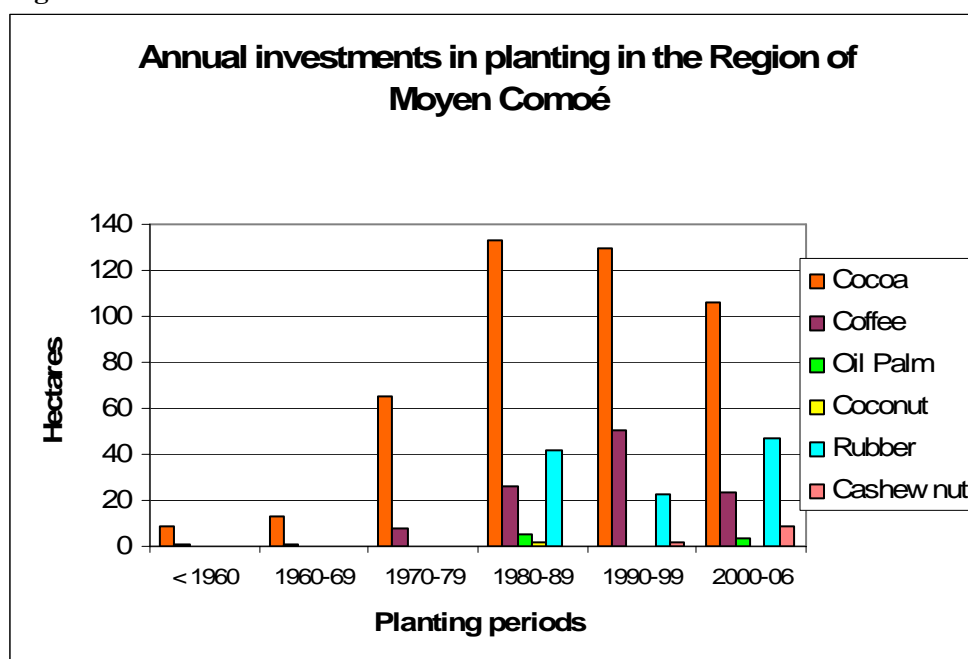
- regular income throughout the year
- a regular income for farmers' wives, especially if they process the oil and sell it for oil consumption or to buyers for local soap processing.

However, one can already suspect a negative impact in terms of cocoa investment, at least in planting. Land and labour and of course capital resources are not without limits, hence the trend to increase productivity (as mentioned in Stefan Weise's presentation)

7. Cases of seemingly successful tree crop diversification

In the region of Moyen Comoe, where rubber was promoted relatively early, in the 1980s, diversification appears to be successful without encroaching too much on the cocoa sector (Figure 24).

Figure 24



Sources : CIRAD, author's survey, 2006.

It is also successful because it simultaneously generates and distributes income throughout the year. In the early 1990s, the early adopters of rubber started to benefit from rubber proceeds but these were not sufficient to compensate for their declining income from cocoa (Table 6). In 2006 they are far better off than the average (Table 7).

However, farmers who started adopting rubber had more land than the average farmer (Table 8). This reminds us that diversification is not always an equitable process. It is usually easier for large landowners to undertake diversification and then possibly re-invest the revenues of diversification to consolidate the first tree-crop, in this case cocoa.

Table 6
Estimated revenues x 1000 cfaf in the early 1990s

	Cocoa	Coffee	Oil palm	Rubber	Total
All cocoa farmers	1147	484	0	131	1622
Sub-group of cocoa farmers who adopted rubber	707	159	0	621	1488

Sources : Survey F Ruf (CIRAD) 2006

Table 7
Estimated revenues x 1000 cfaf in 2005/06

	Cocoa	Coffee	Oil palm	Rubber	Total
All cocoa farmers	648	191	0	486	1297
Sub-group of cocoa farmers who adopted rubber	502	27	0	2396	2926

Sources : Survey F Ruf (CIRAD) 2006

Table 8
Farm structure (in hectares) in the Moyen Comoe region

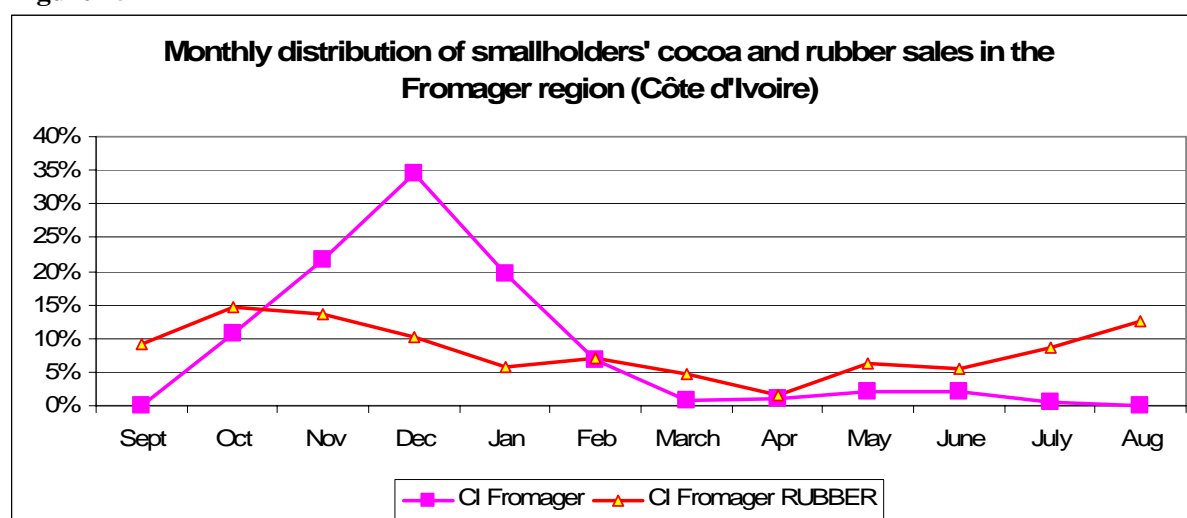
	Surfaces				Total
	Cocoa	Coffee	Oil palm	Rubber	
All cocoa farmers	5,87	1,5	0,1	1,4	9,0
Sub-group of cocoa farmers who adopted rubber	5,93	0,4	0	7,1	13,6

Sources : Survey F Ruf (CIRAD) 2006

Finally, the success of rubber in the Bettie region, and throughout Côte d'Ivoire is partially explained by the regular income provided by rubber throughout the year. As stressed by one migrant farmer, "if you own a rubber farm, you are a civil servant"

In terms of the monthly distribution of income, the complementarity between rubber and cocoa is not perfect but clearly improves the cash flow for an average household, as shown in the case of the Fromager region, in the west central region of Côte d'Ivoire (Figure 25).

Figure 25



8. The specific case of timber

For decades, smallholders, especially in West Africa, have been excluded from timber ownership and from the timber market. If there is one major diversification to be promoted by public policies and by the private sector in favour of cocoa smallholders, it has to be timber. It will be the next ‘double green’ revolution in the cocoa regions in the decades to come.

Photos 4 and 5. Successful smallholders’ timber planting in the Sefwi Wiawso region of Ghana, with the support of Ricerca & Cooperazione (NGO based in Ghana)

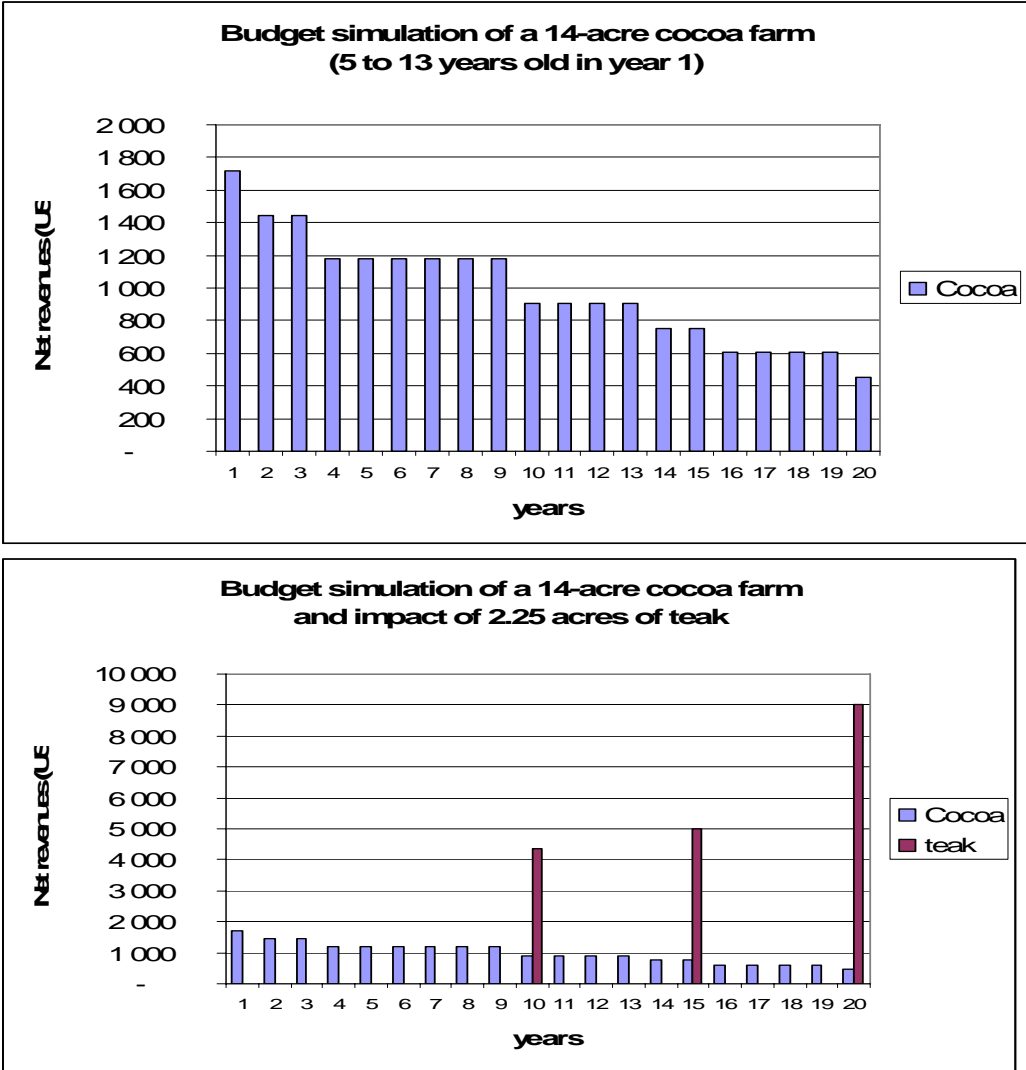


Source: author's photograph, Dec 2005.

In a country like Ghana, too few concrete initiatives are being taken to tackle the technical difficulties involved in helping farmers to plant trees and, more importantly, to find legislative and political solutions in terms of tree tenure and ownership rights. Among the very limited cases of real work done in this area, I would like to stress two promising but still not well enough known experiments, one by Ricerca and Cooperazione, an Italian NGO based in Ghana, and another by Samartex, a private timber company.

The impact of timber managed by smallholders will be enormous, from both the environmental and economic point of view, including in terms of income for smallholders. Here, the target is not to provide more regular income but on the contrary, to generate occasional windfalls (Figures 26 and 27), which would help with the many investments needed on a cocoa farm (see Section 2).

Figure 26 and 27. Impact of timber revenues on an average cocoa farm



What are we waiting for to proceed? However, I would recommend not to systematically promote timber investments in the framework of an ‘agroforestry’ scheme. What we can learn from the first experiments conducted by Samartex and Ricerca is that most smallholders are very enthusiastic, but they usually prefer to keep cocoa and timber trees separate. For a rapid start and up-scaling process, let’s follow their strategy for the moment.

9. Cases of potential threats to food self-sufficiency

We recalled the importance of a certain threshold of food self-sufficiency as a cornerstone of family agriculture efficiency above (see Section 2). Worries could increase in countries like Côte d'Ivoire and Indonesia.

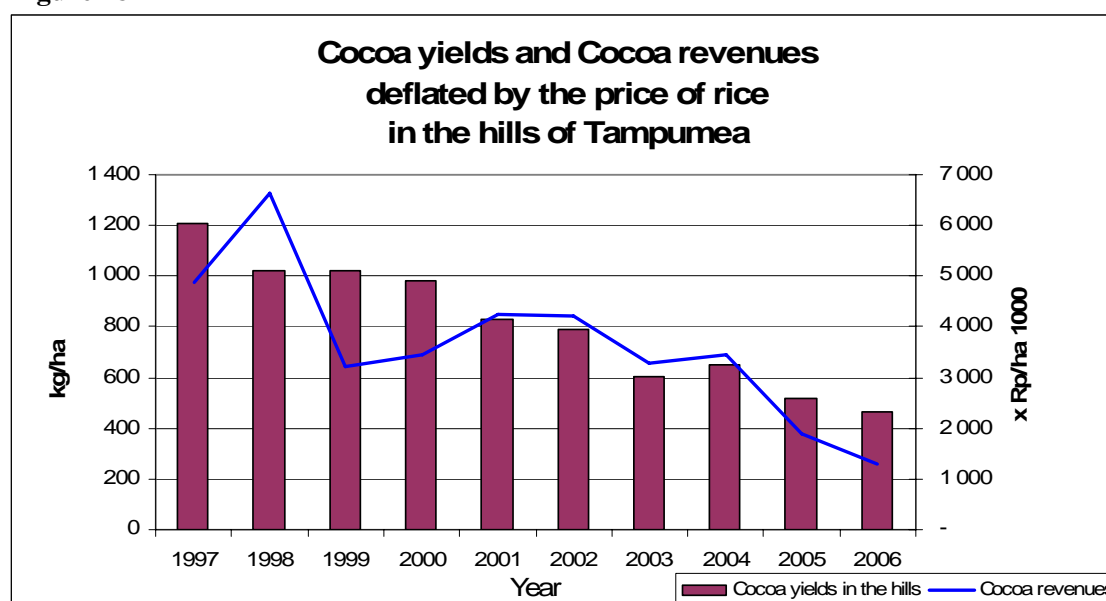
9.1 Indonesia

In Indonesia, after a period of great success of the green revolution, which was partially funded by oil revenues, the relatively low price paid to producers and the progressive removal of subsidies resulted in a relatively lack of interest in rice farming. In addition, thousands of hectares are swallowed each year to meet housing and industrial needs for land.

More specifically in Sulawesi, after a period of combined growth of paddy and cocoa sectors made possible by the green revolution in rice and its huge increases in productivity, the paddy sector started to lose its attractiveness. Balinese are expert rice growers, both in their original 'paradise island' home and also in Sulawesi, where many of them settled in the 1960s and 1970s, either under government transmigration schemes or as spontaneous migrants. Often, under official schemes, the Balinese faced delays in getting access to land and irrigation they had been promised. These prompted a few of them to migrate locally and to take up to cocoa growing. Others, more radically, converted established rice fields in cocoa (Ruf and Yoddang, 2006). This process may well continue in the rich alluvial plains and volcanic soils where cocoa can still generate wonderful windfalls.

Nevertheless, the prices of rice will keep increasing throughout the archipelago, hence an additional budget to be devoted to food items, including by cocoa farmers, a majority of whom buy all the rice they need. I fear an abandonment of cocoa farms in the hills of Sulawesi, where yields are collapsing and where transport costs remain high. When cocoa smallholders have to add this burden to the cost of pest control and to the more global negative impact of ageing cocoa groves, the spiral of recession may become unstoppable (Figure 28).

Figure 28



Sources: CIRAD, survey by Ruf and Yoddang, 1997-2006.

In a village such as Tampumea, cocoa farmers responded to the 1997 drought and to the CPB infestation by reinvesting in irrigated paddy fields, locally called ‘sawah’. Some farmers who could not afford to invest chose either to take a sawah under pledging contract (‘gadai’) or under a sharecropping contract (‘bagi hasil’) (Table 9).

History and geography enabled that response. Favourable topography, with a river and a large plateau in the middle of the local hills probably guided the choice of the DI/TII rebel movement in the 1950s to select this site as a remote base camp. A simple irrigation system was built at that time. All this was revived and rehabilitated in the 2000s and gave birth to new paddy fields (Photo 6).

Table 9.

Number of farmers owning and working on sawah						
Village	own sawah	gadai taking	bagi hasil	TOTAL farmers		tot interviewe farmers
Noling		3	3	0	6	27
Tampumea		9	2	6	17	26
Total		12	5	6	23	53

Photo 6. Irrigated paddy fields on the Plateau of Tampumea surrounded by cocoa farms on the slopes of the hills



Photo by author, Tampumea, 2001

This historical and geographical opportunity is helping smallholders in Tampumea to survive the decline in cocoa revenues. But in most villages in the hills, such an opportunity does not exist, at least for the moment.

9.2 Côte d'Ivoire

In the case of Soubré, some of the cocoa farms are slowly dying but the mortality rate is being efficiently slowed down by fertilizers (see Section 3). The pressure on land for food crops remains high. As in Sulawesi, those who can afford it, start investing in lowlands for paddy cultivation. This pressure on land was recently expressed to us by one foreign migrant.

“ Maybe this shortage of food crops will be the thing, which, one day, will push all of us out of this country ”

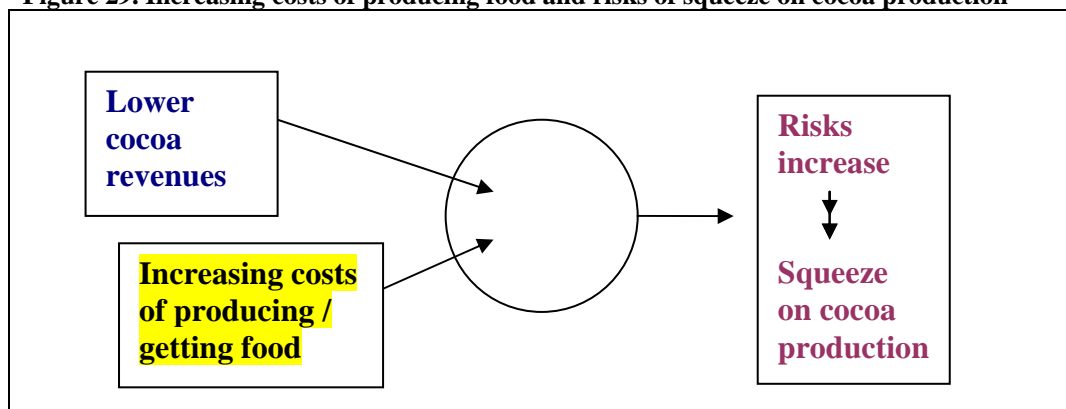
In departments such as Agboville and Thiassale, close to Abidjan, which are affected by the rubber boom and more specifically by a ‘gentleman farming effect’ with all senior executives in Abidjan investing in land and rubber, a shortage of land for food crops is already noticeable, especially for migrant farmers.

If a new tree crop partially replaces the old one, some land generally becomes temporarily available for food crops, and this is to a certain extent the case. Large rubber landowners (or rather their plantation managers) do authorise small migrant farmers to grow food crops (the rent for the land is paid with produce: they share the proceeds from the food crops). In the short term, this is almost an advantage compared to previous years when migrants had to pay around 10,000 to 20,000 Cfaf per hectare per year.

In the medium term, all farmers, especially migrant farmers, continue to worry. They know that the current takeover of the land by large rubber farmers is having a dramatic impact on land availability. They also say that ‘Rubber is a selfish crop’. They wish to say that a dense canopy and a quite long life cycle of rubber postpones the replanting stage and thus the possibility to provisionally free up space for food crops (case illustrated by Figure 2)

The competition for land at the expense of cocoa and food crops may weaken the base of family agriculture. As in Indonesia, this new difficulty to guarantee a minimal share of food self-sufficiency reduces the capacity of family agriculture to survive periods of low prices.

Figure 29. Increasing costs of producing food and risks of squeeze on cocoa production



A similar risk probably brings us to the same type of solution: a public policy favouring the re-launch of irrigated rice fields in the lowlands. As rubber does not grow well in lowlands, separated spaces between tree crops and food crops are one possible solution in modern Côte d'Ivoire whose population density is increasing (see Figure 4).

10. Potential lessons in terms of public policies: what types of investment are required?

In all the main cocoa producing countries, smallholders are already undertaking a process of intensification, even a kind of green revolution and at the same time a process of diversification, either under government schemes or more spontaneously. Nevertheless, both remain fragile and need to be consolidated by public policies and private initiatives. Without going into detail about the specific needs of each country, a global conclusion about ways to reorient investments in favour of cocoa farmers can be summarized under five main headings

1. Do not forget food crops and food self sufficiency. Tackle food crop and nutritional requirements:

- Back to irrigated rice in the lowlands
- Re-invest in research devoted to food crops potentially mixable with mature cocoa
- Move forward with fish ponds

2. Timber and timber again

- Encourage dialogues at a national scale to promote the adoption of timber by cocoa farmers
Organize “Timber Farmer’s Days”
- Identify pension funds ready to invest in smallholder timber (with potentially high returns)
- But without pre-conceived ideas and no ‘compulsory agroforestry’: respect farmers’ preferences.

3. Cocoa inputs:

- Planting material remains a core issue and a State responsibility
- Fertilizers remain a key input but encourage research and experiments on combined organic fertilizers, more research on optimal use of fertilizers and pesticides
- Labour: even Indonesia shows the need to improve productivity and look for labour saving technologies (such as herbicides which are in fact being increasingly used by cocoa farmers and should not necessarily be considered evil)

4. Tree crop diversification

Some public and private investment is necessary and will be extremely useful to provide information, credit, and selected planting material, but what is also required is to:

- rapidly identify the kinds of moderate support in order to reduce heavy credit schemes and upscale adoption of a tree crop (case of rubber in Ghana). Once pioneers have demonstrated their success with the new crop, the copying effect may be sufficient to attract followers who can be helped with a reduced level of support.
- Investment and support for cocoa should not be abandoned. Keep a close eye on the ‘initial’ crop which may otherwise be rapidly abandoned

5. Marketing, farmers’ organisations and infrastructure

Domestic marketing is relatively efficient in the three main cocoa producing countries. Some farmer’s organisations could help to reduce cheating on scales and weighing of cocoa bags. They could reduce the cost of access to inputs. Some farmer’s organisations could do a good job coordinating pest control and reducing negative externalities.

Infrastructure is also important, in some places more important than in others. For instance, in the hills of Sulawesi, highly competitive market purchase can be only improved by better infrastructure, with roads that provide access to the hills.

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