Rubber smallholders' flexibility No windfall, no crisis

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Chapter 8

Rubber smallholders' flexibility
No windfall, no crisis

Eric Penot and François Ruf

A few decades ago rubber was one of the first tree crops to be characterized by a spectacular breakthrough, the production of new, highly productive clonal material. With regard to rubber, the adoption of clonal planting materials led to a spectacular improvement in labour-productivity and revenues. It requires also different cropping patterns during immature period.

An increase in return to labour costs is usually the first priority of smallholders. As this adoption of clones by smallholders only started in the 1970s in Indonesia, this is an extremely important strategy which must be stressed before we begin to analyze the impact of the *krismon (a contraction of "Krisis Monetar" in Indonesian or "monetary crisis").* With regard to rubber, there is clearly a dualism of seedlings and clonal material. This dualism is more important than with other tree crops. Rubber seedlings are often grown under a complex agroforestry system and nicknamed locally 'jungle rubber'. Clonal rubber is generally grown in monoculture sometimes with intercrops during the first three years."Even when computing the cost of the investment and the credit that has to be repaid, the net income per hectare and per labour day from a clonal plantation is at least 50% higher (sometimes 100%) than the income from a jungle rubber plantation" (Gouyon 1999, 31).

What was the situation before *krismon*? Due to capital and information constraints, only 15% of the smallholders already had access to highly productive clonal material rubber in 1996. This percentage was achieved, first and foremost, through official projects. Then in the late 1990s, the "copying effect" started playing its role, however rather limited. More and more farmers were able to observe the advantages of clonal material. This led to a booming network of private nurseries that helped to accelerate the adoption of this material. This means that a relatively strong dynamism was observed before *krismon*. It also means that most clonal plantations are still young, which is important in terms of potential response to price changes (Chapter 1).

However, when *krismon* arrived, around 85% of traditionnal rubber farmers still relied on ageing jungle rubber with limited productivity. How may *krismon* influence these 'jungle rubber' and 'clonal' farming systems? Is it going to accelerate or reduce the investment in rubber plantings? Is it going to help to accelerate the adoption of clones?

In 1998, rubber farmers did not benefit from the spectacular windfall, which affected cocoa and coffee (Chapters 5-7). Can this be explained by the different performances of farming systems or by variations of the International market? Is there a direct relationship between the decline of global prices and the interference of the Asian crisis in Indonesian rubber supply and exports (Chapter 2)?

How did the monetary crisis affect the other dramatic changes faced by Indonesian rubber smallholders?

In addition to the economic crisis, as in other regions of the country, the ecological crisis also struck Sumatra and Kalimantan in 1997-98. Huge fires destroyed millions of hectares of forests, fallows and crops, including rubber. Will both crisis reduce investment in clonal plantings?

Eventually, regions such as West-Kalimantan were the theatre for grave social troubles related to conflicts between autochtons and some immigrants, especially spontaneous immigrants1. A lack of confidence in the country's regime was evident well before the crisis. Last but not least, oil palm development looms in traditional rubber regions. Might it hamper the development of clonal rubber technology in Indonesia? Does the crisis encourage the adoption of oil palm at the expense of rubber? Does the crisis deepen the social imbalance between smallholders who already have access to clones and those who do not?

To try to answer these questions , the paper is structured in 4 sections:

1 A brief overview of the rubber sector : the situation before krismon
2 Krismon and its impact on rubber smallholdings
3 The rubber crisis on the international market
4 A conclusion including the future for the rubber smallholder sector

1 A brief overview of the rubber sector

1.1 Indonesian smallholders and the supply of world rubber

Like cocoa, rubber as a product has experienced an extraordinary development during the 20th century when the tree was transplanted from its native continent, South America. Unlike cocoa, the development of rubber occurred in part in Africa but mostly in Southeast Asia. Indonesia benefited greatly in terms of its regional and international development (Fig.8.1). In the 1990s, Malaysia, Thailand and Indonesia contributed 75% of the total world production of rubber. Indonesia is the second largest rubber producer, close behind Thailand. In Indonesia, in terms of non-oil exports, rubber is currently the fourth largest export after plywood, pulp and paper and oil palm. In 1996-97, rubber was the third largest export, before oil palm.

Indonesian smallholder production overtook estate production as early as the 1930s, and currently comprises 73% of the production of rubber and 85% of the total planted rubber area (DGE, 1998) .One of the last tree crops to be controlled by estates, both private and government, is oil palm, and since the early 1990s, most rubber estates moved to oil palm.

Natural rubber is mainly used for the tyre industry (car, truck and plane), which accounts for 70% of the product's total use. Therefore, rubber demand is directly linked to the transportation sector, which is also constantly increasing. Rubber farmers can rely on that strong worldwide demand and follow it with a solid supply response. The prospect for

1 Especially the Madurese spontaneous migrants.

rubber in terms of demand is clearly positive. In fact, a supply shortage is expected somewhere between 2003 and 2008 (Burger K, 1994). There is currently around 1,2 million rubber farmers. The rubber sector as a whole in Indonesia is a source of income for more than 10 millions people.

1.2 From traditionnal jungle rubber to clonal plantations

Indonesian smallholders used to develop an extensive and complex agroforestry system: the jungle rubber system, usually made up of rubber seedlings intercropped with a high number of other tree species all growing in a forest-like environment (Gouyon and Penot, 1995).

Until the 1980s, 'jungle rubber' was an important source of incomes for many poor farmers in pioneer zones. However, due to increasing land scarcity, its productivity per hectare and per year started to be insufficient to meet the new expenses posed by housing, children, education and health. As most farmers still rely on ageing jungle rubber with a low and declining productivity, they face the need to improve their rubber cropping patterns though a process of intensification based on the use of clones2 (Gouyon and Penot,1995).

Despite the fact that financial returns are delayed by some 8 to 15 years, jungle rubber may still be an option for pioneer farmers in remote areas because it does not require much labour and inputs investments. If farmers deal with poor soils, degraded *Imperata* grasslands and/or excess of rainfall for instance, as is the case in most areas of West Kalimantan, only clones, and their promise of returns after 5 years, offer a reasonable rubber option.

In short, clonal rubber in monoculture came at the right time in the 1970s as an alternative to jungle rubber. Since the early 1980s, the government and international agencies have assigned an increasing importance to export-oriented tree crops.[3] Clonal rubber has been popularised since the 1970s, through the dominant model of monoculture, but only 15% of the smallholders were able to access various types of rubber projects[4]. The lack of technical information and skills for using clones, and lack of capital to invest in clonal rubber plantations have reduced the pace of the adoption of clones (Courbet and Penot 1997; Kelfoun and Penot 1997). However since the late 1990s, private nurseries are booming due to a greater demand for clones, in particular in North and South-Sumatra, where rubber development projects had a greater impact.

North Sumatra used to be the primary rubber-producing province (the "estate belt"), but in the 1990s rubber trees were partly replaced by oil palm. Thus the province of South Sumatra now takes that lead, followed by Jambi, West Kalimantan and the South/Central Kalimantan

2 There is some other types of rubber improved planting material, in particular the polyclonal seedlings, but clones, obtained through grafting, are more homogenous, more productive and have better adaptation to local conditions through various degrees or tolerance to some diseases.

3 Before then, and post 1965, the Indonesian agricultural policy focused more on rice self-sufficiency, in particular on irrigated rice in Java (Chapters 9 and 10).

4 Such a policy has been already adopted on a much larger scale for smallholders in Thailand and in Malaysia in the 1960s for political reasons (rubber was seen as a reliable source of income for local populations, in order to counter local uprisings). Indonesia developed such a policy, somewhat belatedly, in the 1970s.

provinces.

The plains of South Sumatra represent one of the regions in Indonesia most highly specialised in the production of rubber. The province of South Sumatra is also one of the best showcases for the long-term positive impact of rubber projects, consolidated by a rubber research station (located in Sembawa). This was the original source of clonal planting material. The presence of well skilled technicians and existing planting material certainly helped to trigger the development of private nurseries, which enormously enhanced farmers' opportunities to adopt their own clonal rubber systems. In other provinces private nurseries are almost entirely absent (Bengkulu, Riau or Central Kalimantan) or are just being established in the late 1990s (Jambi and West Kalimantan).

1.3 The situation before the '*krismon*'

1.3.1 A typology of situations

With regard to the adoption of rubber, three different areas can be identified in Indonesia:

- the very remote or pioneer areas: such as Irian Jaya, the Molucas (Seram), and all the remaining zones on the outskirts of the central plains, or in the *piedmont* of the mountains (such as East Pasaman area in West Sumatra). Jungle rubber is generally the only technology immediately accessible to poor farmers.[5]
- the traditional jungle rubber based regions where the process of the adoption of clonal rubber is still embryonic: Jambi and West Kalimantan are quite typical examples of such.
- the areas where projects had a very significant impact, in terms of the replanting of jungle rubber with more productive clonal rubber plantations. In these areas, a private nursery network has been developed in order to supply the strong demand for improved planting material, thus enabling local farmers to invest in clonal rubber, typically so in North and South Sumatra.

Our study areas, Jambi and West Kalimantan, are located in the area defined second. This is typical of an "intermediate" area. These are no longer pioneer zones, but they have not reached the stage of advanced capitalization. In other words, the selected villages in these areas are representative of most of the farmers who will have to face a shift from traditional jungle rubber to more productive, clonal rubber based, cropping systems. It can be roughly estimated that two thirds of rubber smallholders are in that position. In addition, farmers who lack capital are vulnerable to offers made by private estates such a as a « credit and plantation package », with compensation with land such as the exchange of five to seven hectares of land for 2 hectares of established oil palm plantations. In the past, gouvernemental projects provided such packages (NES in particular). Since the mid 1990's, private estates focused on oil palm production have replaced official projects.

[5] Rubber agroforests have been well described in Sumatra and Kalimantan (by Colfer et al, 1989, H de Foresta, 1990, Leti Sundawati, 1993, D.C. Lawrence, 1996, N. Salafsky, 1994, F. Momberg, 1993, S Werner 1993, Thiollay, 1994, Kheowvongsri P. 1994).

1.3.2 A typology of farms

In this "intermediate situation", a village typology can be identified. This typology will be used to assess the impact of *krismon* according to the variety of situations. As is often the case, as exemplified by an analysis in terms of 'ethnic' criteria, a consideration of most tree crop booms highlights the parts played by differing access to land, labour and tree-capital.

1. "Traditional" local villages using only jungle rubber:
These local villages are inhabited by people who can be considered as 'autochtons', that is to say people who came several generations ago and who have acquired local rights to land. They are Malayu in Jambi (village of Seppungur) and Dayak in Kalimantan (Kopar and Engkayu), still relying on the jungle rubber system. They are constrained mainly by a lack of capital and of relevant technical information about clonal rubber cropping patterns. In the case of Kalimatan, another contraints are the age of the plantations and the lesser level of production compared to that of Jambi.

2. Local villages with access to clonal rubber developement schemes:
These are also 'autochtons', either Dayak or Malayu. In Kalimantan this type of village is exemplified by Sanjan and Embaong, where most farmers have one or two hectares of clonal rubber. They generally have sufficient capital (from their project plots) and invest in further clonal rubber. They may also seize the opportunity presented by oil palm projects, as is the case in Embaong. Besides lack of the appropriate technical information, their main constraint is also the availability of clonal rubber planting material. There are still very few private nurseries which provide planting material. Quality and clonal purity is also a problem.

3. Javanese transmigrants in tree crop oriented transmigration schemes :
These are villages which adopted plantations provided by the project early on; an example of one such is the NES (Nucleus Estate Scheme) of Rimbo Bujang in the Jambi province (comprising the villages of Sukamulia and Saptamulia). Even before *krismon*, they were successful.

4. Javanese transmigrants in food crop-oriented transmigration sites :
They initially had no rights to plant tree crops. This is the case in Kalimantan, in the villages of Sukamulia and Trimulia. Their main constraints are a lack of land (with an emerging land market) coupled with a lack of tree crops and so of the incomes brought by tree crops. Upland foodcrop farming is not adapted to these poor soils invaded by *Imperata cylindrica.* Some farmers got 0.4 to 0.8 ha of clonal rubber from the SRAP[6] project in 1995. Even before *krismon*, they were just surviving.

5. Local Dayak farmers in food crop oriented transmigration projects (Transmigrasi Lokal)
They still have ageing jungle rubber in their former village but want to have access to road transportation and technical information (one example is the village of Pariban Baru). Some

[6] SRAP : Smallholder Rubber Agroforestry Project, a joint research programme by CIRAD and ICRAF. SRAP tried to test various Rubber agroforestry systems (RAS) through on-farm trials with farmers.

farmers had access to one hectare of clonal rubber through the PKR-GK[7] (the "partial approach project") in 1992.

Regarding types 4 and 5, it must be stressed again that until 1992 tree crops were forbidden in these food crop oriented transmigration schemes. Since 1992 some farmers have planted clonal rubber, either on their own or through small projects. This typology is representative of various situations in terms of access to projects, economical and ecological environments and ethnic groups. The analysis is based on farm incomes (detailed in Annex 1).

1.3.3 The 1997 incomes

There was a wide range of average yearly incomes from rubber per family within, what were historically, the main areas (between Rp1 250,000 to Rp 6,500,000). The main source of on-farm income is rubber (types 1, 2, 3, 5). The only exceptions to this are those Javanese farmers who were trapped by *food crop* transmigration schemes (type 4) where off-farm employment provides most of the incomes.

Table 8.1: Rubber and off-farm incomes for various types of situations (in x 1000 rupiah): situation in July 1997 before the crisis.

Province/ Villages	JAMBI Rimbo Bujang	JAMBI Seppungur	KALIMANTAN Sanjan & Embaong	KALIMANTAN Kopar & Engkayu	KALIMANTAN Trimulia & Sukamulia	KALIMANTAN Pariban Baru
Ethnic group and type of cropping systems	Javanese transmigrants in NES project with clonal rubber	Traditional Malayu with jungle rubber	Traditional Dayak in SRDP project with clonal rubber	Traditional Dayak with jungle rubber	Javanese in foodcrops oriented transmigration project	Local Dayak in "foodcrops Lokal Transmigrasi" project with jungle rubber and later clones
Typology	3	1	2	1	4	5
Rubber income	5512	3240	2929	1014	96	680
Sale of rice surpluses	104	42	105	190	557	124
Off-farm income	814	830	330	360	997	450
Total Gross income	6700	4139	3704	1815	1932	1484
Agricultural inputs	270	27	340	251	282	230
Net income	6430	4112	3364	1564	1650	1254

Sources: Kelfoun A, Courbet, P., Penot E, 1997.

[7] PKR-GK is a partial approach project from GAPKINDO, (the Rubber Association of Indonesia) providing farmers with clonal rubber and inputs for the first year only. Implemented in 1992.

Off-farm activities
After 1992, many of these Javanese transmigrants planted rubber, either clonal or more generally non-selected seedlings due to lack of capital or availability of planting material in the area, in their former foodcrop plot (*lahan* 1 or 2)[8]. Most of these plantations, if not burned by the 1997 fires, are still immature or are just beginning to produce. Therefore, these farmer's average net income is the lowest. Off-farm activities, mainly retail and rubber trade as well as estate jobs, provide an additional income for all types of farmers. In the upper area of the Kapuas river, gold mining is also an important seasonal activity. In Sintang transmigration areas, 80 % of off-farm income is linked with gold mining. The remaining 20 % is linked to work on oil palm estates. In the Sanggau area, oil palm private estates provide most of the jobs for local or transmigrant farmers.

Clones versus jungle rubber.
The income from rubber is directly linked with its yield (see Table 8.2). Clonal rubber is 2 to 3 times more productive than jungle rubber with adapted clones9. Besides this important yield gap between the two systems, the immature period for clonal rubber is only 5 to 6 years (as compared with 8 to 15 years for jungle rubber). Farmers with clonal rubber plantations, whether or not this is provided by projects, have a higher income and standard of living than those relying only on jungle rubber, in particular those with very old jungle rubber (case 5). This explains why Dayak farmers attempt to join "local transmigration programmes". They also require better access to roads and markets.

Sumatra versus Kalimantan.
Dayak farmers with clonal rubber (case 2) only have one hectare of clonal rubber with a clone, GT1, that suffers from leaf disease (*Colletrotrichum*). This cuts yields by 30-50%, leading to a relatively poor income in comparison with the NES farmers with clonal rubber in Jambi (case 3). Besides diseases, rubber in Kalimantan also suffers, as compared with Jambi, from poorer soils and a climate to which they adapt less easily (with a high rainfall which causes greater production losses). This means lower yields in both jungle rubber and clones (Table 8.2). In Jambi even 'traditional' farmers, using only jungle rubber (case 1), have a far better income due to their younger and more productive jungle rubber. This allows a more productive area per family and some additional income from share-cropping.

Rubber and rice
Even before the crisis one could verify the assumption that clonal rubber engendered a spectacular breakthrough in terms of labour productivity and returns (Table 8.2).

[8] In food crop oriented transmigration projects, farmers are provided with 2 plots of 1 hectare, lahan 1 and 2, and an additional small plot of 0.5 ha for the house and the garden. .

9 Smallholder plantations with the PB 260 clone in SRDP project in South Sumatra have an average production of 1600-2000 kg/ha/year compared to 3 to 600 kg/ha/year with jungle rubber according to age.

Table 8.2: Return to labour for various cropping systems in Jambi in July 1997

	Cropping system	Number of farmers		Return to labour (.000 Rp/manday)	
Location		Jambi	West Kalimantan	Jambi	West Kalimantan
Upland rice	Shifting cultivation,	2	16	8 000	2100
Sawah	Local varieties	7	14	4 800	4100
	Improved varieties	5	8	8 200	8100
Rubber	*Jungle rubber*	24	100	25 300	9 600
Rubber	*Clonal rubber monoculture Mature plantation*	7	24	61 8 00	27 200

Source : A Kelfoun, Ph Courbet, E Penot, 1997

Most upland rice (« ladang ») produced by rubber smallholders is for their own consumption. Rice production is not sufficient however, and farmers use part of their rubber and off-farm incomes to buy rice. Most farmers do not own sawah (irrigated paddy fields). Although upland rice cultivation is very limited in Jambi, it appears to be more labour efficient than in Kalimantan. In both cases, and respectively in each province, the labour productivity of traditional "shifting" cultivation is far below that of jungle rubber (three to fourfold). This explains the success of jungle rubber as the main local tree crop system adopted during the 20th century in Sumatra and Kalimantan plains and its rapid spread as such.
Since the 1970s clonal rubber has represented a new step in productivity and a new income niche for farmers who plant and/or replant their old jungle rubber with clones when they can afford it.

2. *Krismon* and its impact on rubber smallholdings

2.1 1998 and 1999 years of living dangerously : a quadruple crisis

In 1998, despite an increase in the prices of their commodity, most rubber smallholders lacked the enthusiasm displayed by cocoa and coffee farmers. This reflected the fact that they had to deal with more obvious disadvantages. These can be summarized in terms of quadruple crisis:

- An ecological crisis in 1997-98 with huge fires destroying some crops, including rubber, and taking a high toll specifically upon the Sumatran and Kalimantan plains, where rubber farmers are concentrated.
- A financial crisis which did not generate a windfall such as that experienced by the coffee and cocoa growers. Whereas in 1998 these commodity prices increased fivefold during the 2 or 3 months of peak harvest, rubber prices only tripled for 2 or 3 months and experienced a significant peak in production.
- A social crisis entailing conflict between autochtons and migrants, Muslim and Christians, and between 'native' Indonesian and Chinese ethnic Indonesians. This also took on a special dimension in the rubber producing regions of West Kalimantan.
- A political crisis. This led to social unrest and a lack of confidence on the part of the private sector in economic recovery, because many Chinese ethnic Indonesians are involved in the rubber industry the risk for the producer is certainly increased.

2.1.1 Prices changes and steps in the crisis for smallholders during the period 1997-1999

As 75-90% of the income of rubber smallholders is provided by that crop, rubber prices are the main indicator of their economic evolution. The price of rubber on the international market dropped from 130 US cents in July 1997 to around 60 US cents in mid-1998. It remains around 55 cents in mid-1999 (Fig.8.3). In the second half of 1997, the early stages of the rupiah's decline enabled the price of rubber, paid in rupiah to the producer, to stabilize. The acceleration in the collapse of the rupiah, in January 1998, caused the price paid to the smallholder for his rubber to double and even triple for a few months (Figs. 8.3, 4a and 4b).

The effects of the crisis upon the farmers can be divided into four main periods:

- The first period, from July 1997 to December 1997, appears to be a period in which the crisis had no effect. Rubber prices, in rupiah, increased only slightly; to Rp 2265 from Rp 1950 per kg in West-Kalimantan (+16%) and to Rp 2630 from Rp 2025 per kg in Jambi.
- The second period may be defined as *profiting from the crisis*. However, the fact that rubber prices remained high for only two months (January to February 1998) meant that this period was far too short for farmers to take advantage of it. More importantly, food prices also skyrocketed, especially the price of rice; this tripled in January 1998 due to local shortages. This is one of the main differences between rubber farmers and cocoa farmers, who benefited from surpluses of rice in Sulawesi and therefore profited from the crisis for a longer period.
- The third period is defined as *entering the crisis*. Prices of agricultural inputs and food overtook the price commanded by rubber. This led to a serious, though temporary, decrease in income and purchasing power due to the very low parity of the rupiah (March 1998 to December 1998). Most food prices kept increasing and remained at high levels at the end of 1998, leaving smallholders with a loss of purchasing power. This trend is illustrated by the cost of imported rice from Vietnam or Assam or that of local rice (Fig.8.5). Most farmers were confused by this "price dance" and most did not understand the reasons for such price volatility.
- The fourth period remains uncertain. It could defined as *an adjustment period*, as the rupiah returned to around Rp 8,800 per US $ in April 1999 (then dipped to under Rp 7,000 per US $ in July 1999 before again rising to Rp 8,000 per US $ in August). Inputs and food prices look more or less stable (from January 1999 until June 1999). On the other hand, the international rubber price kept sliding dangerously in mid-1999 and political issues, including the Aceh and Timor massacres, made political equilibrium extremely fragile. Some staple food prices such as fish and meat remain extremely high in mid-1999. Rice remains at three times the level it attained in mid-1997.

However, in Jambi and West-Kalimantan the prices of other foodstuffs decreased slightly, to a level considered to be "relatively acceptable" by most rubber farmers in June 1999 (a decrease of around 30% as compared with prices in February 1999). Still, in rupiah, labor costs in mid-1999 are "only" twice that of mid-1997. Until March 1999, local products, such as planting material stumps, did not increase much in price. They remained at around Rp 500 per stump, and eventually increased in price to Rp 700 in June 1999. Fertilisers tripled or even quadrupled in price (table 8.3), but farmers do not use them much, especially during the

mature phase. Prices of locally produced fertilisers, such as urea, increased less than purely imported goods such as KCL.

In June 1999, most rubber farmers considered prices to be almost back to "normal", with the exception of fertilisers, but it is clear that they worry about renewed fluctuation in the price of rubber. "Normal prices" for producers means that they do cover their average expenses and do not create any distorsion in the usual purchase power. From their point of view, as rubber farmers, they moved from a relatively neutral '*krismon*' in 1998 to the beginnings of a dangerous "commodity crisis" in 1999 (section 3).

Table 8.3: Rubber and input prices in 1997, 1998 and 1999 in West-Kalimantan

Item	July 1997	July 1998	June 1999	Increase in 1999 compared with 1997
Rubber farm gate price (DRC 100%) (Rp/kg)	2400	4000	3500	x 1.5
Local rice (Rp/kg)	1200	2000	3000	x 2.5
Imported rice (Rp/kg)	1000	2400	2900	x 2.9
Labour and land				
Labour cost (Rp/ manday)	3500	7000	7500	x 2.1
Cost of fallow land(Rp/ha)	750,000		1,500,000	x 2
Planting material				
Stump	300	550	700	x 2.3
Plant in polybag	1000	1500	2000	x 2
Fertilisers and herbicides				
Urea (Rp/kg)	400	450	1200	x 3
KCl (Rp/kg)	600	900	3000	x 5
SP 36 (Rp/kg) (TSP)	600	700	1500	x 2.5
Round-Up (Rp/liter)	25000	37000	42500	x 1.7

2.1.2 The rubber/rice trade-off for the rubber farmer

Rice is the staple food of Indonesia and is therefore a necessity. As rice had one of the highest index levels in 1999, it deserves special attention (Table 8.4, Fig. 8.5). West-Kalimantan is far from being self-sufficient in the production of rice. The province has to import thousands of tonnes of rice from Sulawesi, Java and foreign countries. This accounts for the fact that before the crisis rice in Indonesia was one of the highest priced goods. It also accounts for the higher impact the crisis had upon rice prices. The comparative price of rubber, in comparison with rice, declined during the crisis. The poorest farmers, whose main expense is rice, suffered and had to reduce the proportion of rice in their diet. For most rubber farmers, as the comparative price remained above 0.7 until June 1999, most

maintained their normal dietary pattern with regard to rice. However, the families who were over-dependent upon rice, and this does not only include the poorest, crossed a dangerous line in June 1999.

Table 8.4: relative price of rubber and rice in West Kalimantan in rupiah

Date	Exchange rate	Rubber price (dry sheet 70 % DRC)	Rice	Amount of rice for 1 kg of wet rubber
July 1997	2400	1500	1200	1.25
January 1998	12000	4000	4500	0.89
June 1998	10000	3000	2500	0.86
September 1998	8000	3000	3800	0.79
November 1998	6500	3000	3400	0.88
January 1999	8700	3000	3700	0.76
March 1999	8500	3500	3500	1
April 1999	8500	2500	3200	0.78
June 1999	7300	1850	2700	0.69

Note: farm gate rubber prices are that of rubber dry sheet with a Dry Rubber Content (DRC) of 75 % (a particularity of West Kalimantan when all other provinces produce cup lumps with a DRC of 45-50 %). Therefore, rubber sheet price is of course above that of slab or cup-lump price. Source : Survey SRAP 97/99.

2.1.3 Impact of Krismon on costs and investment

Rubber production has few requirements, other than labour. The main input necessary is formic acid for latex coagulation. Cost of production is therefore mainly linked to labour costs, especially if share cropping is the dominant labour contract (as in Sumatra and Jambi for instance). If both rubber and food prices double at roughly the same pace such increases provide few problems for the farmer.

The main effect of *krismon* is upon the ability of the farmer to invest. The tripling of the price of imported inputs, in particular herbicides (Round Up) and fertilizers may deter investment. On the other hand, improved planting material became relatively less expensive until March/April 1999. This constitutes 50% of the total investment during the first three years of a clonal rubber plantation. Unfortunately, following demand, the price of improved planting material jumped by 40% in June 1999.

If farmers can combine the use of clonal rubber with a decrease in the use of imported inputs, it might be less expensive to invest in clonal rubber system. This seems possible in areas without *Imperata cylindrica,* where herbicides are not essential

Transmigrant Javanese farmers still try to develop rubber plantations and are considering buying surrounding land in addition to their initial two hectares. Land prices have been increasing since 1996. In the Sanggau area of West Kalimantan, the average price of land was Rp 350,000 per ha in July 1997 (for *Imperata* grassland) and has jumped to 1.5 million rupiah in June 1999.

2.1.4 A partial conclusion

With a volatile political situation, a major economic recession and 50% of the population classified in June 1999 as subsisting below the poverty line, as compared with an estimated 15% before the crisis, Indonesia approaches the political situation it experienced in 1965, or something very close to that; 1965 was remembered as "the year of living dangerously".[10] However, such a comparison is far from perfect and, political matters aside, there are differences which must be stressed. On one hand, Indonesia now possesses much less forest and fewer natural resources than it did in 1965. There is also a higher density of population and there are increasing social conflicts. These problems are to some extent offset by the present infrastructure and communications. At this stage, it is clear that an export commodity such as rubber has given thousands of farmers an advantage in overcoming the crisis not possessed by the majority.

2.2 *Krismon* impact on rubber smallhoder incomes

In this section, the fluctuations of rubber farmers incomes between July 1997 and January 1999 in 6 villages are analysed with special attention to the variety of the impact of the crisis on various types of rubber households.

2.2.1 1998: a neutral year for most rubber producers

From estimated revenues in July 1997 and January-March 1999, we calculated indexes with July 1997 being the base 100. The rubber income index for January-March 1999 varies from 237 to 370, averaging 281 (table 8.5). This is similar to the value of food given by the price index (288, BPS) and slightly less than that of rice (250). This confirms that the crisis does not seem to have really affected the gross purchasing power of most rubber producers.

Table 8.5: Fluctuations of the income index from July 1997 to January-March 1999

	Income indexes in January-March 1999 (July 1997 = base 100)					
	KALIMANTAN				JAMBI	
	Dayak SRDP project	Dayak 'Traditional'	Dayak Local trans-migration	Javanese Food crop Trans-Migration	Malayu 'Traditional'	Javanese NES Project
Rubber income index in 1999	261	237	292	256	300	370
Net FARM income in Rp index 1999	255	236	268	145	275	345
In US $ index 1999	82	75	86	46	88	111

Those who had simultaneous access to projects and to clonal rubber (Dayak local transmigration sites, SRDP farmers in Kalimantan and Javanese NES in Jambi) were clearly better able to endure the crisis than others. This is not surprising, as clonal rubber provides

[10] This reference is to a film which dramatised the 1965 crisis which led to the "New Order" of the Suharto government.

an income three times that of jungle rubber. Farmers who continue to rely on good jungle rubber also follow this trend. However, those relying on ageing jungle rubber saw only a small decrease in net farm income.

Unsurprisingly, Javanese transmigrants in food crop schemes which weren't producing rubber as most of their rubber plantations are still immature have the lowest net farm income, close to that of the wage index (148, BPS). However off-farm job opportunities have been maintained (mostly in oil palm estates and in gold mining), and have even increased (see below). Although off-farm income does not allow to cover the basic needs of the family, due to the low level of wages, most Javanese transmigrants in the Sanggau area (Kalimantan) consider *krismon* to have had little impact, mainly due to the fact that jobs in plantations and gold mining did not dry up. This is probably the main difference between the situations which may be seen in Java or in urban areas.

Except for some 'traditional' Dayaks in Kalimantan and a few Javanese in food crop transmigration schemes, most farmers were not badly affected by the crisis and maintained their purchasing power. In December-March 1999, there was no particular change in consumption patterns, except in those of the poorest families. However, consumption of meat and fish generally decreased due to the relatively high prices of these foods. In terms of total consumption this situation may be defined as "no more/no less". Discussions with farmers confirm that the crisis has been perceived more as a "potentially risky period" than as a real crisis.

2.2.2 Off-farm activities

Off-farm activities still remain essential in the case of transmigrants in Kalimantan, because their rubber plantations are still immature. Many local rubber smallholders also work in plantations for certain periods of the year. The older and less productive their jungle rubber, the more they work off-farm. Jobs offered by estates have been maintained and even increased and the number of farmers involved in off-farm activities has also increased (table 8.6). Oil palm plantations have substantial labour requirements during the first three years.

Table 8.6: Off-farm opportunities among 90 farmers in Sanggau, West Kalimantan, 1996 to 1998.

Type of off farm activity	**1996**	**1997**	**1998**
oil palm workers in estates	20 %	24 %	34 %
Employees	10 %	13 %	17 %
Farmers with regular off- farm activities	40 %	48 %	60 %

Sources: survey by E. Penot & I Komardiwan, May 1999.

Off-farm activities for transmigrants have been widely maintained with an average period of activity of 9.8 months per year in 1997 to 10.1 months/year in 1998. The maintenance of off-farm opportunities seems to be confirmed. However, the average estate worker's wage index in January 1999 was only 200 (July 1997 = 100). Wages increased less rapidly than rubber incomes. Estates reacted to the crisis by reducing their labour costs. In short, although off-farm activities look stable before and after the crisis, off-farm incomes did not increase in the

same proportion as did inputs, food costs and rubber incomes. In June 1999 in West Kalimantan, the daily wages were between 6000 and 10 000 Rp in gold mining; the same applies to oil palm estates. The basic daily wage on oil palm plantations is 7300 Rp, plus 1500 Rp for the first extra hour and 2500 Rp for the second extra hour worked. 7500 rupiah per day can be considered to be the average cost of local labour (Table 8.3).

2.3 Does *krismon* influence Indonesian rubber production?

2.3.1 Increase in production and exports

Indonesian rubber production constantly progressed, due to continuous jungle rubber planting in pioneer zones. Since the 1980s, clonal rubber from project and some non-project farms has played an increasing role and increase its share of the total rubber production.

In 1997, despite the El Nino effect, Indonesian rubber production hardly diminished, dropping from 1.574 million tonnes in 1996 to 1.564 million tonnes in 1997. According to BPS[11] (DGE, 1998), production remained around 1.548 million tonnes in 1998 and 1.564 million tonnes in 1999 (forecast). The LMC bulletin provides a slightly higher figure with 1.656 million tonnes in 1998 (a 6% increase from 1997). Dr Budiman's[12] personal estimation is 1.6 million tonnes for 1998 (a 3% increase, Budiman 1999).

Indonesian domestic rubber consumption dropped from 140,000 tons in 1996 to 100,000 tons in 1997. Such consumption is mainly by tyre production[13] (80 %). This local industry was seriously affected by the crisis, and the local prices of tyres have tripled. Finally, the transport business has moved to retread tyres (a technique which is 30% cheaper). The crisis did not help the domestic tyre industry due its dependency upon imported products.[14] But the impact on prices and Indonesian rubber production is not significant, as domestic consumption accounts for quite a small share of the market (9.76%) as compared to exports.

The "El Nino" effect has nothing to do directly with *krismon* and price increases, but it is one more reason to believe that the supposed short-term, price-elasticity evident in supply in 1998 was a marginal mechanism.

2.3.2 No clear increase in the tapping of rubber trees to increase production

Did the crisis trigger any change or intensification in the terms of tapping?

Farmers enjoyed a high price, in rupiah, for 2 or 3 months in 1998. Was a short-term supply

[11] BPS (Biro Pusat Statistiks, the Indonesian Central Statistics Bureau). However, statistics were not officially released in 1999 due to the elections held in this year.

[12] Dr Budiman is the executive director of GAPKINDO, the Rubber Association of Indonesia, this represents all Indonesian rubber processors.

[13] The very first production of Indonesian synthetic rubber (annual capacity of 60 000 tons) happened in 1997 with the company PT Sintetikajaya, belonging to the largest tyre producer in Indonesia

[14] Natural rubber constitutes only 22 % of the production cost of tyres. 93 % of the other inputs are imported, with a price set in US $.

response possible? Could farmers have tried to cash in on the price fluctuation by increasing their level of production?
There are, theoretically, two possible ways of increasing yields almost overnight.

Firstly: farmers can increase the tapping frequency of each mature tree and therefore increase production within one month. This technique is especially suited to clonal plantations15. Technically, an immediate increase of production is possible but not sustainable in the long run and can destroy the rubber trees. 70 % of farmers surveyed in Kalimantan in May 1999 declared that they did not tap their plots more frequently (I Komardiwan & E Penot, 1999). 30% acknowledged that they had tried, but not for very long. Discussions with local farmers in the Sintang and Sanggau areas in June 1999 confirmed that such a strategy is limited, and cannot be used for an extended period without causing serious harm to the trees. As a joke, farmers talk about the "PSM" system, with three tappings a day ('Pagi/Sore/Malam' or Morning/Afternoon/Evening system) but nobody really does it. In Kalimantan, with trees suffering from leaf diseases, it is obviously not a potential strategy according to farmers'opinion. It might be different in South Sumatra with trees in good conditions.

The second strategy is to tap additional jungle rubber trees. The average yield of jungle rubber is around 4 to 500 kg/ha/year, and 300 kg/ha/year for ageing trees. But jungle rubber is generally obtained from trees in a "park of jungle rubber". Jungle rubber yield per hectare varies according to the number of trees tapped. Jungle rubber gardens have between 250 to 450 'tappable' trees per hectare according to the age of the plantation. Some might be put in reserve. This, theoretically, allow the farmer some flexibility and capacity of response to price changes. There are also some rubber plots kept in reserve as land markers or as "security plots". In Kalimantan, such "jungle rubber reserves" are limited, but Sumatran farmers frequently have more jungle rubber than they can tap. It is part of the logic of extensive farming systems and also helps to keep property rights alive.

Our surveys in Jambi and Kalimantan did not suggest that the availability of labour was increasing in rural areas after the crisis. They indicated no transfer of labour from Java or urban areas to the central Sumatran or Kalimantan rubber areas. Farmers had a limited labour force before the crisis and that fact changed little after the crisis. Share–cropping, a common feature in Sumatra, might be locally more developed for a while in particular with the demand of off- farm work from transmigrants from food oriented projects.

Moreover, 10-20 % of the total income of smallholders relying on jungle rubber was gained from off-farm opportunities, as estate workers in particular. The interruption of the estates' new plantation policy (oil palm, *Acacia mangium*) in 1998 did not reduce job opportunities (Table 8.6). This policy did not, however, provide additional labour for the tapping old or remote jungle rubber.

What conclusions should we draw from this? There were some reports, from GAPKINDO and from newspapers, of this type of behaviour (taping more trees or more the trees). It was used to account for an increase in supply and exports and thus for a decline in international

15 (Clonal rubber in normal conditions (PB 260) produce 1 500 to 1800 kg of dry rubber per ha per year. In West Kalimantan, the GT 1 clone produces only 1 000 to 1200 kg/ha due to leaf disease) (TCSDP, D Boutin, pers. com.)

rubber prices, as suggested in Chapter 2. Our surveys tend to show that only a minority of farmers tried to increase their rubber supply overnight by using either of the two methods discussed above, although the figure may be higher for the most dynamic rubber producing regions such as South Sumatra. Such methods could not have a significant impact on Indonesian rubber supply in the short/mid term and thus on the international price or rubber.

Whilst rubber is a 'refuge value' and provides a reliable source of income despite price fluctuations, the ability of the rubber producers to adapt overnight to increases in supply (in order either to cash in on local price increases or to compensate for local price declines) is limited.

3. The rubber crisis on the international market

The international price of rubber greatly decreased, measured in US dollars in the period mid 1996 to 1999. However this decline started before the economic and monetary crisis, well before the last quarter of 1997 (Figs. 8.2 and 8.3), therefore independantly from *krismon*, at least , at the beginning . After a period of high economic activity and demand, *circa* 1980, the price that rubber commanded dropped after 1985 (partly due to the "second oil shock" and its economic aftermath). The price increased again in 1994-96, and this was due to large purchases from China, a significant increase of car sales in the USA and a decrease in stockpiled rubber, which led to important purchases by the industry (Loyen, 1998). The price reached 160 US cents per kg in 1995. After a short period of two years and half, prices started to decline again at the end of 1996, before *krismon*. Since then the price of rubber has fallen constantly. It dropped to 0.55 US cents per kilogram[16] in June 1999.
The main factors for this decline in the price of rubber since the end of 1996 seem to be as follows:

- The world supply increased by 4 % when the demand increased only by 3.5 %.
- Mainland China's purchases came to a halt.
- A world stockpile of 2 million tons at the end of 1996. (Sulkowski, 1997).

Important rubber stocks in 1999 still weight on international rubber prices. The rate of growth for rubber supply was higher than that of demand several months before the crisis and, logically, the international price was decreasing well before the crisis. What is true is that the collapse of the currency led to an increase in rubber prices, in rupiah, at farm level (Fig. 8.3). However, at least at that stage, there is little evidence to support the idea of any significant short-term supply response to this sudden price increase in rupiah, which could in its turn explain a drop in the international price in dollars. The decrease of the international price for rubber was compensated for by the collapse of the rupiah, which enabled the price of rubber to, roughly, triple during 2 or 3 months. Prices then decreased to only twice their pre-crisis level. As price of rubber is the major factor of the average income, expressed rupiah, the latter more or less followed the same trend. However, beyond the average trend, farmers incomes vary among farmers who have clones and those who did not (see above).

[16] Price given for TSR 20 = Technically Specified Rubber grade 20, the grade most commonly used for tyre production.

4. Conclusion

We should consider the consequences of the 1997-1999 period according to three main points: the real impact of krismon on households that depend on rubber for a living, the hidden impact of the rubber crisis and the aftermath in terms of farming systems evolution in the very next future. The latter is itself split in three components: the impact on planting and further investment in rubber, the competition for land with oil palm projects, and monocropping/agroforestry strategies. The conclusion ends up with the crisis seen as a revealing of past policy inefficiency.

A rather neutral impact of Krismon on rubber farmers

The exchange rate strongly affected the local prices of products and inputs in Indonesia. The primary effect of this "dance of prices" in 1998 was to disorientate most farmers. Internal rubber prices have followed domestic food prices and the prices of some input materials available in the country (planting materials and fertilisers such as urea). The value of rubber, in rupiah, was relatively high due to the fall of the currency. This was compensated for by a decrease in the international price paid in US dollars. Thus producers experienced no particular advantages or disadvantages. Rubber farmers' standards of living remain more or less the same, as incomes have been maintained. The poorest farmers, still relying on old jungle rubber have suffered to some extent because of the crisis, but their standard of living was already low before the crisis. A similar situation may be observed amongst the Javanese transmigrants. Farmers with early access to clonal rubber, mainly through projects, clearly benefited from *krismon* in 1998, but they are a minority among rubber smallholders.

Most farmers seem to have tackled the crisis quite well, some by developing temporary non-rubber based strategies (such as transmigrants). They developed more off-farm activities, sold some cattle and reduced meat consumption. However, this optimistic scenario must be qualified by social considerations. The selling of cattle is a risky strategy involving the liquidation of capital. Increasing off-farm activities, being exploited by wage payers in large oil palm estates, is neither a sign of social development nor good news for the ecological environment. The fact that men are risking their lives in dangerous gold mines, involving months of separation from their families, may have enormous negative impacts on health and the security of the family unit.

The links between the Asian crisis and the rubber crisis

The "rubber crisis" refers to a constant decrease in price on the international market since January 1997. In 1997, the volatility of the rupiah has obscured this dramatic trend. In 1998, the collapse of the rupiah attended a relatively good price to be maintained. It seems that the very short period of real price increase did not trigger a significant short-term supply response. Even if this was attempted amongst a minority of smallholders, the effect was not significant and could not have really influenced Indonesian supply and international prices.

However, it would be illogical to argue that the Asian crisis did not influence the international price of rubber. As Thailand, Malaysia and Indonesia account for 80% of the world's rubber supply, what happened to their economies obviously had a direct impact upon the international rubber market. Our conclusion is that the main impact of the Asian crisis, in

terms of international prices, was not demonstrated by a supply and response mechanism but rather by lower costs, expressed in dollars: end users took this opportunity to lower the price they paid. However, the rubber price decline started before the crisis and appears to have been structural according to specific features not directly or consequently linked with the Asian crisis. The Asian crisis was not the only factor to influence the fall in prices. The Asian crisis in it self has its origin partly on a too rapid economic globalization in Southeast Asia as well as in a financial and monetary crash. The rubber crisis is more specific.

Although most farmers overcame the 'neutral' *krismon* in 1998, they faced a real crisis with the further decline of the rubber price during the second half of 1999. Although fragile, the 'stabilisation' of the rupiah in 1999 played a role inverse to that played by the 1998 *krismon*. As a result of world price decline and rupiah stabilisation, farm-gate prices rapidly decreased in mid-1999. Farmers were just saved by a partial recovery of the world price at the very end of 1999.

A very moderate impact of the 1998 crisis on rubber replanting and investments

*Krismo*n has highlighted the fragility of smallholders' farming system, which relies solely upon old jungle rubber. The need for the replanting and renewing of trees is not related to the crisis, but the crisis has shown it to be a necessity. In June 1999, 86% of farmers declared that they intend to plant or replant within the next 3 years. For all those farmers who do not have access to oil palm projects, investing in clonal rubber is still the main strategy used to overcome the low productivity of jungle rubber.

Whether or not to replant using clonal rubber is a decision which depends upon conditions widely independent of the fluctuating price of rubber, as long as rubber prices do not drop below a certain price threshold. In fact, that threshold never seems to have been reached in the history of rubber production. The productivity trend has increased through the adoption of technology (clonal rubber and the monoculture package). This is long term process, and is hardly affected by price fluctuations.

The moderate price increase in rupiah in 1998 should not trigger specific new planting of rubber, at least not beyond what has already been planned by farmers. The trend towards planting clones existed before the crisis. It was more developed in North and South Sumatra than in other provinces due to the important impact of rubber projects and the existence of a private nursery network, which provided sufficient clonal planting material for local farmers. In the mid-1990s, in the province of South Sumatra, there were more than 500 private nurseries (Gouyon 1995). There are probably many more by now, 1999-2000. In Jambi, private nurseries are booming as well (Penot and Komardiwan, 1998).

Finally the 1998 crisis may have significantly accelerated new clonal plantings only in regions where farmers already had mature clonal planting and a pre-crisis strategy of active planting.

On the opposite, in many regions and villages, the willingness of planting clonal rubber may be hampered by a new strong alternative, oil palm, emerging in the early 1990s and restarting in 1999 after a provisional slowdown in 1997/98. All surveyed farmers insist on the necessity of a movement towards clonal rubber from jungle rubber but also towards oil palm, when

possible. In old rubber areas, oil palm appears to be an important component of the "agricultural landscape". It is obviously becoming a serious alternative to rubber, particularly in provinces such as West Kalimantan, North Sumatra, Riau and Jambi.

Competition for land by oil palm estates

The oil palm estate sector has undergone spectacular growth in the last ten years and has provided local farmers who had access to with both job opportunities and the possibility of crop diversification. Of the 5.5 million ha conceded to private and governmental companies, 2,4 million have been planted of which 1,78 million ha are in production (Potter and Lee, 1998). West Kalimantan is the province with the largest recent development of oil palm. Therefore, with the plantings of 1996 and 1997 (which need maintenance) and those of 1999, to fulfill future needs, there is no prospect of rural job opportunities failing due to the crisis in the next few years.

Oil palm estates and the contracts they offer to farmers clearly provide a new alternative, besides the clonal option, to jungle rubber. Oil palm projects provide three main advantages : full credit to fund the planting phase, an income comparable to that of clonal rubber and a reduced immature period (three years only). These advantages pave the way for the movement of farmers towards this new crop option, at least for those contacted by private companies. Full credit systems are welcome, even if credit conditions are not clear and even though 7,5 ha of land must be given in exchange 2 ha of oil palm four years later. In West-Kalimantan at least, the main outcome of the crisis has been that many farmers who might have hesitated to join oil palm projects are now willing to engage in such a strategy. Although some autochthon communities, like Sanjan, display a strong vision of their future and keep land for the next generation, most villages run to oil palm if a projects is available. In the mid-term, what is left for rubber? Beside, because land is becoming scarce, most farmers are unwilling to abandon rubber for the new 'Cinderella' crop, oil palm

What is left to agroforestry strategies?

With regard to rubber, the most important thing demonstrated by the crisis is that farmers definitely perceived the need to move towards the use of productive clones in their cropping systems in order to better secure their income beside increasing it. Farmers need the high returns and early maturity provided by clones. There is still a bright future for rubber smallholders, but complex jungle rubber based on seedlings and highly complex agroforestry is probably now lost forever. Farmers can no longer afford waiting ten years before getting returns from their rubber seedlings. This does not mean, however, that agroforestry strategies are incompatible with the use of clones. Some research is effectively currently implemented in Indonesia (CIRAD-ICRAF) and farmers display endogenous ability for exploring possibilities to use clones in light agroforestry systems rather than in monocropping. The latter is too capital-intensive during the investment phase and agroforestry strategies may reduce that investment. At least, that was researchers' ambition (Gouyon 1993, Gouyon, Foresta and Levang 1993, Penot 1995, Penot and Gede Wibawa 1996, 1997). The idea was not strictly to reproduce jungle rubber with clones, but to rebuild light agroforestry systems with a few useful species.

To some extent, in the 1990s, the farmers' need for quick returns seems to have compromised the chances of adapting clones to agroforestry systems or adapting agroforestry strategies to the use of clones. However, in the 2000s, as roads are improving, and if agricultural policies refocus the fruit sector on smallholders, rather than on estates, a combination of rubber and several types of fruit trees may attract smallholders' interest. It is already the case in areas close to markets, close to provincial capitals. Agroforestry systems help to rebuild ecologies degraded by massive clearances, droughts and fires. They help to restore a "forest rent " (Ruf, 1987). Moreover, a complex agroforestry system makes replanting technically easier. It may also help economically. If a farmer can fell trees and sell the timber the money will help to fund replanting. Beyond these technicians' arguments, it is believed that the crisis will help to reveal new possibilities in adapting clones to agroforestry systems or agroforestry to clones.

The crisis as a revealing of a policy of inefficiency

Structurally, with 2.5 million ha of jungle rubber to be replanted with clonal rubber and a enormous reserve of productivity, both in labour and land, it seems clear that the future of Indonesian rubber smallholders has great potential both economically and environmentally. Clonal plantations may help to improve and restore the environment in the long term, possibly through the use of some agroforestry techniques.

The rubber sector is one of the best showcases with which to demonstrate the common roots of the economic and ecological crisis. Large-scale rubber schemes were costly and, some, the first ones in the 1970s', riddled with corruption. They presented enormous logistical problems, with farmers sometimes receiving doubtful planting material, but eventually had real positive impacts in terms of the information they provided concerning rubber clones. However, by revealing the extent of environmental and social damage caused to rubber smallholders by estates and by logging companies (a number of which belonged to the Suharto family, their friends and the army), the crisis proved that these damages were aggravated, if not triggered by policies of ignorance, corruption and inefficiency (Chapter 6). The crisis may appear 'neutral' within the rubber sector, but what is revealed is far from neutral. It shows the immediate need for political changes in the rural sector. It shows also the real necessity for producers to have the possibility to regroup themselves into farmers associations to defend their economic interest.

Eventually, despite farmers' willingness to move forward, the ecological and economic environments have been so badly damaged that the investment potential of rubber in the near future look less promising now than before the 1997 ecological crisis and the 1998 *krismon*. Again, as the main causes of the trouble stem from the policies of the large estates and the logging companies, rubber is one more sector which demonstrates the need to prioritize the smallholders. These priorities should concern all aspects of agriculture and environment, from land management and land ownership, to information, credit facilities and the assistance provided to and by farmers' organizations, which must remain under the farmers' control.

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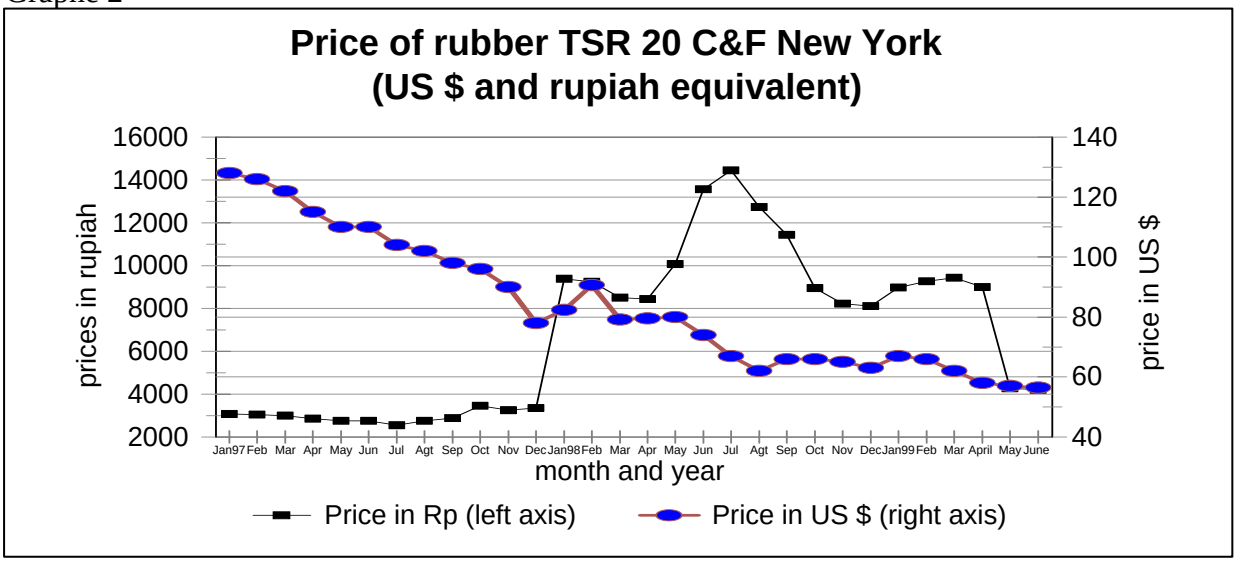
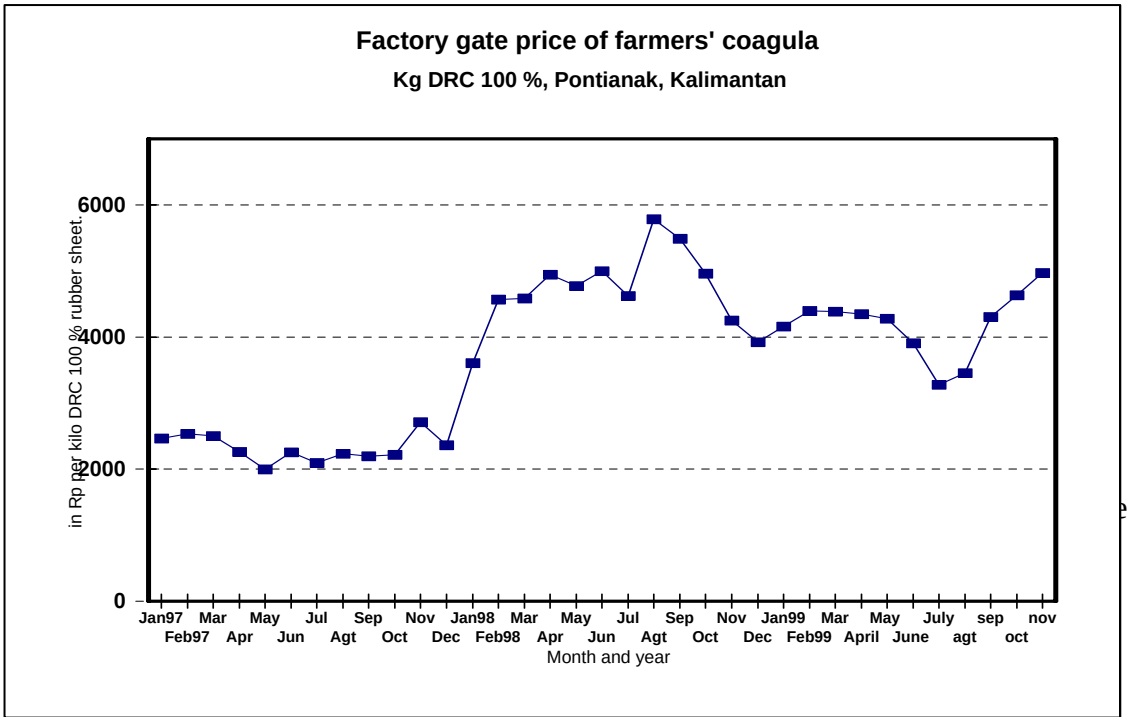
Graph 1

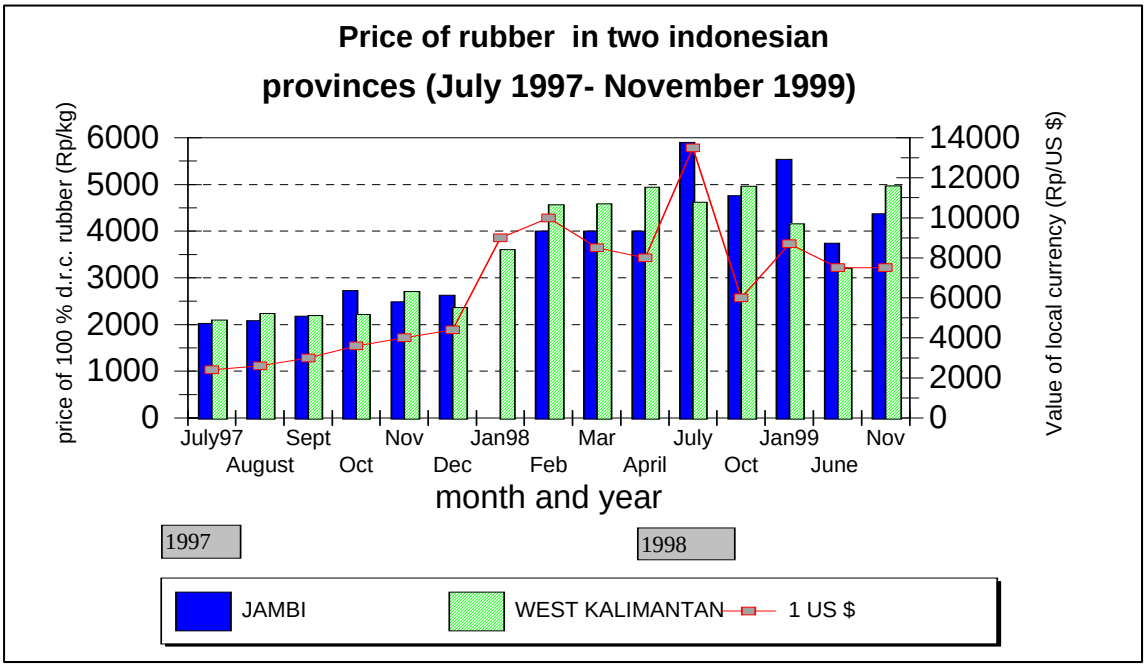
Graphe 2



Graph 3



Graph 4



Graph 5