

AN IPARD-CIRAD COOPERATION ON
Rubber Research Institute of Indonesia
RRII programme of

**MULTILOCATION TRIALS NETWORK FOR RUBBER CLONAL RECOMMENDATIONS
IN VARIOUS AGROCLIMATIC CONDITIONS OF INDONESIA**

FIELD TRIP TO WEST KALIMANTAN

REPORT

OCTOBER 1993

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I would like to express all my thanks to DINAS PERKEBUNAN of Pontianak which give to us a great help, providing us a car, a driver and full assistance for the success of our mission, and in particular Pak Karsan S, who follow the mission with us. I thank also all the persons mentionned in that report who gave to us full support and information. I would also thank Pak Rasidin.

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TABLE OF CONTENT

1 INTRODUCTION

2 OBJECTIVES OF THE FIELD TRIP.

3 PRESENTATION OF THE PROVINCE OF WEST KALIMANTAN

4 THE EXISTING PROJECT IN THE PROVINCE.

5 CONTACTS AND VISITED LOCATIONS

Tuesday 26 october.

Contact with DINAS PERKEBUNAN (DISBUN) Pontianak

Wenesday 27 october

Visit to PT ROKKAN group office in Pontianak.

Visit to Kalimantan Plantation Development Group (KPD group) office in Pontianak.

Thursday 28 october

Visit to DINAS PERKENUNAN Mempawah (70 km north of Pontianak).

**BUDWOOD GARDENS
NURSERY**

Monoclonal Field Trial : MFT

Visit to the trial "Screening of 100 clones for susceptilibilty to Colletotrichum".

Visit to the PT WIRA Rivaco Mandum at Ngabang (KPD group).

Friday 29th October

Visit to the DISBUN office of Sintang.

Visit to PTP XIII In Sintang/Nanga Jetak. Visit to KPD rubber estate at PT Lahan Jakranawala, Nangga Pinoh.

6 CONCLUSION

ANNEX 1 Methodological paper for the establishment of multilocation trials network for clonal recommendations in *Indonesia*

CLONE FIELD TRIAL (CTF) : A METHODOLOGICAL PAPER.

1 INTRODUCTION

The team was composed of Pak Rasidin Aswar, project leader from Pusat Penelitian Karet of Sungei Putih, and Eric Penot, CIRAD-CP, from Balai Penelitian Sembawa. The field trip was scheduled, as other field trips with other members of the project team (to Jambi, Bengkulu and Jakarta/Bogor), to collect information, make contacts and give support to the establishment of a network of rubber clone multilocation trials in Sumatra and Kalimantan. In the long term, the results of these trials will lead to clonal recommendations adapted to the different agro-ecological zones. The collection of information concerns : soils and climatic data and maps, clone performance and distribution data, assessment of diseases affecting rubber and information on private estates, PTP, TCDSP, DISBUN and other rubber projects activities.

The trip was made under the assistance of DINAS PERKEBUNAN Pontianak, from 26th October to 30th October 1993.

2 OBJECTIVES OF THE FIELD TRIP.

The objectives of the field trip were to have an overview of the rubber growing areas and the existing trials in the province of West Kalimantan, and to identify possible partners and trial locations for the establishment of some trials in various locations of the province, representative of the different agro-ecological zones.

An other objective was to collect information on climate (rainfall data), clone performance and the effect of diseases to rubber growth and production.

3 PRESENTATION OF THE PROVINCE OF WEST KALIMANTAN

Kalimantan is the Indonesian part of Bornéo, divided in four main provinces. West Kalimantan, which provincial capital is Pontianak, is 147 510 Km² (see map 1). It has a wide central plain with a fluvial system centered around the Kapuas river, bordered by the Sarawak state of Malaysia, in the North, and the mountains : Schwannier chain in the south and Muller chain in the East. The main plain is divided in uplands, sometimes slightly hilly, where tree crops and upland rice are grown, mainly rubber and oil palm for the trees, and lowlands, most of the time wetlands, covered with forest or rice fields when deforested. For smallholders, the main farming system is based on slash-and-burn of the forest for upland rice cropping, followed by fallow or the establishment of rubber plantations, mainly extensive such as jungle rubber, with poor planting material (seedlings). Some farmers have access to improved planting material (clones), assistance and credit through several smallholders.

map n° 1



Figure 1 Location of West Kalimantan

development schemes among them TCSDP¹ and NES² programmes are the most important. The estate sector rely mainly on oil palm and rubber. Development activities, trade, towns and transport are depending from the rivers, and, more recently, from the new tar road from Pontianak to Putussibau.

The typically equatorial climate is characterized by a very short "dry" season, generally with no month under 100 mm of rainfall, and heavy rainfall between 2500 and 3500 mm/year, up to 5000 mm/year locally. The upland soils are generally ferralitic and leached, considered as poor soils, unsuitable for foodcrops, but suitable for rubber and oil palm.

For rubber, the main constraints are possible excess of water (above 3000 mm/year), excess of humidity linked to erratic wintering leading to a high susceptibility to certain diseases, in particular leaf diseases (mainly Colletotrichum), and poor soils. The opening is generally delayed up to the 6th year for clones commonly opened at the 5th year, like GT 1.

The current total hectareage of rubber is officially 387 100 ha³ (14,4 % of the total hectareage in Indonesia, among it 64 % mature and in production (248 200 ha) for a production of 117 800 tons/year (9,5 % of the total production of Indonesia).

The distribution of hectareage is the following :

- smallholders :	380 766 Ha
- PTP, governemental estates :	5 636 Ha
- private estates :	700 ha

Obvsiously, the private sector are underestimated as the sector in developing (KPD group has allready 30 000 ha for instance, ROKKAN groupe has 3 000 Ha...), and probably is also underestimated the smallholders sector, as it is difficult to obtain accurate information when such a sector is still developping. However, in this figure from 1990, the smallholders sector represents 98 % of the total rubber cropped area, which is probably very close to the reality. The increase of rubber hectareage is 33 % in 14 years, between 1978 and 1992. This increase is the less important, compared to the other provinces, but rubber is already a traditionnal crop in West Kalimantan, as it has been introduced after the first world war. These figures show that there is still a strong dynamic of planting, mainly the fact of non

¹TCSDP = Tree Crop Smallholders Development Project, formerly named as SRDP = Smallholders Rubber Development Project, financed by ADB. TCSDP is divided in PMU = Project Management Unit. In bahasia indonesia, PMU is called UPP (Unit Pelaksaaan Proyek).

²NES = Nucleus Smallholders Sheme : a "plasma" of smallholders plantations, generally 2 ha for each farmer, and a total hectareage betwen 5000 to 12000 ha, is linked to a PTP governemental owned "Nucleus" estate (generally between 1500 to 3000 ha). In bahasia Indonesia, NES shemes are calles PIR (Perusahaan Inti Rahyat).

³These data come from "Statistik Perkebunan Indonesia Karet" , DGE 1993, and concern the situation in the year 1990.

project smallholders. West Kalimantan represents 55 % of the Kalimantan rubber planted total area.

Still land is available and a wide part of the uplands may be cropped with rubber. There is a certain dynamic in planting rubber for non-project smallholders without any help from the government, as rubber permit to valorize land unsuitable for permanent foodcrops. It also permits to secure the property of land, at a very low cost (no or very few inputs and cleared land ready for planting after a year of upland rice behind a slash-and-burn of the forest. These situation lead to the developement to a large extend of a very extensive rubber plantation system known as "jungle rubber" (hutan karet). The eastern part of the province can still be considered as a pionner zone, as the western part, where rubber was primarely grown, is probably more focused on replanting with more emphasis on adapted improved planting material. There is a general lack of accurate information on the non project smallholder sector.

There is hardly anymore primary forest in the Kapuas river central plain. Secondary forest may become scarce in the next years with the extension of rubber plantations (and also oil palm) and swidden agriculture based farming system, but there is still a very large land availability for plantations. Forest still exists in the south of Pontianak (because there is no road connected to the southern part of the province, and in the remote wetlands or mountainous areas. Gold mining is quite active and destroys large areas of land.

4 THE EXISTING PROJECT IN THE PROVINCE.

PTP XIII is implementing a NES/PIR programme around Sintang, since 1981. The initial target was 3000 ha/nucleus and 10 000 ha/plasma. In 1993, 1352 ha/nucleus and 6 687ha/plama were implemented.

An other rubber NES programme is implemented since 1983/84 in Sambas, in the north-western part of the province, with a target of 3000 ha/nucleus and 12 000 ha/plasma. In 1986, 999 ha/nucleus and 6243 ha/plama were implemented.

TCSDP is also implementing a programme of smallholders rubber plantations between Pontianak and Sintang, in Anjuran, Ambawang, Sossok and Sintang, in Sambas and in Sanggau Ledo. The current hectarage under TCSDP programme already planted is 22 521 ha, in 8 PMU's as 19,4 % of the total rubber planted Pontianak Kabupaten area.

The TCSDP programme supply farmers with the folloming clones :

- PB 235
- PB 260
- PR 261
- PR 300
- BPM 1
- BPM 24
- AVROS 2037
- RRIM 600

Private estates are developing at a high rate (to give an example : 276 000 ha of land were allocated to 12 private companies for oil palm in Kabupaten Sanggau in 1986⁴). Land has been recently allocated for rubber plantation to private estates (since 1990).

Generally, rubber planting through PTP/NES and TCSDP programmes were implemented close to a road or to a river (tributaries of Kapuas river) to permit the shipment of the production, and easy access. Most of the production seems to be shipped by the rivers. Jungle rubber is generalized when there is no immediate outlet, and in particular when there is no good road.

Some data from DISBUN are available for the Pontianak Kabupaten (116 039 ha of rubber, as 30 % of the total rubber area of the province). 22 521 ha, as 19,4 % of the total area is under TCSDP, which seems to be a higher rate than in other province (generally around 10 to 15 %). Most of the area cropped in rubber by smallholders in TCSDP is concentrated in that Kabupaten. The hectareage concerned by other smallholders development schemes is 2518 ha. In other Kabupaten than Pontianak, Sambas and Sintang, farmers have hardly any access to information, credit or improved planting material.

DISBUN is providing improved planting material (clones and polyclonal seedlings) for "partial approach scheme" smallholders. The P4/APBD is a project for smallholders under the control of the governor (in Anjuran). Other Tree Crop Projects for smallholders are PRPTE (Peremejaan Rehabilitasi dan Perluasan Tanaman Ekspor, or Rejuvenation, rehabilitation and extension of export crops, a governor sponsored credit scheme), and PPKR (Proyek Pengembangan Karet Rakyat, partly financed by the World Bank)

5 CONTACTS AND VISITED LOCATIONS

Tuesday 26 October.

Arrival in Pontianak from Jakarta.

Contact with DINAS PERKEBUNAN (DISBUN) Pontianak : meeting with Pak Achmad M B, director of DISBUN Propinsi, and Pak Karsan S, deputy director of Sub DINAS Production.

We can rapidly call again the objectives of DISBUN. DISBUN is a governmental agency which provides information and land to the estate sector, private or governmental (PTP). All the land released to estates are under its jurisdiction. DISBUN provides also, at a certain level, extension, and planting material from budwood gardens.

⁴Source : ReppRoT West Kalimantan report, 1986.

The DISBUN has a map based on 1/250 000 ReppRoT map, of land suitability for rubber, oil palm, the two main tree crops of the province, and other crops. This map have been released by Pusat Penelitian Tanah dan Agroklimat/Bogor⁵. A map of existing private and governmental estates (PTP) is also available locally.

A programme of visit has been set-up and contacts were made for the organization of the trip. We could remark the efficiency of DISBUN in organizing the trip and providing full assistance.

Data may be obtained through "Perkebunan kalbar" report.
The visited locations can be seen on map 2.

Wednesday 27 october

Visit to PT ROKKAN group office in Pontianak.

Meeting with Pak Lee Shongkin, staff Director, and Pak Zainan Achmad, deputy director.

PT ROKKAN has 3 plantations in Sintang/Sukau (1500 ha), in Putussibau/Jongkong (1200 ha) and in Ketapang/Nagantayak (300 ha). Planting were implemented in 1991/1992. The planted clones are : BPM 1, RRIM 600, RRIM 712, PB 260, PR 261 and RRIC 100. The total budwood gardens area is 13,1 ha.

The main diseases observed are Colletotrichum, Fomès and Pink disease. In front of the strong pressure of Colletotrichum, the priority of planting is given to PB 260.

Visit to Kalimantan Plantation Development Group (KPD group) office in Pontianak.

Meeting with Pak Clemens D Suryadi, Assistant Executive director.

The group seems to have 30 000 ha planted in rubber.
The planted clones are :

Large scale :

- GT 1 (not anymore planted due to Colletotrichum)
- PR 261
- PB 260

⁵Soils and Agroclimate Research Center of Bogor.

Small scale :

- BPM 1
- BPM 24
- RRIC 100
- RRIC 110
- AVROS 2037
- BLIG (origin PT London Sumatra, North Sumatra)
- RRIC 712

The main constraints identified are : strong attacks of *Colletotrichum* in locations where rainfall exceed 3000 mm/year, problem of erratic wintering staggered on a 6 months period, and morning rainfall.

The KPD group is also implementing a rubber forestry plantation for wood production at PT Lahan Jakranawala, in Nangga Pinoh, south-east of Sintang, with an hectarage of 5000 Ha. The group own also a saw mill and a timber concession in the zone. Rubber wood will be used for plywood and panelwood production.

Thursday 28 october

Visit to DINAS PERKENUNAN Mempawah (70 km north of Pontianak).

Meeting with Pak HAIYASUBIYAKTA, headman of the local DISBUN.

Data collection and information on the Pontianak kabupaten (district) : 116 000 ha of rubber , among it an estimated 88 000 ha of smallholders's jungle rubber.

BUDWOOD GARDENS

Visit to the DISBUN budwood gardens of Anjungan under P4/APBD project. 3 clones : BPM 1, PR 261 and AVROS 2037. The original planting material is coming from Pusat Penelitian Sungei Putih (North Sumatra). The first budwood garden is correct however it is not pruned at a particular time in the year, leading to a certain heterogeneity. The second budwood garden is not well placed and could be improved (see picture 1).

NURSERY

Visit to a nursery of polyclonal seedlings (see picture 2), for smallholders.

Monoclonal Field Trial : MFT

Visit to a Monoclonal Field Trial (MFT), implemented by Balai Penelitian Getas (central Java), in Anjungan under TCSDP/PMU Anjungan management. 10 plots of 10 clones with an area of one hectare each. The clones are : BPM 1, BPM 107, BPM 109, PB 255, PB 280, PR 261, RRIC 102, RRIM 600, TM 6 and TM 9. The planting has been done in 1991. The trial is, so, just two years old and still immature. The planting material comes from Sungei Putih.

Visit to a second MFT Trial in Dedayu Kecamatan Toho, under P4/APBD management, with 5 plot of one hectare each with the following clones : PB 260, RRIC 100, RRIC 110, RRIM 712 and RRIM 717.

These two MFT are under supervision of Getas Station.

These two MFT should be included in the multilocation clones trials network, and completed by another MFT with some selected clones as suggested behind.

Remarks :

The new MFT to be implemented in the network in that location, in order to complete the already existing ones, may have the following clones : in priority : TM 5, TM 8, RRIC 101 and RRIC 102, PB 280 then, if possible, PB 217, PB 235, PR 309, PR 314, PR 330, TM 5 and TM 9. With the same design : 1 clone in plot of one hectare.

The objective of such a MFT is to test , in a real scale close to estate conditions, the real tolerance of clones supposed to be tolerant (the priority list), and to test the level of susceptibility, or effective suitability for that particular zone, for the other clones, belonging to the supposed medium "tolerance group" (see the table 1).

Priority should be given to the clones with a certain level of tolerance, or resistance, to collectotrichum. Because of their high susceptibility to collectotrichum, some clones may not be included in the MFT, such as : BPM 24, PR 300, PR 303, RRIM 712, and RRIM 728. We notice that PB 235 is given as very susceptible by RRIM and as medium by RRII⁶. This a point to be seen.

⁶RRII = Rubber Research Institute of Indonesia. (Pusat Penelitian Karet, in bahasa indonesia).

We call again the level of tolerance of clones for colletotrichum in the following table:

TABLE 1 : SUSCEPTIBILITY OF CLONES TO COLLETOTRICHUM

SUSCEPTIBLE	MEDIUM TOLERANT	TOLERANT
PR 107	PB 235	AVROS 2037
GT 1	PB 260	BPM 1
BPM 24	BPM 107	PR 261
PB 217	BPM 109	RRIM 600
PB 235 (from RRIM recommendations)	PR 302	RRIM 805
PB 255 (from RRIM recommendations)	PR 307	RRIC 100
PR 300	PR 309	RRIC 101
PR 303	PR 311	RRIC 102
RRIM 712	PR 314	RRIC 110
RRIM 728 (from RRIM recommendations)	RRIM 717	TM 5
		TM6
	TM 4	TM 8
	TM 9	PB 280 (from RRIM recommendations)

When a clone is marked with "RRIM recommendations", it means that RRIM and IRRI don't classify the clone in the same class of tolerance. One of the objective of the trial should be to give a definitive response to the level of susceptibility, or tolerance, for suspected clones.

Visit to the trial "Screening of 100 clones for susceptibility to Colletotrichum".

This trial is implemented under the supervision of Sungei Putih in Karangam. It has two plots. The first plot is under the sun, the trees were planted in a high density with 5 repetitions, The blocks of 5 repetitions have been randomized (see picture 3) for a total number of 45 clones. The trial was planted in October 1993. There is already, on some clones, attacks of Colletotrichum, but not enough to jeopardise, at that stage, the growth of the plants.

The second plot is under the shadow of a GT 1 plantation, same design as before, severely affected by Colletotrichum (see picture 4), as GT 1 is. No young leaves are able to develop for all clones in such conditions. It has been suggested to treat the trees for the first year against Colletotrichum to permit to the young trees the establishment of the first leaves, and the first 3 or 4 steps. Then, after a year for instance, to stop all treatment, to see the tolerance to colletotrichum on trees at a sufficient developed stage.

It is too early to obtain information from that trial, but it is clear that other trials should

be done in other locations in order to assess the level of pressure of *Colletotrichum* which is the main constraint for rubber in that province.

Visit to the PT WIRA Rivaco Mandum at Ngabang (KPD group).

Meeting with Pak Jerry Chkah, director manager, and Pak Kamsen Saragig, acting manager.

The total current planted area in rubber is 3090 Ha.

The planted clones are the following :

Large scale :

GT 1	(1989, and 1990)	1 131 ha
PB 260	(1990 to 1993)	1 405 ha
PB 235	(1992, 1993)	235 ha

Small scale :

PR 261	183 ha
BPM 1	70 ha
BLIG	67 ha
BPM 24	50 ha
RRIC 100	29 ha

The planting material come from tanjung Morawa (North Sumatra).

All the trees are still immature. PB 260 represents 60 % of the planted area, as a strategy against *Colletotrichum*. No *Corynespora* disease has been yet reported in the region, fortunately.

The other clones available in budwood gardens for further planting are the following : PB 340, PR 300, BPM 107, TM 2, 9, 16 and RRIM 712.

The very few clones available, resistant, or tolerant, to *Colletotrichum*, lead to rely on a very few number of clones to be planted. This strategy may be dangerous and risky in case of possible development of another leaf diseases, like *Corynespora* for instance for PB 260. The latter shows that priority should be given for the establishment of some Clone Field Trials (CFT) with adapted clones, in several locations, in order to assess the level of pressure of the disease and to be capable of proposing a certain number of clones for diversification in further clonal recommendations (see CFT methodology in annex 1).

It is suggested to implement a CFT in that plantation if it is possible. The 21 clones of a "CFT type" in West Kalimantan could be the following :

Priority	and also
PB 260	
AVROS 2037	PB 235
BPM 1	BPM 107
PR 261 (as control)	BPM 109
RRIM 600	PR 309
RRIC 100	PR 311
RRIC 101	PR 314
RRIC 102	TM 4
RRIC 110	TM 9
TM 5	
TM 6	
TM 8	
PB 280	

Friday 29th October

Visit to the DISBUN office of Sintang.

Meeting with Djoko Triyono, TCSDP Sintang and Suhaidi, DISBUN Sintang, who have accompanied us to the fields.

Visit to PTP XIII In Sintang/Nanga Jetak.

Meeting with Hqdji Lili Segli, director Manager.

PTP XIII is implementing a NES/PIR programme around Sintang, since 1981. The initial target was 3000 ha/nucleus and 10 000 ha/plasma. In 1993, 1352 ha/nucleus and 6 687ha/plasma were implemented. The planted clones are the following : GT 1, PR 261, PR 255 and PR 300. PR 255 seems to have a good performance (see picture 5). There is yet no PB 260. Some clones are severely affected by Colletotrichum like GT 1 (see picture 6).

The yields are : for Nucleus/plantation : 767 kg/ha , and for Plasma/plantation : 546 kg/ha. The average rubber area per farmer is 2,33 ha.

PTP XIII implemented a MFT (Monoclonal Field Trial), under supervision of Getas Research Station with the following clones :

- AVROS 2037 (1,397 ha)
- LCB 1320 (3,257 ha)
- BPM 1 (1,870 ha)
- BPM 24 (1,1 ha)

- GT 1 (3,4 ha)
- PR 303 (1,99 ha)
- PR 261 (3,2 ha)
- PR 300 (4,7 ha)
- RRIM 600 (1,944 ha)
- RRIM 712 (2,57 ha)
- RRIC 101 (1,32 ha)
- PR 255 (4,935 ha)

The planting was made in 1991, with planting material from Getas. In this list, one can observe that GT 1, BPM 24, PR 300, PR 303 and RRIM 712 are susceptible to Colletotrichum.

As for the former MFT in Anjungan, it is suggested to add another MFT with the relevant clones to complete the existing one. The design should be the same, as on clone in one plot of one hectare. It is suggested to include in this new MFT the following clones : in priority PB 260, RRIC 100, RRIC 102, RRIC 110, TM 5, TM 6, TM 8 and PB 280, and then, PB 235, BPM 107, PR 309, TM 4 and TM 9.

Visit to KPD rubber estate at PT Lahan Jakranawala, Nangga Pinoh.

The KPD group is also implementing a rubber forestry plantation for wood production at PT Lahan Jakranawala, in Nangga Pinoh, south-east of Sintang, with an hectarage of 5000 Ha. The group own also a saw mill and a timber concession in the zone. Rubber wood will be used for wood panel production.

6 CONCLUSION

The main constraint of the West Kalimantan province is the Colletotrichum leaf disease, due to excess of water (in particular when rainfall exceed 3 000 mm/year), high and constant hygrometry, lack of effective rainy season (no monthly rainfall < 100 MM), and, finally, locally erratic wintering, whic consequence is the stagering of the ssusceptible period of the tree to the disease on several months, instead of a very particular period. Other diseases, such as oidium, pink disease are reported. It is clear that the level of pressure of various diseases has to be assessed, depending on locations and agroclimatological zone.

The second constraining factor is poor soils, still suitable for rubber (but generally not for other tree crop except oil palm), but poor enough to delay the opening of the trees up to the 6th year.

The province is roughly divided in three zones :

- the Pontianak/Mempawah zone (probably including Sambas), with an annual average rainfall of 2000 to 3000 mm/year. This zone is the coastal zone.
- the Sanggau/Sintang zone with an average rainfall between 3 000 to 4 000 mm/year. This zone is the middle Kapuas river central plain.
- the Putussibau zone, with an average rainfall around 4 000 mm/year. This zone includes the piedmont of the Schanner and Muller mountains chains, at various altitude..

The very few clones currently available, resistant, or tolerant, to *Colletotrichum*, lead to rely on a very few number of clones to be planted. In particular, PB 260 is the most favoured clone to be planted since the last 3 years. This strategy may be dangerous and risky in case of possible development of another leaf diseases, like *Corynespora* for instance. The latter shows that priority should be given for the establishment of some Clone Field Trials (CFT) with adapted clones, in several locations, in order to be capable of proposing a certain number of clones for diversification in further clonal recommendations.

It is suggested to implement the following trials :

Clone Field Trial : CFT

It is suggested that the 21 clones of a "CFT type" in West Kalimantan could be the following :

Priority	and also
PB 260	
AVROS 2037	PB 235
BPM 1	BPM 107
PR 261 (as control)	BPM 109
RRIM 600	PR 309
RRIC 100	PR 311
RRIC 101	PR 314
RRIC 102	TM 4
RRIC 110	TM 9
TM 5	
TM 6	
TM 8	
PB 280	

PR 261 may be the control, and PB 260, as tolerant or resistant to *Colletotrichum*. It could be useful to include GT 1 as a control for the effect of *Colletotrichum*.

PB 235 should be included in order to assess its susceptibility to *Colletotrichum*.

It is suggested to implement up to 5 CFT in the following Kabupaten : Sambas (PTP and/or TCSDP), Pontianak (TCSDP), Sanggau/Anjuran (KPD group, PT Rivaco MandumNgabang), (Sintang PTP XIII) and Putussibau (the pioneer zone for rubber) (ROKKAN group).

Monoclonal Field Trial : MFT

As already some MFT were implemented in West Kalimantan, it is suggested to add complementary MFT in order to take into account all the relevant clones.

The new MFT to be implemented in Anjuran (under TCSDP management) should have the following clones : in priority : TM 5, TM 8, RRIC 101 and RRIC 102, PB 280 then, if possible, PB 217, PB 235, PR 309, PR 314, PR 330, TM 5 and TM 9. With the same design : 1 clone in plot of one hectare.

It is also suggested to add another MFT in PTP XIII/Sintang. It is suggested to include in this new MFT the following clones : in priority PB 260, RRIC 100, RRIC 102, RRIC 110, TM 5, TM 6, TM 8 and PB 280, and then, PB 235, BPM 107, PR 309, TM 4 and TM 9.

On Farm Trial : OFT

No contact were made with TCSDP officials. However, it is clear that West Kalimantan should be selected for an OFT, as it is the main zone of rubber smallholders of the island. This should be suggested and discussed at TCSDP direction level, depending on planting programme for the next years.

Environmental assessment of clone Performance Field Trial : EPFT.

As tolerance for leaf disease seems to be the main problem of the province, there is still locations, like around Putussibau, the piedmont of the Schanner or Muller mountains...where the agroclimate is not well known. We may implement in this locations an Environmental assessment of clone Performance Field Trial : EPFT, which allow us to have a better knowledge of the specific characteristics of these zones for rubber growing, and the potential constraints. The EPFT is implemented with 10 clones in order to give accurate information

about the environment from the analysis of the performances of clones selected for their susceptibility, or resistance, for a particular diseases or situation.

The table 2 gives the main characteristics of each trials.

TABLE 2 : MEAN FEATURES OF THE TRIALS

Items	CFT	MFT	EPFT	OFT
Number of clones	21	12	10	4
clone for control	PR 261	GT1 in estate	PR 261	PR 261
area per clone	0,5 ha	1 ha (up to 10 ha)	0,5 ha	1 ha
total area per trial	12,5 ha	12 ha minimum	5 ha	150 ha
number of repetitions per clone	4	0	4	25
number of trees per plot/clone	60	same as in estate	70	same as in project
density of planting	500 (7x2,8)	same as in estate	500 (7x2,8)	same as in project
statistical design	Fisher block (without any under treatment) SPLIT PLOT (with under treatment)	variance analysis, no block	Fisher block	Fisher block
undertreatment	level of stimulation	no	no	no
tapping system	D2/S2 or D3/S2	same as in estate	D2/S2	same as in project
location	PTP, estates	PTP, estates	PTP, estates	Smallholders project TCSDP
duration in years	15	minimum 10, up to 30 years	15	15
groth analysis	year 6	year 5	year 6	year 6
First clonal recommendations	year 8 or 9	year 8 or 9	year 8 or 9	year 10

MAP 2

- 1 - Pontianak from Jakarta.

Visit to PT ROKKAN group

Visit to Kalimantan Plantation Development Group (KPD group)

- 2 - *Visit to DINAS PERKENUNAN Mempawah (70 km north of Pontianak).*

Visit to the DISBUN budwood gardens of Anjungan

Visit to a nursery of polyclonal seedlings for smallholders.

Visit to a Monoclonal Field Trial (MFT), implemented by Balai Penelitian Getas (central Java), in Anjungan under TCSDP/PMU Anjungan management

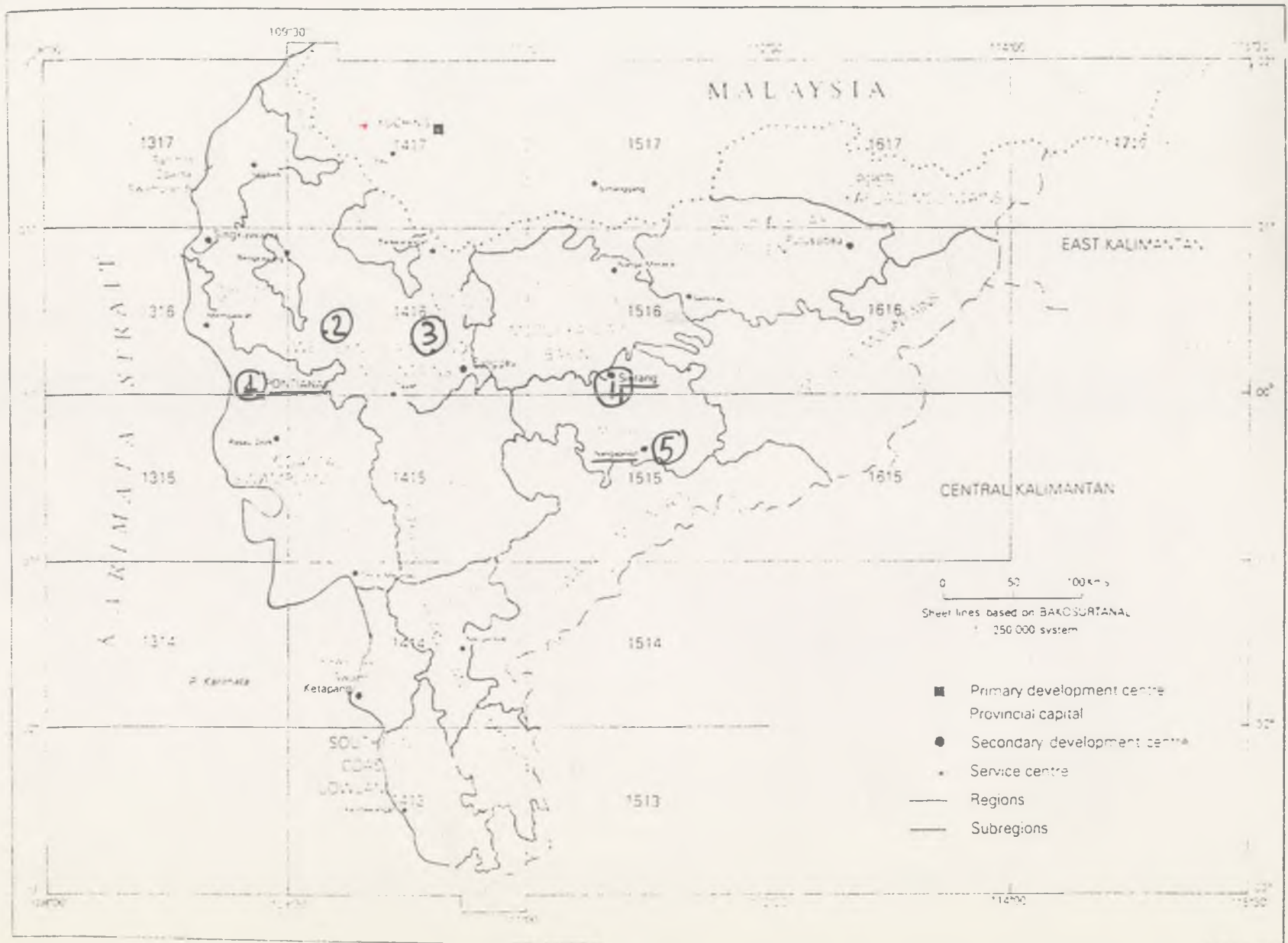
- 3 - *Visit to the trial "Screening of 100 clones for susceptibility to Colletotrichum".*

Visit to the PT WIRA Rivaco Mandum at Ngabang

- 4 - *Visit to PTP XIII In Sintang/Nanga Jetak.*

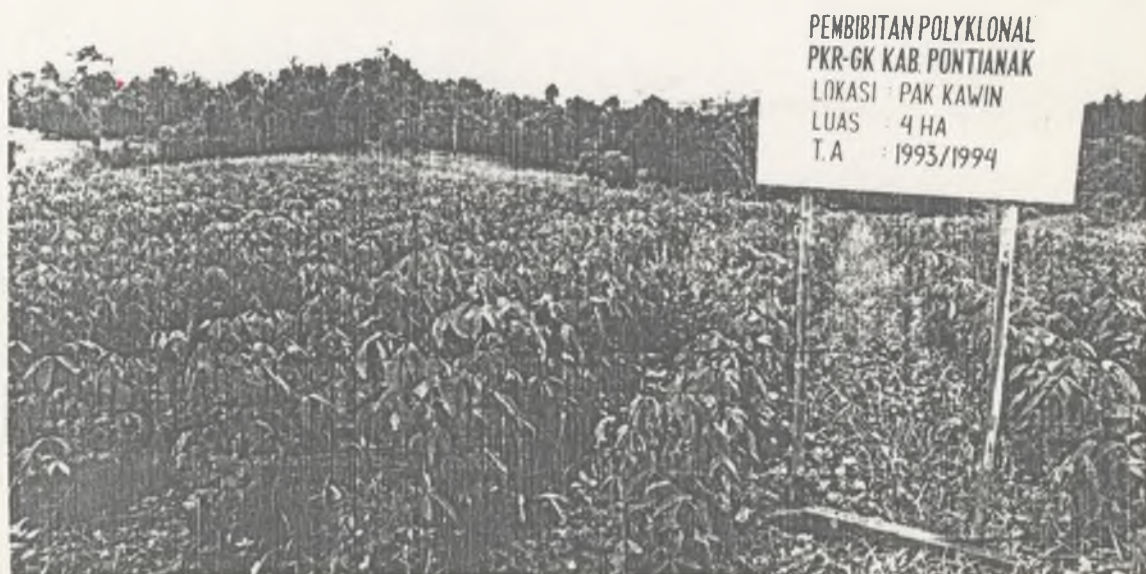
- 5 - *Visit to KPD rubber estate at PT Lahan Jakranawala, Nangga Pinoh*

map n° 2





Picture 1: *DISBUN budwood gardens of Anjungan under P4/APBD project. 3 clones : BPM 1, PR 261 and AVROS 2037.*



Picture 2 : *Anjuran/Pak Kawin : Visit to a nursery of polyclonal seedlings for smallholders*



Picture 3 : *Visit to the trial "Screening of clones for susceptibility to Colletotrichum".*

The blocks of 5 repetitions have been randomized for a total number of 45 clones. The trial was planted in October 1993. The first plot is under the sun.



Picture 4 : The second plot is under the shadow of a GT 1 plantation, same design as before, severely affected by Colletotrichum.



Picture 5 : *Visit to PTP XIII In Sintang/Nanga Jetak.*

PR 255 seems to have a good performance, however it is very susceptible to *Colletotrichum*.



Picture 6 : some clones are severely affected by *Colletotrichum* like GT 1 on this picture.

ANNEX 1

Methodological paper for the establishment of multilocation trials network for clonal recommendations in *Indonesia*

CLONE FIELD TRIAL (CTF) : A METHODOLOGICAL PAPER.

Nota : this paper is a general methodological paper for CFT for all Indonesia. The list of clones may change depending on diseases pressure and agroclimatological zones.

Presentation

Roughly, we can present the CFT :

" testing of "unknown" clones (as clones not currently widely used but promising, or well known in other zones) in known situations (in zones where rubber is allready widely cropped) : *CLONE FIELD TRIAL*".

We will define what we call "unknown clones" and see the various cases of situations.

This trial is equivalent to the "large scale field trial" of RRIM.⁷

THE CLONE FIELD TRIAL : CFT

Objective : to obtain, in the mid-term, accurate information about the main features (growth and production, sensibility to diseases, wind....) of promising clones in well known situations where rubber is already grown, like South Sumatra for example.. The analysis of the data should give fastly clone recommendation papers (5 years for growth, and 8 to 10 years for a first evaluation of potential of production). The clones can be well known clones of class I, like PB 217, PB 235, PB 260, BPM 24, PR 300 or RRIC 100, RRIC 110..... but still not widely grown clones, or promising clones (including those of class II and III,(like the TM serial), or even the most promising new clones released by the breeders.

⁷RRIM = Rubber Research Institute of Malaysia.

Plant breeding scheme at CIRAD-CP, rubber programme⁸, and the place of CFT and MFT.

PLANT BREEDING SCHEME OF IRCA/CIRAD-CP : the different level of trials				
KIND OF TRIAL	Use in the network	Number of plants per plot	number of repetitions	Main features, objectives
Seedlings evaluation field (CES in french)	NO	12	3	<ul style="list-style-type: none"> - Evaluation of clone families. - Help to choose the parents for future breeding. - apply a selection on individual value inside the best clones families. - act as a collection of genetic variability created by pollinisation.
Small scale clone field trial (CCPE in french)	NO	10 (3)*	2 (3)*	<ul style="list-style-type: none"> - to select a wide range of new interesting clones from CES with early criterias of selection.
Large scale clone field trial (CCGE in french) = CFT (21 clones)	YES	50 to 60	4	<ul style="list-style-type: none"> - to select the most promising clones in comparison with a control on an agronomic scale (clone to be planted at a large scale)
monoclonal field trial (CM in french) = MFT	YES	1 to 10 hectares	0	<ul style="list-style-type: none"> - to diversify the locations of the trials. - planted at a large scale to appreciate the behavior of clones in real scale conditions. - to identify the best exploitation system locally for each clone.

(* Formely with 10 trees in 2 repetitions, a new design take place in 1992 with 3 trees in 3 repetitions)

⁸The former IRCA, Rubber research Institute of CIRAD, is now the rubber programme of CIRAD-CP, the perenials crops department.

The CTF is the step to assess the adaptability of a clone to the local conditions (soils, climate, management...) before large scale use and MFT. The CFT follows the "small scale clone field trial" (CCPE under french terminology⁹, see following table) where it is impossible to have reliable data on incidence of tapping panel dryness and wind damage as well as level of production (yield/ha).

Generally, the CFT is used to test the best promising new clones coming from the national research or coming from others countries trough programmes of cooperation (for example : IRRDB exchange of clones). The clones used in CFT are new or promising clones. We understand as "new clones" the clones which may be well known in other zones or countries , or already in research stations, but not currently widely grown in estates or by smallholders, i e without references on a large scale use. For instance, typically, "new clones", as not yet widely used clones, are, in South Sumatra and Kalimantan : PB 217, PB 235, PB 260, BPM 1, BPM 24, the TM series, RRIC 100, RRIC 110, PR 300, RRIC 712.....

In the case of Indonesia, the CFT will include clones which are well known in certain zones of Indonesia (North Sumatra in private estate..., or already grown in PTP), or in research station (Sungai Putih, and Sembawa) but "unknown" in others main rubber areas and may be growed on a more wide scale and which has not been commonly used in Indonesia. We consider here "unknown clones" as clones which we don't know the potential and the adaptability to the various conditions of the country. The current clone recommendation blue book¹⁰ is based on a rough theoretical analysis of agro-ecological zones, and may be improved through the implementation of a network of trials throughout the country, in order to assess, through a real physical experimentation, the potential and the suitability of these clones.

The CFT, in that case, should include clones from the class I, in order to verify practically their real suitability, but also clones from class II or III to identify promising clones, for the future. The choice of the clones must include the fact that we are searching for immediate solutions, with a clone recommendation system efficient as soon as possible..

⁹See "Amélioration génétique de l'hévéa : situation actuelles et perspectives 1992-1993", (" Rubber genetic improvement and breeding, perspectives for 1992-1993"), from A Clément-Demange, M Gnagne, H Legnate and D Nicolas, IRCA/CIRAD, october 1992, which constitute the french reference in term of methodology for the rubber breeding programme, including the clone behavior field trial.

¹⁰Plant Breeding Conference, 1990.

The CFT permit a comparison between these promising clones and a clone considered as a reference (GT1, or PR 261 for example). The reference may be different depending on the user (estate or smallholder).

The CFT include a main treatment : the clones, and may include two under treatment : the exploitation system (high and low level), in order, first of all, to give to any clone the same opportunity to be selected, regarding its kind of metabolism and its requirements in term of stimulation, and, secondly, to express any possibly specific fragility to tapping with stimulation.

The CFT permits a relative comparison between the clones and the controls in one location, but one should be very careful for an absolute comparison in between CFT from different locations.

Some features

the implementation CFT is modular :

- the implementation of the CFT network can be progressive, in several steps, at different times, and spread off on several years.
- the locations of CFT can be spread off depending on the needs and on a typology based on agroecological zones.
- the network can be completed by monoclonal field trials (MFT), see later on, : a trial with a minimum of 1 ha, up to 10 ha, with one clone to study the behavior of this clone in real conditions : in estates or in smallholdings. This option is chosen for clones with a high level of confidence for their performances (BPM 24, PB 260, RRIM 712, RRIC 100...). (see later). The purpose of a combination of CFT and MFT is that CFT permit the identification of the most suitable clone for a given situation and the MFT permit to identify the best tapping management for each clones. This combination is highly suitable for estate.

Methodology :

Experimental design

CFT with a limited number of clones (8 clones)

The design in this case could be : an area of around 6 ha, with 1 control (GT 1 or PR 261), and up to 8 clones (the best promising among the available

ones, class 1, and with the highest probability of adaption to local conditions), in Fisher block design, with 100 to 120 trees per plot, with 4 repetitions.

The selected clones should be known and their tapping management already assessed.

This design is hardly adaptable to farmers conditions but can be implemented in well controlled situations, like projects : for example a TCSDP project with experienced farmers and extensionists.

Regarding the number of available clones to be tested in Indonesia, this design seems not be adapted to the need and the following design will be preferred.

CFT with 21 clones

Experimental design

This design is probably the most suitable for Indonesia regarding to the number of clones to be tested. This design is classically used in estates or under well controlled situation.

CFT is on an area of 12,5 ha, with 1 to 3 controls (including GT1, PR 261, and up to 21 clones, in Fisher block design without under treatment or split-split with under treatment (maximum 2 under treatments), with 50 to 60 trees per plot, with 4 repetitions. The block should have even lines of trees. The borders should be the same clone, but are not included in the trial for the measures.

Density of plantation

The recommended density is currently around 500 trees/ha, with for instance 7 m x 2,8 m.

Management

The management, in term of maintaining and, mainly, exploitation system, should be the same as it is on the estate where the trial is implemented. The opening for tapping is decided clone by clone, when at least there is 200 trees tappable per hectare. The date of opening are every 6 months at regular date , depending on the classical date of opening for each zone.

For known clones in a CFT, the exploitation system will be the commonly used system suitable for these clones (no under treatment).

In case of the use of non well known or new clones, it could be necessary to include an under treatment (intensity of stimulation for example). The design is then a split-plot. The under treatment must take into account the kind of clones, regarding to the typology of metabolism (high, medium and low). In case of under treatments, they are the same for all the clones. A suggested under-treatment can be, for instance, 4, 6 and 8 stimulations/year.

Every time a clone is obviously not suitable, it can be removed from the trial, it means that we can postpone the monitoring and data collection for this clone.

The CFT permits to identify the best suitable clones under a given exploitation system, but not to assess what is the best exploitation system for each clones (which could be identified with MFT).

The monoclonal field trial (MFT) can permit, in the same time, to determine which exploitation system is the most suitable.

Duration of the trial : 15 years

Data collection

- control of planting : at 3 month, and at 6 month, with replacements of those which are dead or missing.
- growth : girth every year at 1 metre, and 1,7 m after beginning tapping.
- measure of virgin bark thickness.
- measure of the bark thickness the 7th year after opening, on regenerated bark at the upper part of the panel. The measure can also be done for every clone after 3 years of tapping.
- the general framework of the tree, its canopy, its ability to cover the land and to shadow in between the rows in order to control the weeds (particular for Imperata in smallholders conditions)..
- susceptibility to wind : after 3 years.

- production level assesement for a given exploitation system : it will be provided on a annual basis. The DRC is calculated with a sample of 5 kg, for each exploitation system (if there is under-treatments) but will be the same for all the clones. If harvested as cup-lumb : production control twice a month. The best solution is probably the use of polybag for cumulate tappings, if it is available.
- following of the production throughout time : a first assessment of the productuion level is made at 10 years, the global analysis can be made at 15 years.
- response to stimulation.
- latex plysiological charateristics (diagnostic latex = DL). Possibly on a CFT, in particular if there is under-treatments. In case of an association with CFT and MFT, the DL can be implemented on MFT. Samples of 7 trees are taken for each treatment or under-treatment. 3 repetitions of DL analysis are done for each sample.
- susceptibility of leaf diseases : colletotrychum, corynespora, oidium.... Every year.
- susceptibility for tapping panel dryness , from a year after opening.
- susceptibility to root disease (fomes....). Every year.
- susceptibility to panel diseases.
- susceptibility to others diseases (Pink disease, phytophtora, die-back.....). Every year.
- susceptibility to wind dammage. Every year.
- wintering, date, number of defoliation.

Exploitation system

The tapping system is choosen depending on local situations and users (estates or smallholders, with and/or without stimulation, or two different tapping frequency, if there is under-treatments). The exploitation system has to be similar to those used by the farmers (1/2 S D/2) and estate (1/2 S D/3 with

stimulation for example). This topic can be discussed with estate manager or the smallholder.

All clones are tapped the same way. It would be preferable to use the same tapper for the same block, in order to reduce the differences of tapping between two tappers inside the same block.

Choice of clones

Suggested list of clones :

BPM 1
BPM 24 (in zones without Colletotrichum)
PBM 107
PB 217 (in zones without Colletotrichum)
PB 235
PB 260
PB 255 (in zones with no risks of wind damage)
PB 280
PB 314
PB 330
RRIC 100
RRIC 110 (in zones with no risks of wind damage)
PR 300 (in zones with no risks of wind damage)
PR 255 (in zones without Colletotrichum)
PR 303
TM 5
TM 6
TM 8
TM 9

CONTROLS

GT 1 (in zones without Colletotrichum)
PR 261

TOTAL : 21 clones

Miscellaneous :

- clone purity : has to be fully certified : visual control with appropriate technician in fully certified garden, or in collection garden, electrophoresis verification in other cases, if any doubt exists.
- availability of budwood : programme of budwood garden : schedule a high level of availability of planting material

Locations

In zones of replanting, where rubber is already cropped and well developed. The agro-ecological zones are well known and identified. A high level of knowledge of rubber cropping has been acquired. Typically : South Sumatra and West Kalimantan, and North Sumatra. The farmers are in a dynamic of replanting and are looking for an increase of productivity through adoption of improved planting material. The land tenure has been secured through personal ownership. They are ready to invest in their plantations and buy certified budded plant.

We can expect also the same attitude with the farmers in location where rubber is newly developed through well controlled smallholders project like TSCDP (the case of West-Kalimantan in particular).

Expected output

- a good assessment of the growth (before and after opening), of the homogeneity, of the susceptibility of the clones to the leaf diseases, of foliar density and of the framework of the trees.
- a good assessment of the annual production for a given exploitation system, of the evolution of this production throughout the time, of the response to stimulation, of the susceptibility to tapping panel dryness. We must however admit that, generally, the production level is over-estimated, up to 20 %, in comparison with estate conditions, due to the quality of monitoring of the trial (from observations in Cote d'Ivoire, SOGB¹¹, where estate field and CFT have been compared).

¹¹SOGB/MICHELIN is one of the biggest estate in Cote d'Ivoire, generally considered as very well managed with an average yield of 2200 kg/ha.

- a good assessment to wind damage susceptibility, but this criteria can be improved and better assessed in MFT.

Reports

An annual report.

A first complete report of growth after oppening all the clones (5 to 6 years)

A complete analysis and assessment of clones potential and adaptability at 10 years.

A final report with full analysis at 15 years.