FARMERS'STRATEGIES AND IMPROVED RUBBER AGROFORESTRY SYSTEMS

Support mission report

Support mission to SRAP/CFC project/ICRAF
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Eric Penot, CIRAD-TERA, August 2005.

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Key persons encountered during the mission

Meine van Noordwijk Regional Coordinator, ICRAF
Gede Wibawa Project Manager and Head Research Bureau, IRIEC
Laxman Joshi Project Manager
Ilahang Field Manager, West Kalimantan
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Report content

1 Introduction

The first phase of the Smallholder Rubber Agroforestry Project (SRAP) took place from September 1994 to June 1998. The project was implemented jointly by CIRAD and ICRAF with the collaboration of GAPKINDO; IRRI and IRD. Funding was provided by USAID, ICRAF, GAPKINDO and CIRAD. The SRAP set out to:

- Develop improved rubber agroforestry technical pathways through on-farm trials taking a participatory approach with local farmers in 3 provinces. Development of such technologies and their integration within local farming systems with a future further a development perspective was based on a dual sustainability objective:
- economic sustainabilty, through diversification of incomes and
- physical sustainability through reintegration of some of the biodiversity of forest or agroforest origin, maintenance of a forest type environment with all its advantages in terms of soil fertility, water management, erosion control, and rehabilitation of degraded land of the *Imperata* grasslands type, etc.).

- Monitor issues concerning farmers' adoption of innovations and farmers‘ strategies on technical change

The second phase of SRAP occurred from 1998 to 2004 with D Boutin (CIRAD-CP) as team leader.

With CIRAD's withdrawal in 2004, the launch of the project on "Improving the productivity of rubber smallholdings through Rubber Agroforestry Systems", funded by the CFC, made it possible to continue activities in this field. This first technical support mission is one of the 6 CIRAD support missions allowed for under this project. It was undertaken with JM Eschbach, from CIRAD-CP with the following purpose :

- inspecting field trials, holding discussions and making recommendations, particularly for tapping (JM Eschbach),
- presenting and initiating technical/economic simulation with the software “Olympe” developed by INRA and CIRAD (E. Penot).

The Rubber Agroforestry System, or RAS, trials are grouped under three major topics:

- trials under conditions of natural regrowth in the interrow (RAS 1)
- intercropping trials (RAS 2)
- *Imperata* control trials (RAS 3)

A On Fral Trial network (OFT) was set up in the three provinces of West Kalimantan, Jambi and West Sumatra (100 fields, a smallholder field equals one replicate with several plots depending on the treatments).

The network set out to test a certain number of technical hypotheses under true conditions, based on three agroforesty systems with increasing levels of

intensification, inputs and labour depending on the strategies of the different communities and ethnic groups in the project:

- Dayaks and Javanese transmigrants in West Kalimantan,
- Minangs in West Sumatra and
- Malayus in Jambi.

The following comments are based on observations and interviews with farmers carried out during the fields visits. The analysed data have been provided and compiled by ICRAF in West Kalimantan and Jambi, in particular with an Excel file which contains all the agronomic observations in the 488 trial plots, as it was proposed by JM Eschbach during the mission implemented in 2000. Due to lack of time, it was not possible to visit the trials in West Sumatra.

The mission has been implemented in 3 phases:

i) a field visit of one week in 2 provinces where SRAP had previously developed its activities (with new on farm trails developed by ICRAF/CFC) : West Kalimantan and Jambi,
ii) ii) a training session of 3 days on “Olympe”, a farming system modelling and simulation tool, organized by ICRAF with 23 participants, and
iii) iii) a debriefing in Bogor. The mission was composed of Gede Wibawa, Laxman Joshi, Eric Penot and Jean Marie Eschbach with the participation of ICRAF staff.

The fields visit was very interesting as many SRAP on-farm-trials (OFT), planted in 1995-96, in partnership with farmers, are now in production. So it is possible to make several conclusions about RAS experimentation (improved Rubber Agroforestry Systems) at least at 2 levels:

i) first of all about the various agroforestry practices tested in RAS 1, 2 and 3 during the immature period (5 to 7 years according to systems) and
ii) ii) about the beginning of the production period: most trees have now between 2 to 4 years of tapping showing several important problems. Meanwhile, some news trials are currently being planted that have been as well visited on which we had the opportunity to provide some advices.

2 A global review of RAS trials

A more detailed review on trials results is presented in JM Eschbach complementary report. More global views and issues are presented here.

2.1 Agroforestry practices during immature period for RAS systems.

The situation and behaviour of farmers from the on-farm-experimentation network (more than 100 farmers) are very different in Jambi and Kalimantan provinces.

In Jambi

Malayu and Minang farmers in Jambi have been interested by RAS 1 low management during immature period mainly in order to save inputs costs and labour requirement for weeding during that specific period.

But all farmers have slashed the bush (forest re-growth) in the inter-row, sometimes as soon as the third year, generally at opening (6-7 years). Plots look like monoculture after opening. Very few other fruit or timber trees have been planted or selected from forest re-growth. Obviously, if labour and capital saving during immature period have interested most farmers, agroforestry practices during production period does not seem to develop any interest for various reasons.

RAS 2.5 trials in Muara Buat with cinnamon have all failed due to very poor maintenance as well as very strong attacks from monkeys and, most important, pigs. The original idea of combining cinnamon and rubber was good in a sense that both crops are complementary and labour invested profit to both crops.

Meantime, Cinnamon prices, which were very high in 1995 (6 000 Rp/kg) with a very large planting dynamic, has dropped down to 2500/3000 Rp in 2005 leading to an almost complete abandon of this crop (meanwhile, the rupiah value has considerably decreased).

Other RAS 2 systems have not well been implemented as protocols have been poorly followed by farmers. However some plots were very promising in 1998, poor tapping and jungle rubber like tapping practices applied on clones have literally destroyed the trees production potential in only 4 years in some fields (Pak Saer and relatives).

In this cases, short term strategy based on immediate income combined with poor knowledge on tapping practices with clones, has almost destroyed the potential of trees.

In Muara Buat and Rantau Pandan (Jambi), other activities such as illegal timber logging provides other interested opportunities to farmers who eventually where only interested by clonal planting material rather than agroforestry practices, at least in the long term. In Sepppungur, farmers have been keen to low management in the inter row but then move to monoculture after tree opening.

In other words, agroforestry practices have been used only during immature period. For some farmers, it is now obvious that their strategy was to acquire clonal planting material whatever type of agronomic practices.

Pigs are really a problem for RAS establishment (idem for clonal monoculture if not properly monitored) in Jambi as local people are Muslim and pigs are not traditionally eaten.

The situation is quite different in Kalimantan as pigs are eaten by local Christian population. The use of clonal high stump of 2 or 3 years may be explored as a potential possibility in Jambi and all Sumatra as well. Such technique leads to delay

planting at least 2 years after preparing the planting material and requires training and skill for farmers.

There is no RAS 3 trials in Jambi.

left : 2005 : RAS 1 Aljupri's plot, poor stand. Evolution to monoculture.
Right : 2005 : RAS 1 Ismael's plot; secondary vegetation in the inter-row : looks like RAS1 should be after opening.
Rantau pandan.

2005 : RAS 1 Mawi Lutan's plot, evolution to monoculture.
Seppunggur

2005 ; RAS 2 Yani's plot, evolution to monoculture
Rantau Pandan

Left, 2005:RAS 2 Sabran's plot, very poor management, a clonal jungle rubber like.
Right 1997 : RAS 2 plot Saer's plot, intercropping with rice, fruits and various vegetables plants.

2005 : Sabran's plot,RAS 2 very poorly managed and tapped : severed destruction in the plot. Seppunggur

In West Kalimantan

In West-Kalimantan, the OFT network is more developed, with 60 plots, than in Sumatra (32 in Jambi and 8 in West Sumatra that have not been visited), conclusions are quite different.

Globally, Dayaks farmers are more keen to maintain agroforestry practices either during immature period or production period but not for all of them .

In transmigration areas :
Javanese transmigrants (in the village of Trimulia for instance), have used agroforestry practices during immature period only with RAS 2 and 3 but shift to monoculture after opening as many associated trees have died in a very harsh environment: poor soils, high pression of alang² and limited labour and capital for intensification. Their behaviour is very similar to that if Jambi.

In other words, we can consider in that case that agroforestry is only an opportunity at a certain period of the crop but is not a strategy in itself. The global aim is to increase income generation through clonal rubber mainly without particular attention to associated trees or crops after opening.

Meantime, most farmers have also adopted oil palm since 1998-2000 with 1 ha/farmer through a local project with local private companies. Oil palm and rubber on a total farm area of 2,5 ha constitute probably the best combination in terms of income generation and risk management in order not to be dependant on one crop only as it was often the case in transmigration areas before

Farmers' main objective is to be not dependant only one crop in particular after the rubber crisis of 1997-2002 when prices where particularly low for a long period (almost 5 years).

***Imperata* grassland rehabilitation**
RAS 3 trials provide evidence that it is possible to install a rubber plantation under very high alang² pressure with limited inputs (4 to 5 litres of Round-up for the first 3 years, some fertilizers on rubber) and limited labour (divided roughly by two under AF management compared to that of monoculture). What is at stake potentially is the rehabilitation of large piece of land currently let for oil palm or Acacia mangium only.

The best systems seems to be the combination of *Flemingia congesta* as a non-viny cover-crop with selected fast growing trees (FGT) such as *Gmelina arborea, Acacia crassicarpa* and *Acacia mangium* (with as well the classical associated fruit and timber trees). Such a combination, providing very rapidly shade and land covering, is very effective on alang² and at least provide similar results to control plot with *Pueraria phaseolides* or *Mucuna spp*. Controlling alang² at low cost is the main priority for *Imperata* savannah rehabilitation in these areas. Other non viny covercrops, including local species, should be tried in order to open up the range of possibilities and combinations

However, planting material availability and quality for *Flemingia c.* is very poor. Another problem is the fact that *Acacia mangium* is growing very fast event in very poor soils and need to be properly controlled. In other words, *A mangium* trees should be cut as soon as their canopy is slightly above that of rubber. That occurs generally around the 4th year after plantation.

Rubber, whatever type of cropping systems RAS 2 or 3 or monoculture, is now widely used in transmigration areas (Trimulia and Pariban Baru villages in SRAP area) and do transform the landscape. Annual burning is disappearing leading to secondary forest regrowth, however bush is very poor (Melastoma spp, ferns ….). But the dynamic of alang² is broken and recovering for cropping in under way in may areas. The abandon of burning on a large scale enable farmers to take the decision to plant without major fire risks.

But in all case, these Fast Growing Trees (FGT) providing shade, whatever trees in different conditions, should be cut as soon as their respective canopies is concurencing that of rubber, generally after 4 to 5 years after planting.

To that respect, again, *Acacia mangium* might be potentially dangerous if not cut as its growth is by far more rapid than rubber. A tree left in the plot after 8 years has a canopy far above that of rubber and wide spread dangerously seed and young plants that become very aggressive.

At least, *A. mangium* should not be used alone, but combined with *Gmelina, A Crassicarpa* and other FGT. New combination with other types of FGT and covercrops, preferently with non viny species, could be explored in the very next future as RAS 3 concept for I*mperata* grassland rehabilitation is a real challenge.
It is as well necessary to try to propose more plants in case one plant become susceptible to a disease or a particular threat. In some areas, *Gmelina arborea* seems to suffer from a leaf disease.

RAS 3 experimentation paved the way for an interesting alternative for *Imperata* grassland rehabilitation but combinations of potentials plants should be extended.

Another important point is the adoption of oil palm through local project (with private companies) in transmigration areas (1 ha without land compensation), or 2 ha in other villages (with land compensation that modify strongly farmer' strategies. This evolution has been already discussed as early as 1999 in a previous report with focus on the following question: are we moving to substitution or complementary between the 2 crops ? It seems clear that after 7 years of very low rubber prices, rubber is still in mind of most farmers providing ground for the complementary hypothesis.

In such case with oil palm, farmers jumped on that very profitable opportunity, leading to less interest in RAS systems, at least for a certain period. However, if associated trees could have survived in Trimulia for instance, farmers would have maintained "RAS 2 like" systems. Such trend should be monitored in detail in order to see impact of new crop on other traditional crops, either in monoculture of in agroforestry. It seems clear that farmers would have missed an important opportunity if they decided not to adopt oil palm. We should probably try to see and monitor that evolution in the

mid-term keeping in mind that oil palm is the best opportunity farmers have to increase significantly their income and, therefore, be able to invest into new clonal rubber plantations or rehabiliting their ageing jungle rubber into clonal plantations.

This is to say that caution should be used in the current trend analysis of farming systems evolution. Short term impact decisions does not implies that farmers do not have a long term strategy. If agroforestry practices have still technical and economical advantages, beside their traditional sustainable and environmental advantages, then farmers will maintain them and keep them as part of their technical possibilities.

2.2 Agroforestry practices during production period for RAS systems.

In Jambi, most farmers do not apparently favour associated trees in their RAS plots. A small number of trees are effectively kept. Most plots have now a “facies” of monocultuture.

Dayaks farmers in Pariban Baru have maintained a large number of associated trees with rubber in production. Therefore, the RAS 2 (or RAS 1 later enriched) concept is largely adopted in this area as already seen in the village of Sanjan as soon as 1993 in former SRDP plots. Meanwhile, Dayaks farmers in Embaong, already familiar with clonal rubber with their SRAP plot planted in 1987, have maintained RAS 1 agroforestry practices during immature period and then shift to monoculture after opening with a notable exception of one farmer who planted (or selected from re-growth) more than 200 associated trees in his RAS 1 rubber plot after cleaning at opening. This farmer is very much like those of Sanjan village (a close village where 30 % of SRDP farmers have developed such association, documented in a paper in 1997 by E Penot/W Shueller). In other word, in that case, the farmer has adopted RAS1 low management during immature period, and then shift to RAS 2 management during production period. We should later record if other farmers will follow that trend.

RAS 1

In RAS 1, we also observe a wide range of forest re-growth types with probably less trees than in the original jungle rubber, at least with different plants dynamics, as rubber canopy is close after 5 years (5 to 10 years in jungle rubber). We did observed in the past very poor forest re-growth in some plots, in particular in Seppungur. Impact on RAS biodiversity evolution is highly dependant of the state of the original plot as well as the environment that provides, or not, seeds. Seeds stok in soil after slash and burn is probably very significative.

In other words, biodiversity conservation in the inter-rows, comparable to that of the original jungle rubber, as originally scheduled in the RAS 1 concept, seems to be over optimistic. Biodiversity will probably be, at least, the “usefull” biodiversity with fruit and timber trees. We still need to wait some more years to see how inter-rows will be managed but at least, maintaining a forest like vegetation does not seem to be in favour for most farmers. Beside, maintaining such a vegetation increase fomes

risks and might have a negative impact through the de development of panel phytophtora.

SRAP farmers in Kopar and Engkayu have, as well, follow quite well the RAS 1, 2 or 3 protocoles and their feeling is largely positive for such type of management for the immature period. They have all adopted oil palm with 2 hectares per farmer in 1999. Therefore, interest for agroforestry practices during production period has largely decreased in that specific case.

RAS 1

Left, 2005, RAS 1, Tinus's plot, Engkayu : poor management, high losses of trees, clonal jungle rubber looking like.
Right, 2005 ; RAS 1, Embaong, a real RAS 1 with vegetation in the inter-rows.

RAS 1

Above: 2005, Embaong, evolution from RAS 1 to monoculture.

Below, left, 2005, replating or forest regeneration with local weeding in the inter-row : evolution from RAS 1 to RAS 2 with fruit and timber trees.
Below, Right , 1997 ; RAS 1 in Engkayu : forest regrowth in the rubber inter-rows. No *Imperata.*

RAS 2

Most RAS 2 plots have still a large number of associated trees, but on a very heterogeneous basis. Therefore, a complete recording of associated trees (planted, dead, replanted or selected from natural re-growth) should be done in order to have a detailed image of the current situation.

RAS 2

Left, 1997: Engkayu, Andreas's plot, RAS 2
RIght, 2005 : same plot : the "ideal" RAS 2 with associated fruit trees.

Left, 2005: Engkayu, Gabriels's plot, RAS with a limited number of associated trees
Right, 2005, Engkayu, Gabriels's plot, Clonal comparison RAS 2 trial, poor management, very few associated trees and evolution to RAS 1.

RAS2

Left, 2005, Petai and Rubber canopies in RAS 2. Pariban Baru, Local Transmigration area.
Right; same plot : competition of *A mangium* against rubber after 10 years.


Left, 2005, RAS 2. Pariban Baru, Local Transmigration area. Few associated rubber trees , evolution to monoculture.
Right, 2005. RAS 2. Pariban Baru, Local Transmigration area. High number of associated rubber trees.

2005, RAS 2. Pariban Baru, Local Transmigration area. Average number of associated rubber trees.

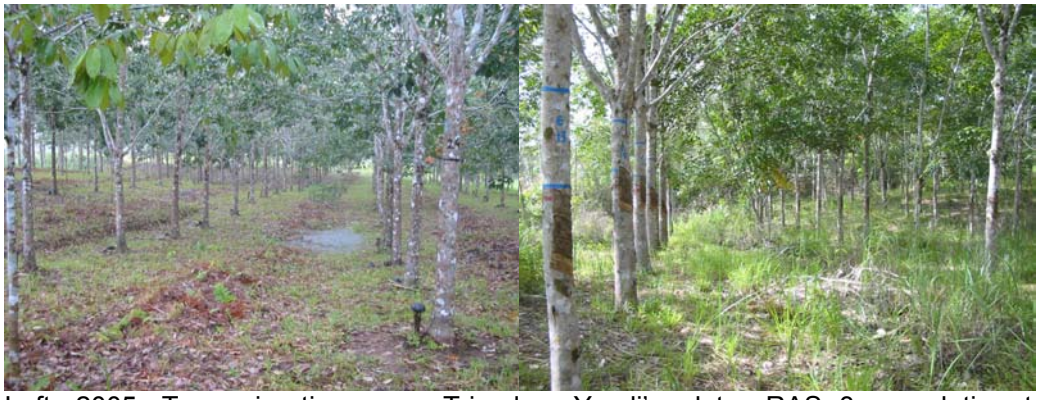
Same plot in 1995 :second year after planting with rice intercropping.

RAS 3

If the struggle of rubber trees against Imperata has been successful, it seems that it is not the case for associated trees. The minimum labour and maintenance applied on inter-rows, permitted by the combination of FGT and cover-crops has been generally quite deadly for associated trees that cannot overcome competition and low maintenance. The association with associated trees should be revised, either though adoption of very rough plants able to stand such harsh conditions, or though a specific maintenance for fruit and timber trees, which does not seem to be favoured by local farmers. Another possibility is to intercrops timber trees after canopy closure, but the delay of timber trees to rubber may be difficult to manage at the end of rubber lifespan when associated timber trees may not be sufficiently developed. Then, it seems possible with medium lifespan species such as teak or Nyatoh (20 to 30 years maximum).

RAS 3 types

left, 1997: Transmigration area: Trimulya: Margono's plot RAS 3 with *flemingia congesta* and associated trees (fast growing tress and some fruit trees).



Left, 2005: Transmigration area: Trimulya, Yasdi's plot ; RAS 3 : evolution to monoculture
Right, 2005 ; Kopar, Experimental first RAS 3.1 : evolution to monoculture, poor growth.

Left, 2005, Kopar, RAS 3 : Stepanus's plot; evolution to monoculture.
Right, 2005, Kopar, RAS 3 : Stepanus's plot; evolution to RAS 2 with associated trees.

Conclusion

To summarize, agroforestry practices have shown great interest for farmers in Kalimantan during immature period and most keep on during production period with different level of motivation and interest according to their new situation, adoption of oil palm being probably the most determinant factor. The second factor is the local agro-ecological conditions and tree management linked with associated trees survivability.

RAS 1 may evaluate later on in RAS 2 type. RAS 2 may remain a RAS 2 if associated trees do survive and produce. RAS 3 will evaluate in RAS 2 if associated trees do survive. In all cases, if associated trees do not survived, nor the forest re-growth in RAS 1, all systems shift to monoculture more or less enriched with few species. (see figure 1)

There is still a great scope in double spacing systems that have not been initially tested in SRAP. Experiences in Thailand, Sri Lanka, Vietnam and now Cambodia shows that double spacing with 15-18 meters between several rubber rows enable to grow sunlight timber of fruit trees with a good level of production such as Durian, Rambutan, Duku etc.…In that case, such systems are very intensive and required a fair amount of lab our for maintenance during the long immature period of both rubber and fruit trees. If such systems were irrealistic 12 years ago, trends and minds have changes with the introduction of oil palm and new socio-economical conditions. Some trials should be developed in order to test the feasibility of such systems, in particular in areas close to cities with easy access to markets.

Figure 1 RAS 1 evolution and potential dynamic

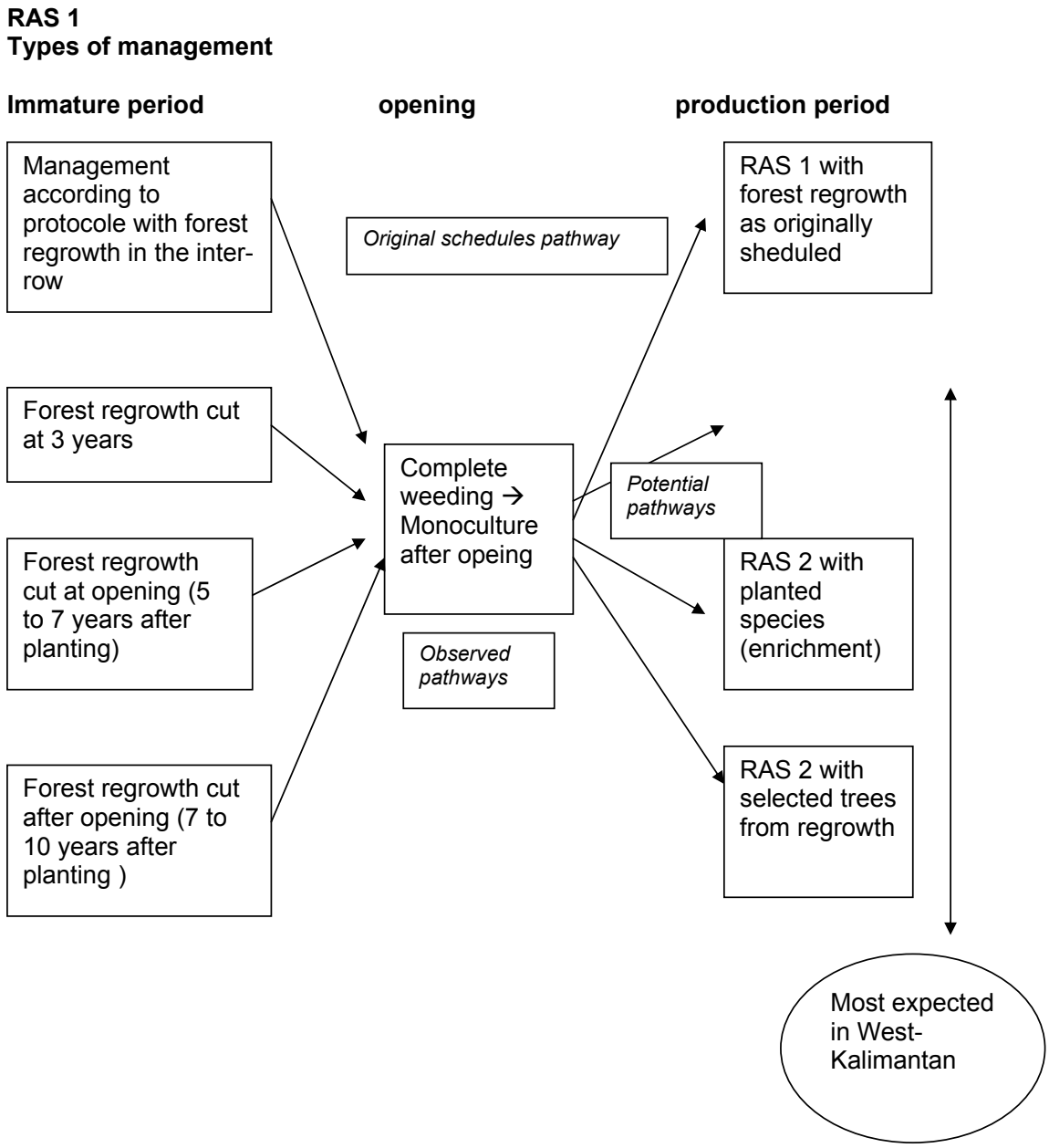
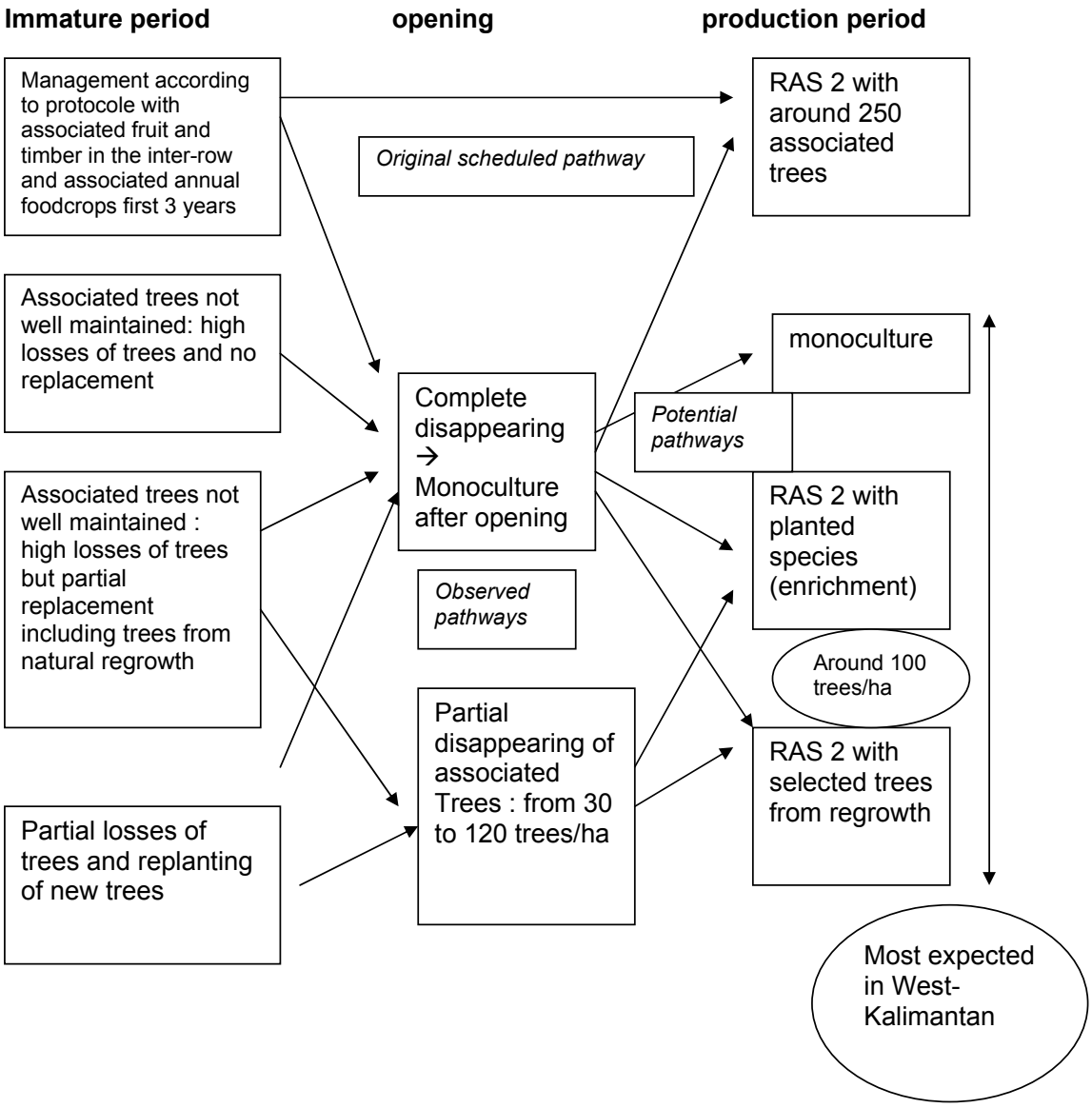


Figure 2 RAS 2 or 3 evolution and potential dynamic



2.3 Common agronomic features and problems to all RAS plots

However, some common features and problems have been observed in almost all plots.

Fomes

White root disease is the main problem as RAS 1 systems (or any other systems) established after jungle rubber clearing show high occurrence of *fomes* due to tree and vegetation decomposition favouring the disease. This has a very strong impact as the number of trees in production is decreasing as fast as trees are killed by the disease which widespread rapidly without proper treatment. *Fomes* treatment seems to be the number one priority for conservation of the production potential.

Phytophtora

Panel *Phytophtora* is relatively present. It is not clear if associated trees or vegetation in the inter rows have a significative impact on such disease, however we know that bush in the inter row is favouring it. Treatment is easy ad not very expensive however processing many trees can be labour consuming. We have so far no indication of what so ever real effect on production but the reliable data set of plot production should provide some indication when properly analysed with details on current plot situations.

Phytophtora panel disease.

Pink Disease

So far, pink disease has not been observed as a real potential threat for rubber production with PB 260, a very susceptible clone to that disease.

In conclusion

In other words, a complete assessment of plots situations should be done in order to link growth and production data with *fomes, phytophtora* and potential competition of associated trees (growth, height, canopy areas and production..). It seems very important to identify if some agroforestry practices have effectively an impact in production phase on diseases and may jeopardize rubber production.

2.4 Associated trees in RAS 2 and 3

Concerning the associated trees in RAS systems, we have now a pretty good idea of the trees to be recommended or promoted (at least according to growth performance and survivability) and those that should be not recommended. However, RAS systems are by definition very dependant on local ecological conditions as well as market factors (access to market as fruit are very perishable products). Extrapolation to other areas should be made carefully. For instance, in West Kalimantan, Petai seems to grow well in Engkayu village when it is obviously not adapted in Pariban Baru village with different climatic and soils conditions. A very interesting point is that timber trees are now largely favoured and adopted. It was not the case in 1995. This is a very favourable point as some timber trees are obviously more adapted in RAS systems with relatively few competition to rubber.

The trees that can be recommended so far are the following fruit trees: durian, tengkawang, cempedak, pegawai, pinang, and timber trees: medang, belinting, sambing, meranti, keladan, majau, lerina, belian… Some other trees may be interesting but their integration should be limited due to potential growth competition such as jengkol, nangka, red nyatoh…..

Some trees might be interesting but soil condition seems to play an important role and therefore may lead to different level of success such as petai. For some trees, such as Rambutan or duku, effective production need to be recorded to see it there is effectively a potential or not. Eventually, some new trees should be tried in observation plot to observe their behaviour under RAS conditions such as teak, salak, kayu legei, other types of shorea spp…

Fruit production level when in association with rubber

There is no sufficiently detailed indication on associated fruit trees production, as well as timber associated trees growth: this is e very important point as part of the total expected income is provided by associated trees at the conditions that there is an effective production.

RRIC 100 and BPM 1 seem to have a relatively better canopy that PB 260 and RRIM 600. Clonal diversification is very important as many potential leaf diseases could emerge as seen in other region (Cameroon, Gabon..). Currently 3 clones are adapted but more should be tried in local conditions. The new observations plot will partially answer that question with the introduction of timber latex clones.

New observation plot established in 2005

The mission has visited as well the plots where new trials will been established in 2005. We should more talk about “observation plots” rather than “trials” as the number of replications is often limited and enable only “observations”. However, such observations are very valuable to implement in a second stage more reliable and relevant on-farm-trials.

2.5 Preliminary conclusions about RAS

In conclusion, 10 years after planting, we know can produce some technical recommendations about RAS patterns as on-farm-trials provide us a wide set of results. Farming system characterization and modelling and impact surveys have been as well conducted that enable us to understand farmers’ strategies about RAS and agroforestry practices with rubber as a whole. Papers have been released in the past but it seems that is time to release may be some final conclusive papers about RAS including the latest data that have not been yet published whatsoever form.

More detailed information on growth will be provided in J.M. Eschbach ‘s report.

2.6 Production of improved planting material by farmers

This programme has been launched in 1996 with the establishment of community budwood gardens with 4 clones, managed locally by a farmers’ group (kelompok petani). The experience has been first documented in 1997 by W Shueller fro kalimantan. Since that time, few information has been collected and it should be interested to trace now the evolution of the use of these budwood gardens, the real diffusion, the quantity of planting material effectively produced and planted, for which systems…does that experience generates he creation of private nurseries such as that of Pariban Baru .

A local survey with methodology used and developed by W Shueller in 1997 could be very useful as planting material production is still a crucial issue for poor farmers in isolated areas with limited capital for investment.

3 Production, tapping systems and associated strategies

Most trials plots have been planted in 1995-1996 and most of them entered in production between 2000 and 2002 after 5 to 7 years of immature period. First of all, we can make the general comment that tapping practices are very poor and lead to a far too high bark consumption. Production potential is highly decreased as it will be difficult to manage tapping on an insufficiently renewed panel. Lack of training and sufficient technical information about tapping practices with clones is obvious. Even farmers with previous SRDP experience have a relatively poor tapping. In Jambi, the quality of tapping is also very poor (even worse than in Kalimantan) and the problem more complicated due to share cropping and frequent change of tappers.

The most common problems seen in the fields are the following:

- high bar consumption leading to panel consumption (at an initial opening height of 1.3 meter) in 2 years instead of 5 years. Bark consumption is around 60 cm when it should be only 25 cm.
- Tapping is very poor and woundings increase difficulties when tapping is done on renewed bark. Tapping frequency can be very high in some places as a result of a very short term strategy from farmers who try to get the bet of their plantation in a very few time.
- The main consequence is a general poor state of the trees, an increase in disease susceptibility and poor canopy. Growth during production seems to be affected. All available data should permit to precise exactly to which extend.
- Tapping frequency seems to be very high in Jambi (D1) and more erratic in Kalimantan (a D3 with 100 tapping/year but not on a regular basis). Tapping frequencies data have to be carefully analysed and may provide a very reliable and comprehensive picture of current practices and impact on trees potential and production.

As stated in JM Eschbach's report, the recorded yields in 2004 in West Kalimantan, obtained in the 2nd year were low, even for smallholdings, except for Trimulya, a Javanese village. However, in that village, whilst yield per hectare was satisfactory, yield per tapping was very low, reflecting poor establishment of the trees, weak growth and poor tapping quality. Yields range from 1342 Kg/ha/year In Trimulya to 772 kg/ha/year in Sekadau, with an average of 952 kg/ha/year.

A very serious effort in training, in monitoring and new tapping practices protocols follow-up should be implemented. What we have now is probably the conjunction of 2 effects: on one hand, opening occurs when the SRAP project was under a very serious limited budget with limited possibilities of training and monitoring meantime, farmers wanted an immediate high production combined with poor technical information and support from the project.

However the problem is serious, there is several possibilities to recover from such situations with appropriate training and information sessions with farmers. Some plot can be carefully selected to implement tapping on farm trials on several topics: tapping frequency, use of stimulation….

This topic will be more developed in Jean Marie Eschbach' s report.

It has been agreed to try to explore possibilities of having a MSc student during its training period on tapping practices. Effectively, Ms Caroline Lefoll, a student from France, will come to implement this survey in West Kalimantan between July and September 2005 under the supervision of JM Eschbach and Gede Wibawa/Laxman Joshi.

Left, 2005: very poor taping
Right, 2005. proper taping.

In conclusion, a table of pros and cons has been set up to summarize analysis on RAS systems (see table 1).

Table 2 summarizes the effective results observed in farmers' plots after 10 years in the light of the preliminary hypothesis.
Agroforestry practices have shown their interest for farmers with limited access to capital and those who like to diversify or limit labour maintenance. Diversification with oil palm has provide access to capital to all farmers involved in oil palm schemes leading to somewhat less interest in some agroforestry practices. An important shift has been observed in the change of interest from originally the fruit trees to now the timber trees. In other word, Agroforestry practices have still a future for some farmers in come specific situation. Promoting agroforestry practices required a good previous knowledge on farming systems constraints and opportunities.

Table 1 : Table of pros and cons for various RAS systems

RAS	Pros	cons	Observations/evolution
1	AF practices during immature period interesting through labour and inputs saving	Increase of *fomes* and *phytophtora*. Do not maintain biodiversity comparable as that of jungle rubber (preliminary hypothesis)	To monoculture To RAS 2 Possible enrichment in timber and adapted fruit trees
2	High intensification level is possible Good anti-i*mperata* strategy if well weeded	Associated trees disappear if not well maintained Limited richness	To monoculture To RAS 2 with limited number of associated trees To RAS 2 with more associated trees from bush regeneration. Enrichment in timber and adapted fruit trees
2.5	Good complementary between the 2 crops	Number of crops limited : susceptible to price volatility	Cinnamon abandoned Move to monoculture
3	AF practices adapted to kill *Imperata* Saving in labour and herbicides	Growth of shading trees too rapid and potentially dangerous for rubber if not cut in time	To monoculture To RAS 2 with limited number of associated trees

Table 2 ; Preliminary hypothesis on on-farm trials on RAS and effective results 10 years after implementation.

Type of RAS	Preliminary hypothesis	Situation 3 years after planting 1998/99	Current situation 2005
1	Biodiversity conservation similar to that of jungle rubber	Still acceptable but limited	Abandoned But AF practices during period are economically interesting
2	High intensification Income generation during immature period	2 years of annual crops intercropping then planting of banana/cassava or shading tolerant crops	Shift in associated trees interest from fruit to timber
2.5	Complementary of 2 crops (rubber and cinnamon)	Lack of weeding lead to disappearance of cinnamon	System obsolete Cinnamon is not any more produced and marketed in the area
3	*Imperata* grassland rehabilitation	Success in *Imperata* control but relatively erratic results according to local situations and type of management. High mortality of associated trees	Associated trees have almost entirely disappeared.

4 Farmers strategies: modelling farming system as an approach for a better understanding.

All SRAP farmers (100 in the original network up to 1998), as well some farmers in the immediate vicinity, have been surveyed for farming system characterisation in 1997 (Ph Courbet in Kalimantan and A/ Kelfoun in Sumatra) and updated in 200O/1 (K. Trouillard and J Lecomte in Kalimantan). Impact surveys habe been conducted in 2000 in West Kalimantan (K Trouillard). Several French students (7) in full collaboration with SRAP staff have largely contributed to this work. All results have been published through thesis (in French) and articles (in English and French). A CD-rom with all publications, reports, powerpoint presentations, surveys data and all grey literature of the project has been provide to ICRAF in order to be sure that all information is effectively transmitted and used in the CFC project (an official version should be released by CIRAD in a few months) .

All this information and material has been very useful to understand farmers' strategies and trajectories and identify the main conditions and factors that lead to agroforestry practices adoption or maintenance or abandon.

But Indonesia in 2005 has deeply changed from the situation in 1994 at the inception of the SRAP project. Government has implemented democratization (with new rights for farmers to create all types of association..), decentralisation policies and more generally has largely disengaged from large nation sectorial projects (generally funded by World Bank and ADB).

The Asian and Indonesian financial and economical crisis is globally over, but Indonesian economy is still recovering from that very difficult period (1997-2001). The rubber crisis as well is over but rubber farmers had to deal with the lowest rubber prices ever recorded since 50 years for 5 long years from 1997 to 2002. Rubber prices (1.2 US $/kg for TSR 20 in January 2005) are now again very attractive and income form rubber is very similar to that of oil palm which as been the best "new crop" in these "black years". However, if oil palm is effectively a very good opportunity for a rapid and reliable increase of income, most farmers move to diversification and never abandoned rubber which prove to be in the long run a very reliable source of income when oil palm is too new to provide to farmers such feeling of income security.

In conclusion, rubber farmers are now more diversified and still very interested in clonal rubber as well as agroforestry practices in order to limit costs and labour during immature period as well as increase income during production period with fruits production, or at the end of rubber lifespan, with timber trees. If oil palm adoption is very easy through private projects opportunities, clonal rubber systems have to be funded by farmers themselves on their owns means.

Timber trees are now becoming a good opportunity as the demand is very high when Indonesian forests are becoming scarce.

There is still a high scope for agroforestry systems. But farmers do modify the initially proposed systems. RAS become innovations when effectively re-appropriated by farmers. The initial objective of RAS experimentation was not to create new cropping

systems as there were existing largely before we came in, but to optimize agroforestry practices (or introducing new practices such as those in RAS 3 to overcome Imperata cylindrical).

It is time to update our information on the experimentation and farming systems reference network in order to be in a position to have a full understanding on the pros and cons of agroforestry in this new context and on the conditions of adoption, diffusion, appropriation and eventually innovations of agroforestry practices with rubber.

“Olympe” is a farming system modelling tool (software), developed by INRA/CIRAD/IAMM France, already used in SRAP since 2000 with French students in collaboration with SRAP staff. But Olympe became fully operational only in 2004. It has been suggested that more people should be trained in the project for using Olympe.

A training session has been organised in order to train ICRAF staff as well as to profit from this opportunity to train other researchers of professors of Universities to this practical tool. We can now say that the training seems to have been successful. Olympe can be largely adopted by ICRAF as the tool to monitor farms and technical change, as well as to provide scenarios and explore the potential possibilities through prospective analysis leading to policy recommendations for decisions makers.

ICRAF is definitely involved in Farming Systems modelling using Olympe (both Indonesian and Thai partners) but it could be interesting to monitor the use of Olympe with other participants and develop a creative collaboration network, sharing experience and analysis. The idea of organizing a 3 days session within a year with presentation of case studies developed by participants and further analysis with in-depth use of Olympe modules have been widely adopted.

The other alternative to rubber : 1) oil palm: village local oil palm private nursery.

2) *A mangium*: in contract with PT finantara Intiga : an option no more interesting for most farmers.

Jungle rubber : still maintained as land reserve and for production if not too ageing.

The impact of oil palm on local village : new house in concrete and parabola in Kopar.

A potential interesting alternative for agroforestry with timber species : rubber with teak.

Data processing and further analysis

The project has already collected a wide range of data in socio-economy and agronomy. Many data have not been processed since 1998. Before continuing collecting a big amount of data, we suggest to rationalize data collection by carefully assess all plots, remove from data collection the non-necessary plots, and concentrate on those which are the most relevant. Data processing for further analysis seems to be necessary in order ton understand the various factors and their interactions.

Meanwhile, the new observation plots will provide useful information on components that needed to be cleared.

Icraf staff has been trained with Olympe and will the opportunity to develop its skills with the students coming in 2005. A complete database of the FS reference network will be available at the end this year.

5 Methodological use of the farming system modelling software « olympe »

Introduction : Olympe: a tool for modelling.

Detailed Knowledge on local farming systems and farmers' strategies in various situations such as pioneer zones, rehabilitation areas or traditional tree-crop belts) may contribute to build better and more adapted alternatives, solutions and proposals to help farmers to make the right decision at the right time concerning their future investment. CIRAD has developed (with INRA[1] and IAMM) a software called « Olympe » that enable the modelling of farming systems. The original conceptor is Jean Marie Attonaty, from INRA-ESR, Paris Grignon. There is also a module that permit the analysis at the level of farms groups. Positive or negative externalities can be integrated as well therefore enabling an approach taking into account Carbon sequestration from tree crops of pollution effects.

The use of "Olympe", a farming system modelling tool is aimed to improve farmers' understanding of their own situation, of their socio-economic context as well as to provide orientations for agricultural and development policies for institutions or donors. Olympe can be used in a variety of situations and through various methodological approaches: comparison of cropping systems, farming system economics and resources management ("farming advices"[2]), prospective analysis, regional approach and even as a "role game". The 2003 seminar on the methological uses of Olympe at CIRAD has shown a wide variety of possibilities that we are going to present in this paper in order to enhance further analysis of present studies and data. Publications of the proceedings as a book is under process.

Why modelling farming systems ?
A model has two main roles: a figurative role of representation of systems (the functioning) and a demonstrative role (possibilities and strategies). Combining these two lead to an explaining model wich function is to represent particular phenomas deriving from general phenomenas (management, acountancy…) according to local conditions that characterise farming systems. The understanding of farming systems as a "productive system" and the logic behind technical choices recall the systemic approach (cf Badouin, 1985 or Jouve , 1992)

General objectives of Olympe

Olympe is base on a systemic analysis of farming systems.
The overall objectives of using Olympe are the following :

- to identify smallholders' constraints and opportunities in a rapidly changing environment for the adoption of new cropping systems or even any other organisational innovation.
-To understand farmers' strategies and their capacity for innovation.

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[1] INRA = Institut National de la Recheche Agronomique, IAMM = Institut Agronomique Montpellier Mediterranée.
[2] "Conseil de gestion" in french.

- To assess their ability to adapt to changing economy, prices crisis and technological change.
- To provide a tool to understand the farmers' decision making.
- To replace farming systems information in the social and economical context (through a regional approach).
- To do prospective analysis and build scenarios according to climatic risks, major climatic events such as "el nino years" and commodity prices volatility.

It is possible to build several scenarios according to changing prices, climatic events or various types of risks. It is also possible to calculate impact at the regional level on various groups of farms (according to a typology). Building scenarios allows such a prospective analysis and the ability to test the robustness of any decision or technical choice.

Data analysis obtained with Olympe should be discussed with farmers using a participatory approach in order to validate scenarios and guarantee a high level of representativity. For instance, a network of selected representative farms can therefore be monitored for several years with two main objectives: first, to diagnose constraints and opportunities and, second, to measure impacts due to technical change.

One of the main output of such approach is to assess impact of technical alternatives or choices at the farming systems level, on the economic point of view as well as on the environmental point of view. Olympe is feed with data from adapted farming systems surveys and will provide key information in terms of diagnosis and, further on, in term of prospective analysis.

The global problematic of diversification for treecrops smallholders

The sustainability of agriculture is becoming a major concern. The main questions concerning "ecological sustainability" are linked to the problem of degraded environment and fragile soils and thus fertility, biodiversity, and protection of watersheds. Several cropping systems offer potential solutions to these problems: agroforestry practices, permanent vegetal cover cropping systems, etc. Crop diversification and rapid technical change characterise the evolution of existing farming systems. The history of these innovations and innovation processes are key elements to analyse and understand and thus be in a position to make viable recommendations for development.

The notion of "economic sustainability", places emphasis on the profitability of specific technical choices: (margins analysis, income generation, return on labour and capital as a function of a specific activity, analysis of constraints-opportunities, etc.) from the point of view of farming systems, at the regional level, and the "community level" where there are serious constraints with respect to land availability, and to access to capital and information. Analysis of farming systems and knowledge about smallholders' strategies in the different contexts are thus key elements that should also be taken into account.

As sustainable development is on the way to becoming the new “priority objective”, the rehabilitation of previously intensively managed agricultural or degraded land also merits consideration.

Perennial crops in particular are subject to very significative and sometimes very rapid changes in plantation/re-plantation strategies in pioneer and post-pioneer areas, and these changes characterise farmers‘ strategies through phases of investment, capital building, capital conservation, re-investment and eventually intensification or diversification or both...

The impact these strategies have on land control, land-use dynamics (agreement on the definition of new types of “territories” between stakeholders) and relations between stakeholders including those not directly involved in agricultural production, should be major topics of research if we are to gain a better understanding of farmers’ strategies in the present context of multiple crises. A constant factor that underlies such strategies is innovation: both the process of technical innovation (technical pathways) and of organisational innovation (farmers organisation, access to credit, etc.) are key elements to understanding and qualifying change.

The major economic trend is towards globalisation accompanied by a general decrease in prices for most agricultural commodities. Concurrently, most farmers enjoyed direct links to markets over a relatively long period of time (absence of the commodity boards in Asia when it is often encountered in Africa), in particular in the case of coca, coffee, rubber, oil palm and coconut.

The main objective of topic-oriented research centred on the analysis of decision-making processes at different levels (farms, community, projects, regional or national policies makers) would thus be to provide socio-economic information to policy makers to improve the decision-making process in agricultural development.

The process of innovation (farmers) and of decision-making (both farmers and developers) are key research topics in sustainable development. And the analysis of farming systems, the characterisation of agrarian systems and the identification of stakeholders’ strategies are key components to a better understanding of these issues..

The factors that determine change and the discriminators to be taken into account for the sustainable development of these commodities need to be related to each specific context. Important issues such as the effect of decentralisation, globalisation and its effects on prices, as well as on local economies and public policies, environmental themes (biodiversity, sustainability) are impossible to circumvent.

The problems of coherence between social demand (including the process of innovation and technical change), the role of the state (the relationship between the State and farmers, between production and market) need to be investigated.

This type of approach is applicable at several different levels, i.e. a small area, a watershed, or an agrarian region, by taking into account the different levels of intervention (production systems, experimentation of farming systems and commodity systems, and so on).

The historical dimension is very significant in this type of analysis even if economic commodity cycles can be very fast. So far, rebuilding the past with a modelling tool and create new scenarios of evolution though a prospective analysis can be linked in order to improve the efficiency of development oriented research. In fact this raises the question of the real cost of the growth of perennial crops under conditions of recurring booms : which type of growth concerns each commodity?

What is the rôle of each stakeholder? What are the main externalities (positive and/or negative.)?

Impact of technical change should take into account effect on sustainability on both farmers‘ livelihood and environment. Success in diversification strategies required a certain number of conditions: capital or credit availability, technical options (innovations), information, markets, farmers' organisations in order to improve marketing etc …

As contexts are important in the evolution of processes, the impact of globalisation on smallholders and commodity systems as well as on their internal growth (logical internal development within a specific context) and the effects of decentralisation policies also should be included in this analysis.

Potentially, scenarios based on various alternatives of diversification and replantation can be simulated using the multi-agent system modelling (MAS). This modelling can be developed in order to integrate all actors decisions into the global analysis (a MsC training period study is scheduled in 2004 on that subject).

The use of Olympe : from farmers to developers…..

Tools for the comprehension of farming systems based on simulation and modelling such as the software "Olympe" (INRA/CIRAD) allow a comprehensive understanding of how a given farming system functions, as well as provide a tool to model prospective technical choices, price scenarios, and even ecological scenarios (for example taking into account the impact of El Nino in given years to test the robustness of technical choices and their adaptability in new conditions or environments).

Such tools based on the use of primary data collected during surveys for the characterisation of farming systems, are essential to provide decision-making tools to key stakeholders in terms of development, adaptive research, project orientations and so on, all projects which require serious negotiations between partners.

These tools could be used at different levels: the local community, regional, national or international, depending on the stakeholders and on the commodity involved. Emphasis would be on the farmer and on the other people directly involved in the farmers' environments, including the government (development policies at the national level). The Participatory approach and Action–Research are a basic methodology in the approach proposed by CIRAD partners.

These tools have been validated by experiments and activities in the field. In addition to the Participatory approach and on-farm experimentation, tools for decision-making

aid such as SIG, System multi-agents (SMA) and farming system modelling (Olympe) allow possible answers to be identified to important agricultural questions.

Risks and hazard assessment through prospective analysis

Most tree-crops farmers have developed a diversification strategy in front of markets uncertainties, prices volatility and climatic hazards. They may also have integrated local opportunities for particular crops (oil palm with private Estates providing development schemes for instance..). Therefore, the prospective analysis may provide visions for the future, potential or possible trajectories, an assessment of the impact on a technical choice or several strategies, an assessment of the robustness of farming systems according to commodity prices volatility as well as climatic risks, and eventually the definition of "thresholds" on risks, profitability and viable alternatives.

First of all, the set of data have to be well defined. Farming systems are created in Olympe according to a typology that may evoluate and change through the prospective analysis. The scenarios have to be defined according to real potential possibilities . Historical records and prices data, agrarian history can help to identify the scenarios.

Rationale for a prospective analysis with Olympe.

The prospective analysis can be used for the following purposes ;

- to test the impact of commodity or inputs prices volatility
- to test the robustness of technical choices in the short, mid and long term
- to assess the impact of strategies or logics on farming systems structure and income
- to assess the impact of climatic events and reduce risks
- to define financial or economical threshold beyond which profitability is too low or risks too high,
- to measure capital and credit requirement to change trajectories through a move to adoption of new cropping systems or re-arranging farming system's structure.
- measure inputs and outputs flows
- assess impact of any decision on profitability, return to labour and return to investment

From a farmer's perspective, the objective is clearly to assess potentialities, risks and identify potential interesting farms trajectories through the domain of possibilities. From a developer's perspective, a better knowledge of economic impact of decisions help to define a better farm counselling and measure the potential impact of extension and recommendations. For the researcher, it helps to define for both farmers and developers a common perspective on development, risks and impact of agricultural policies and markets.

These objectives are included in the general farmers objectives when diversification occurs :

- income securing (a guarantee for a minimum revenue and not a income decrease) and eventually improvement.
- limitation of risks .
- climatic risks on production (food security, assure self-sufficiency, other cash crops…) and
- economic hazards (commodity prices).
- To get a better distribution of income throughout the year (typically from cocoa with 2 incomes periods to rubber with weekly income)
- to profit from potential opportunities (or not to miss it, wich is another way to look as it !).
- being less dependant of a unique commodity in a world of globalisation.
- To build a property (patrimony).
- To valorise land that were not previously cropped.
- to increase knowledge, technical information in order to be in a bettre position to innovate.
- more recently: increase the sustainabilty of agricultural production in the mid or long term. To that respect, taking in to account externalities can become important for both producers and the rest of the world (within the application of the Kyoto agreement and the Clean Development Mechanism (CDM) for instance. Agroforestry practices that maintain biodiversity and soil fertility, basically that maintains the “forest rent” into an “agroforest rent” are included.

This strategy and prospective analysis is part of the overall framework suggested by the team to compare diversification situations :

- definition of farmers’ objectives.
- definition of sub-objectives for each main tree crop.
- identification of the determinants of diversification strategies leading to implementation.
- identification of criteria and indicators of diversification.
- the types of farmers that diversify.
- the lessons in terms of policy and agricultural development guidelines.

6 **Conclusion: from the work plan to the very next future**

We suggest to start from the work plan defined during the Inception Meeting (of 13-14 April 2004, From the Meeting report on "Improving the Productivity of Rubber Smallholdingsthrough Rubber Agroforestry Systems", CFC/IRSG/11) and up-to-date its content. Annex 6 provides as well up to date notes on the Summary of CFC Planning Workshop on *Improving the Productivity of Rubber Smallholdings through Rubber Agroforestry System (*Bogor, 7 September 2002) with extracts and comments in note /italic from E Penot.

The work plan presentations were followed by general discussions on the overall project framework and proposed activities. The following points are the highlights of the discussion:

1. The six components of the project are still valid in the current context, both in Indonesia and Thailand. Due to some differences in scope and on-going research and extension between the two countries, some minor changes are essential**. An important aspect of the project is a need to diversify income generation of the rubber-dependent smallholder farmers in both countries.** The strategy is to take the past and on-going research findings to farmers' fields and promote more productive systems through demonstration, training, and awareness and capacity building through a participatory approach.

2. The view of smallholder farmers not receiving the benefits for rubber production was expressed by a participant. However, it was clarified quickly that it was only an assumption. **Compared to other perennial crops, rubber sector provides a higher proportion of the income to the farmers**. However, inefficiency in the market in Indonesia does reduce the potential income of the farmers.

3. The current price of natural rubber has reached its highest level in 30 years, farmers are benefiting much. This trend is likely to continue with an upsurge in demand from China, Brazil, India, Russian Federation and elsewhere. It has been estimated that an additional planting of 4 million hectares of new plantation will be required to meet the growing demand of natural rubber**. So the future of rubber farmers looks promising**.

4. **The downside of the increasing price of natural rubber is the possibility of farmers clearing other tree-based systems for planting rubber and intensifying rubber production system**. Currently it is too early to predict that, however the project needs to keep a close watch on this aspect.

5. **The importance of including timber production from rubber-based systems was raised**. The meeting was reminded that the project already has activities both in Indonesia and Thailand to address this issue. Both rubber timber and non-rubber timber will be addressed and promoted within the project activities. The scope, potential and constraints in timber production will be investigated through surveys and follow-ups. Demonstration plots will be established and relevant information will be disseminated. Another topic of high relevance of the national policies on timber production and sale.

6. Mr Yayakh, researcher from Malaysian Rubber Board (MRB) pointed out that the **new project has much relevance also to Malaysia and exchange of information between his institution and the project team will be beneficial to both. There is much potential for collaboration on the clone selection research and modelling of tree growth and latex production; it was agreed that these topics will be pursued.**

7. There was a query over farmer participation in the project. It was clarified that most activities – on-field demonstration plots, budwood gardens, and trainings are all planned for participation of smallholder rubber farmers. This is important for maximum impact of the project on smallholder rubber farmers. However, **it is understood that the very process of how and why farmers adopt, adapt or reject technology innovations is not well understood. Under the farming systems characterization component, a specific activity to address this important aspect has been added. Recent development in modelling farmers' adopt and learn behaviour will be used and tested in the rubber agroforestry context.**

8. **The marketing of latex (farm to factory) was raised as an important aspect if the project aims to increase income of smallholder rubber farmers**. Some research has been conducted. While innovative marketing systems have been adopted in some places, the traditional system of a long chain of trading natural rubber still exist in many places. The project realises the importance of marketing in to the overall project objectives. The proposed market study will be revised to make it as comprehensive as possible with the possibility of testing efficient systems in some sites.

9. **Dr Budiman emphasised on the importance of the project and its potential as a model for many other rubber producing countries in Asia and Africa. The project should emphasise on establishing 'working examples' of innovations that can be replicated by government systems**. It was however, clarified that the project is not a development project but an opportunity to demonstrate and convince smallholder farmers of the benefits of results from the past and current rubber research programmes. Careful analyses of the benefits and costs of previously recommended technologies should be an important task in the project.

10. Again, the query over benefits of the rising price of latex received by farmers was raised. It was expressed that when the international price of rubber rises, there is considerable time lag before farmers get a higher price. However, the response rate is much shorter when the international price of rubber goes down. This is partly due to incomplete information and market inefficiency.

11. With the increase in price of rubber, there was a question on the government of Indonesia is likely to exercise an export tax as it did on palm oil in the past. To date there has been no discussion on this. It was explained that the palm oil was levied a tax in the past to protect the domestic consumers while natural rubber is a different context.

12. In Indonesia (and to some extent in Thailand) share tapping is a common practice and it was requested that the new project must ensure that share tappers are not disadvantaged due to project activities. This will be carefully monitored. Ms Brown reminded the meeting that both social and economic aspects are important in the project. She also asked on the situation with non-rubber crops in the system. Both in

Indonesia and Thailand, timber is fast becoming an important commercial product from rubber-based systems. However, policy constraints exist that hinders smallholder farmers benefiting. In case of Thailand, the awareness of importance of rubber plantations for timber production is rising. However, government extension messages do not yet address this issue. There are plenty of research results on how to optimise rubber and timber production that are ready for dissemination. The new rubber project provides an important and timely opportunity for this.

13. The point on whether rubber plantation can benefit from the Clean Development Mechanism (CDM). The effort to consider rubber plantation under the CDM definition of forest continues.
14. Dr. Meri reminded that the Foreign Ministry in Indonesia is the focal point for CFC activities in the country. They wish to be involved in all such activities.

Conclusions from the morning session

1. There was general consensus on the continued validity of the six components of the project. There is not need for any change.
2. The presented work plans were considered necessary but some minor changes (e.g. in the marketing study and the need to be clear on the beneficiary rubber farmers) were proposed.

Synthesis and discussion in the light of the 2005 support mission :

An important aspect of the project is a need to diversify income generation of the rubber-dependent smallholder farmers in both countries.
Therefore farming system characterization and modelling with the sofyware Olympe is a priority, especially for the SRAP farms of reference network.

Compared to other perennial crops, rubber sector provides a higher proportion of the income to the farmers.
This assumption is probably not true anymore with the fast development and adoption of smallholders' oil plantations. Therefore, the identification or major sources of income with the analysis of production factors allocation should provide a clear economic vision of farmers' strategies for the short and long term. Modelling farming systems with Olympe will as well enable to explore scenarios according to crop balances and choices, as well as resilience and robustness of crop choices at the farm level.

It has been estimated that an additional planting of 4 million hectares of new plantation will be required to meet the growing demand of natural rubber. So the future of rubber farmers looks promising.
This forecast has been always "scheduled since 10 years, but delayed by the world rubber price crisis between 997 and 2003. Indonesia is among the best placed to take a major share as labour price is still relatively low and current farmers have a vast reservoir or potential and adaptation in particular through the gradual transformation of jungle rubber into clonal plantations either in monoculture or in agroforestry.

The downside of the increasing price of natural rubber is the possibility of farmers clearing other tree-based systems for planting rubber and intensifying rubber production system.
Diversification is the key strategy developed by most farmers to increase farm income stability in front of commodities prices important volatility leading to uncertainty in order to overcome risk on being dependant on one crop only.

The importance of including timber production from rubber-based systems was raised.
It seems quite clear that farmers have changed their views since 1995 when most of them, with still access to forest land or resources, did not show great interest in our proposals and experimentations in 1995/96. The context has changes with a new strong demand from the plywood industry as well as the pulp industry and, meanwhile, a change in the tree tenure that allow farmers to manage, cut and sell their trees. Tree production is now a very interesting opportunity for most farmers, however it is a long term strategy with no immediate output.
New experimentation plot and trials should be set up to identify the best relevant combination of trees with rubber as well as the most adapted techniques for timber tree plantations. Experience from some trials visited in Thailand by the author around Hat Yai in 1996 (see existing report and photos, should be included in order to take into account the particularities of *Dipterocarpacees* spp growing requirements.

This **new project has much relevance also to Malaysia and exchange of information between his institution and the project team will be beneficial to both. There is much potential for collaboration on the clone selection research and modelling of tree growth and latex production; it was agreed that these topics will be pursued.**
This is quite clear and cooperation should be enhanced as well as that with Thailand and previous experimentation conducted by RRIT in the 1990's.

Concerning farmers' participation and partnership developed since the beginning by SRAP ; **it is understood that the very process of how and why farmers adopt, adapt or reject technology innovations is not well understood. Under the farming systems characterization component, a specific activity to address this important aspect has been added. Recent development in modelling farmers' adopt and learn behaviour will be used and tested in the rubber agroforestry context.**
Partnership is essential and strategy understanding with economic farm modelling with olympe linked with a complete socio-economic analysis to contextualize these economic results is as well essential for such understanding. Initial hypothesis have been presented in 2002 (see annex 5). Farming system analysis and modelling will provide answers to such hypothesis.

The marketing of latex (farm to factory) was raised as an important aspect if the project aims to increase income of smallholder rubber farmers.
Rubber marketing is effectively important however it seems that the marketing channels do work quite well and efficiently even in a situation of crisis. It is not sure that such particular point can be relevant in our analysis. This point was probably very interesting for GAPKINDO. Since Gapkindo has quit officially the project (however since an informal actor in our research process) and in front of other priorities, I suggest to collect information and monitor the situation with a low priority.

Dr Budiman emphasised on the importance of the project and its potential as a model for many other rubber producing countries in Asia and Africa. The project should emphasise on establishing 'working examples' of innovations that can be replicated by government systems.

In terms of research and with SRAP action research approach, it seems clear for us that all efforts should be done in terms of dissemination. However, SRAP is not a development project and cannot implement such activity when other actors are far

better placed to do it. However, an effort should be made to transform SRAP knowledge and experiences into valuable and useful publications and products used by development agencies as well as components for policy definition.

In particular, the results on farmers strategies, innovations processes, scenarios identification and resilience analysis using Olympe should be more valued into various forms, from publication to direct contact with policy makers, into policy recommendations at both local, regional and even national level. Future involvement of traditional actors such as The World Bank and ADB as donors fro development project, should be carefully monitored in order to be ready to make relevant proposals when required.

Proposal for the very next future

Beside all proposal and suggested recommendations in this summary, the team decided to have 2 French students, associated with local students or SRAP staff at least in Kalimantan. One student will focus on farming system characterization update and modelling with Olympe, providing a current picture of local farming systems and an Olympe database on the farming system reference network. He will be trained with Olympe in Montpellier and directly followed by Eric Penot from Montpellier (the selected student is Laure Martin from INA-PG, Paris). The second student will focus on tapping practices and production patterns. He will first process the available data in Montpellier under the supervision of JM Eschbach before coming to Indonesia for field survey (the selected student is Caroline Lefoll from ISTOM). The follow-up will be implemented by both E Penot and JM Eschbach. G Wibawa and L Joshi do the follow-up and support in Indonesia. A synthetic proposal has been provided to the team for both training periods (see annex 3 and 4). Both training periods are scheduled for end of May to end of October/November 2005.

Further monitoring of implementation and data exploitations by the team will be done through further mission in 2006 and 2007.

E Penot
CIRAD-TERA
28/7/2005

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Anex 1

November 2004. CIRAD

Terms of reference of a support mission from CIRAD to SRAP project at ICRAF

Technical support mission to SRAP (CFC Project)

Objective of the mission

The objective of the mission is to review the current state of knowledge and sense of priorities, vis-a-vis the initial SRAP project objectives within the CFC funding programme including the conclusions of the inception meeting of April 2004. Beside the overall scientific collaboration and support to the two current co Project leaders (G Wibawa and J. Laxman) through the project objectives discussed in previous contacts, some specific demand has been expressed by ICRAF in particular for further research in rubber tapping improvement for smallholding and the use and training of a farming system modelling tool called Olympe for further socio economic monitoring and follow up.

Expected outputs

Therefore the main expected outputs of the mission should be the following:

- assessment of on-farm trials established since 1994,
- definition of Research-Development activities in both countries with a prioritisation and a timetable for each activities, according to previous meeting's output and in particular the inception meeting.
- definition of an effective working plan for the project with all partners in both Indonesia and Thailand in particular for socio-economics and tapping techniques.
- definition of new series of on-farm experimentation in both countries.
- identification of a socio-economic programme, topics for further studies (with students) in particular to assess impact of rubber prices volatility and profitability of the crop at farm level in a context of diversification and state disengagement with new policies including decentralization. Farming system modelling (using the software INRA/CIRAD "Olympe) will be a decisive tool in decision making process.
- Identification of local actions to be developed (nurseries, information dissemination, farmers' organisation development for marketing ….).
- training for the software Olympe in both countries for local staff.

Two persons have been identified for this mission:
- Eric Penot (CIRAD-TERA), socio-economy, and
- Jean Marie Eschbach, (CIRAD-CP), agronomy

Tentative Programme
Bogor and Jakarta: 1 day for preliminary discussions, Kalimantan: 4 days for field visits, Jambi: 4 days for fields visits, Bogor: 2 days : last discussions and complete programme identification, Total : 11 working days + 2 travelling days .

Annex 2

Mission schedule (February 2005)

Friday 4
Flight Montpellier – Paris – Amsterdam – Jakarta

Saturday 5
Arrival in Jakarta. Travel to Bogor

Sunday 6
Flight Jakarta – Pontianak (West Kalimantan)
Transfer to Sanggau

Inspection of trials at Embaong:
Sidon (RAS 1.1)
Cacot (RAS 1.2)
Alyosius (RAS 1.2 and new extensions)
Discussions with farmers in the project at Embaong

Monday 7
Inspection of trials at Trimulya:
Margono (RAS 3.4)
Yasdi (RAS 2.1)
Sriadi (RAS 3.4)
Sarjoko (RAS 3.4)

Discussions with farmers in the project at Trimulya

Inspection of trials at Pana, belonging to:
Ibun (strip lining)
Ating (spacing line test)
Duguk (RAS3 fertilizer trial)
Kunok (RAS1 fertilizer trial)
Daniel (RAS1 fertilizer trial, white root disease trial)
Baki (land preparation)

Tuesday 8
Inspection of trials at Paribang Baru (RAS 2.2 and new clone/fertilizer trials)
Discussions with farmers in the project at Paribang Baru

Wednesday 9
Inspection of trials at Kopar:
Indi (RAS 3.1)
Rasyid (RAS 3.2)

Discussions with farmers in the project at Kopar

Inspection of trials at Engkayu:
Gabriel (RAS 1.2 and RAS 2.2)

Andreas (RAS 2.2)
Tinus (RAS 1.1)

Discussions with the farmers in the project at Engkayu

Transfer to Pontianak

Thursday 10
Flight Pontianak – Jakarta – Jambi
Travel to Muara Bungo

Friday 11
Inspection of trials at Seppungur:
Roni (RAS 1.2)
Aswar (RAS 1.1)
Saer (RAS 2.2)
Aljupri (RAS 1.1)
Muhammad (IC 1.03)

Inspection of trials at Pulau Temiang
Husin Wapar (IC 1.03)
Jupri (IC 1.07)
Marjan (IC 1.03)
Amri (IC 1.03)

Saturday 12
Inspection of trials at Rantau Pandang:
Azahari (RAS 1.1)
Ismail (RAS 1.1)
Mawi Lutan (RAS 1.1 and RAS 1.3)
A.Yani (RAS 2.2)

Travel to Jambi

Sunday 13
Flight Jambi – Jakarta
Transfer to Bogor

Monday 14 to Friday 18
Olympe training course

Agenda and schedule for the Olympe training session in Bogor.

DATE	AGENDA
Monday, 14/02/05	
am	Introduction, History and conceptors
	Conception of model
	Full description of model
noon	Lunch
pm	Data setting step by step
Tuesday, 15/02/05	
am	Continue of data setting
noon	lunch
pm	Creating scenario
	Modul to build scenarios
	Creating some exemples
	Constraints and limits of OLYMPE
Wednesday, 16/02/05	
am	Creating indicators, variables
	Creating specific tables
	Adapte Olympe to your needs
noon	Lunch
pm	Results interpretation (Socio-economic)
	Group results
	feedback for the model
	planning of olympe for the future use.

am: 8.30 - 12.00
noon: 12.00-13.00
pm:13.00-17.30

Saturday 19
Return to Jakarta
Flight Jakarta – Montpellier

Annex 3

Research training period and proposal on farming system characterization and modelling

1 Proposal for a training period on farming system survey and modelling

Proposed by Eric Penot (CIRAD-TERA) and Gede Wibawa/L Joshi (ICRAF), co-partners and monitors of the trainne.

Name of the trainee: Laure Martin , from INAPG, Paris, Frecnh citizen.

Country ; Indonesia
Framework : project SRAP/CFC CIRAD/ICRAF (funding CFC).
Schedule : May/June to à december 2005

Costs :

- all expenses in Indonesia are covered by ICRAF/CFC
- the language training (400 US $) is covered by CIRAD TERA (France) .
- tickets France /Indonesia, visa and insurance are covered by students (and/or via CNEARC).
- Reports and language training : covered by CIRAD-TERA.

The training periods will be mainly based in West-Kalimantan, (Bornéo), and with a participation in the similar work done in Jambi , (Sumatra). Presentations and Office work will be done also in Bogor for a few time.

Subject : Analysis and caracterisation of farming systems in SRAP/CFC/ICRAF project area in :6 villages in Kalimantan and 4 villages in Jambi.

Study topic :

- description and diagnostic on local rubber based farming systems (classical systemic analysis)
- analysis constraints-opportunities ;
- analysis of évolution : determinants of evolution, dynamics of farming systems, migrations…..
- modelisation with the software « Olympe » of the farms of the SRAP farming systems reference netwok.

Localisation : Based on project' sites, in West Kalimantan (Sanggau) et Sumatra, Province of Jambi , Muara Bungo..

Expected outputs are the following :

- the final report in french
- an executive summary in English for LIPI and for ICRAF

- a publication with co authors.
- A set of data on Olympe.
- Presentation of the final results in Bogor

The training period will be done in collaboration with Indonesian students.
Some other information to explain the context of the training period

Farmers strategies: modelling farming system as an approach for a better understanding.

It is time to update our information on the experimentation and farming systems reference network in order to be in a position to have a full understanding on the pros and cons of agroforestry in this new context and on the conditions of adoption, diffusion, appropriation and eventually innovations of agroforestry practices with rubber.

Olympe is a farming system modelling tool, developed by INRA/CIRAD/IAMM France, already used in SRAP since 2000 with students. But Olympe became fully operational only in 2004. It has been suggested that more people should be trained in the project for using Olympe.

A training session has been organised in order to train ICRAF staff as well as to profit from this opportunity to train other researchers of professors of Universities to this practical tool. We can now say that the training seems to have been successful. Olympe can be largely adopted by ICRAF as the tool to monitor farms and technical change, as well as to provide scenarios and explore the potential possibilities through prospective analysis leading to policy recommendations for decisions makers.

Icraf is definitely involved in FS modelling using Olympe (both Indonesian and Thai partners) but it could be interesting to monitor the use of Olympe with other participants and develop a creative collaboration network, sharing experience and analysis. The idea of organizing a 3 days session within a year with presentation of case studies developed by participants and further analysis with in-depth use of Olympe modules have been widely adopted.

The project has already collected a wide range of data in socio-economy and agronomy. Many data have not been processed since 1998. Before continuing collecting a big amount of data, we suggest to rationalize data collection by carefully assess all plots, remove from data collection the non-necessary plots, and concentrate on those which are the most relevant. Data processing for further analysis seems to be necessary in order ton understand the various factors and their interactions.

Meanwhile, the new observation plots will provide useful information on components that needed to be cleared.
ICRAF staff has been trained with Olympe and will the opportunity to develop its skills with the students coming in 2005. A complete database of the FS reference network will be available at the end this year.

From Laure Martin

Analysis and characterisation of SCV farming systems

Introduction:

Sustainability of agriculture is becoming a major concern. The main questions concerning "ecological sustainability" are linked to the problem of degraded environment and fragile soils and thus fertility, biodiversity, and the protection of watersheds. Several farming systems offer potential solutions to these problems: agro-forestry, permanent vegetal cover cropping systems, etc. Crop diversification and rapid technical change characterise the evolution of existing farming systems. The history of these innovations and innovation processes are key elements to analyse and understand, and thus be in a position to make viable recommendations for development.

INRA/ESR, IAMM and CIRAD have developed the Olympe software to model and simulate how farming systems function. The model is linked with a socio-economic analysis and takes all contextual situations into account. It enables identification of farmers' strategies and trajectories. Simulations permit prospective analysis based on the volatility of prices and/or the impact of climatic events. This software was first developed in close cooperation with a number of researchers from research institutions involved in tropical agriculture. Farming systems modelling provides reliable quantitative economic data on the different sources of income (from farming and off-farm activities), net return to investment, return to labour, and margins per activity.

Development of the study and methodology:

Tools for farming systems analysis based on simulation and modelling like the software Olympe enable a comprehensive understanding of how a given farming system functions, as well as provide a tool to model prospective technical choices, price scenarios, and even ecological scenarios.
Tools of this type that are based on the use of primary data collected during surveys for the characterisation of farming systems are essential to provide decision-making

tools to key stakeholders in terms of development, adaptive research, project orientation…

The aim of the survey will be first to understand the farming systems and SCV integration and to collect data for the modelisation.

Thus the study will take place in many stages:

- Description and diagnosis on local rubber based farming systems (classical systemic analysis) .
- Analysis of the constraints and opportunities on the farms.
- Analysis of evolution : determinants of evolution, dynamics of farming systems, migrations.
- Modelisation with the software « Olympe » of local farms .

The **methodology** is based on the following stages for the diagnosis:

---> A preliminary diagnosis based on the study of all available information (bibliography, data collections, key-informants), and an exploratory survey.
Survey of the characteristics of the farming system

---> To understand the constraints, opportunities, income and labour productivity of each cropping system and farm activities. The data analysis should provide an operational typology and a clear identification of constraints and opportunities.

An agronomic and socio-economic approach provides suitable technical pathways or improved cropping systems for farmers as well as ensures adequate conditions for the adoption and appropriation (of innovations) by farmers as a function of the different situations encountered in terms of further rubber development.

Type of data required for farming systems modelling using Olympe

Olympe is based on the characterisation of farming systems using a systemic approach. Consequently all the standard information that qualifies the structure and components of production factors of the farm is required. This information can be obtained by means of a traditional survey. In addition, as Olympe focuses on the origin of the different sources of income and provides an economic analysis, all this information should be collected at least at 4 levels:

>cropping systems: crops are divided into annual crops, perennial crops (minimum 5 years) and multi-annual crops (typically banana, pineapple and cassava, between 1 and 5 year cycles). Including CV techniques.

>livestock systems: whatever type of animal.

>Off-farm activity: all activity that is not directly linked with agricultural or livestock production, including processing of primary products…

In these three systems, information concerning the cost of production, inputs and outputs and yields should be included here, i.e. all operational costs. If externalities can be quantified, they should also be included at this level. Labour requirements also have to be identified in order to calculate return to labour, which is a very important factor in making decisions for farmers.

>Production system: at the "farm level" including the decision maker (the producer) and a strategy for the combination of production factors.

All non operational costs are considered here. So all sources of capital (income, including off farm, credits, loans), and all other expenses should be included here. Family accounts and business accounts can be separate but should be recorded.

All commodity prices should be collected, in particular taking into account local variations as well as international historical series of prices that will enable the building of potential scenarios.

Objectives:

Olympe is based on the systemic analysis of farming systems. The overall objectives of using Olympe are the following:

- To test the economic impact of a technical choice (of a particular rice cropping systems for instance) for different types of farms.
- To compare economic results in various farm environment of a technical choice (or a technical pathway…).
- To identify smallholders' constraints and opportunities in a rapidly changing environment in preparation for the adoption of new cropping systems or any other organisational innovation.

To assess their ability to adapt to changing economic conditions, price crises and technological change.

- To understand farmers' strategies and their capacity for innovation and to understand the farmers' decision-making process.
- To do a prospective analysis according to climatic events or prices volatility.
- To test the robustness of a technical choice according to climatic or economical uncertainties (effect of a drought, an "el nino » year , or price volatility…).
- To put information about farming systems in the social and economic context (through a regional approach).
- To calculate externalities, positive or negative, on the environment.

The research aims also to provide guidelines for agricultural and development policies for institutions or donors. Olympe can be used in a variety of situations and with different methodological approaches: comparison of cropping systems, the economics of farming systems and resources management ("farm management counselling"), prospective analysis, a regional approach.

Expected outputs:

These **results and outputs** are the following:

- Annual and perennial cropping patterns and technologies (technical pathways for monoculture, intercropping, agro-forestry systems etc.).
- An operational typology of situations and farmers leading to the identification of "topics of recommendations".
- A global overview of the possible adoption of rubber technology as a function of farmers' strategies and local conditions.
- An ongoing and dynamic data base on farming systems using Olympe software.
-The clear identification of the conditions required to ensure future projects are viable at the decision-making level.
- To anticipate problems (e.g. recurring negative phases of booms, drops in fertility /productivity due to over-exploitation, negative externalities, etc.)
- To propose alternatives (technical itineraries or new organisational innovations, etc.)
- To provide better support for technical choices made by decision makers with respect to agricultural policy.

Conclusion:

Most farmers will already have developed a diversification strategy in the face of market uncertainties, price volatility and climatic risks. They may also have integrated local opportunities for particular crops (oil palm with private Estates that provide development schemes for instance). As a consequence, prospective analysis may provide ideas for the future, potential or possible trajectories, an assessment of the impact of a technical choice or of several different strategies, assessment of the robustness of farming systems as a function of fluctuations in commodity prices or of climatic risks, and perhaps the definition of "thresholds" for risks, profitability and viable alternatives. In this section, we will explore how Olympe can provide data on such hypotheses and how scenarios can be built that are then discussed with the farmer to validate the simulation.

Annex 4

FICHE DE PROPOSITION DE STAGE INDIVIDUEL

PAYS : INDONESIE Régions : Ouest Kalimantan (Bornéo) et Jambi (Sumatra) si possible.

THEME d'ETUDE :

Caractérisation des systèmes de saignée de l'hévéa

et des traitements post-récolte en milieu paysan.

Nature du travail demandé :

Au cours de ce stage on se propose d'étudier les systèmes de saignée de l'hévéa en milieu paysans. L'Indonésie est au premier rang mondial pour les surfaces plantées en hévéa. La majeure partie, environ 2 millions d'hectares, est composée d'agroforêts où les paysans saignent les arbres intensément. Les hévéas clonaux plantés dans les projets sont également exploités de façon très intensive par les paysans, ce qui affecte la productivité et réduit la vie économique des plantations.

Ce stage sera réalisée dans 2 provinces (si possible) pour tenir compte des conditions spécifiques d'exploitation et de traitement de la récolte et devra apporter des éléments de réponse aux questions suivantes :

- Les itinéraires techniques pour la saignée des hévéas sont-ils différents dans les agroforêts et dans les parcelles clonales ?
- Les rythmes de saignée sont-ils dépendants de la recherche d'un revenu régulier ou d'autres facteurs (à déterminer) ?
- Quel est le niveau de connaissance des paysans concernant les systèmes de saignée pour les hévéas clonaux et pourquoi les systèmes observés diffèrent des recommandations ?
- Quels facteurs, externes ou internes, induisent des modifications dans les systèmes de saignée et la préparation du caoutchouc produit.

L'étude devra comporter une importance présence sur le terrain et fera appel à:
- des aspects techniques : réalisation de la saignée,
- des aspects technologiques : traitement post-récolte de la production,
- des aspects socio-économiques : décisions individuelles et influence de l'environnement socio-économique sur ces décisions, et
- des aspects purement économiques : évaluation des prix obtenus en fonction de la qualité et estimation des coûts de production. Le stagiaire utilisera les fichiers préparés sous le logiciel Olympe par une étude précédente effectuée par Julie Lecomte en novembre 2001.

Outre le mémoire , sera demandé un article co-publié avec le directeur de stage, en français ou en anglais.

ORGANISME PROPOSANT LE STAGE :

CIRAD-CP, avec la collaboration de CIRAD-TERA, en directe collaboration avec ICRAF.Bogor.

CORRESPONDANT SCIENTIFIQUE A MONTPELLIER :

Institutions : CIRAD-CP (UR ???), CIRAD TERA (UR 43).

Nom des personnes susceptibles d'encadrer l'étudiant avant son départ en stage :

Jean-Marie Eschbach, téléphone : 04 67 61 65 24, BAT PS III Bureau 115,
Email : jean-marie.eschbach@cirad.fr

et Eric Penot, téléphone : 04 67 61 44 84, BAT 15,, BUREAU 233
Email : eric.penot@cirad.fr

MAITRE DE STAGE SUR LE TERRAIN :

G Wibawa and L Joshi, ICRAF

Coordonnées précises de la structure d'accueil :

- Adresse : ICRAF PO box 161, Bogor.
- N° Téléphone : 62 251 625 415
- N° Télécopie : 62 251 625 418

RENSEIGNEMENTS CONCERNANT LE STAGE

Durée-période : 6 mois (mi-mai à mi-novembre)

0,5 a 1 mois de préparation à Montpellier : bibliographie, méthodologie, traitement des données existantes sous la supervision directe de JM Eschbach, préparation du questionnaire spécifique (en collaboration avec E penot)…
15 jours de stage de langue en Indonésie à Jogjakarta
4 mois sur le terrain juin a octobre
1 mois de rédaction du mémoire à Montpellier : novembre. Soutenance en décembre.

Prolongement possible (VSN, VAT, emploi possible) : Non

FINANCEMENT POSSIBLE-SOURCES :

Voyage : Non (1.050 €). Prévoir assurance rapatriement . Voyage couvert par CNEARC

Séjour et Logistique sur place : Oui.

Pas de stage de langue Toutes les dépenses locales de transport avion, bus sont prises en charge par le projet ICRAF. Une moto + essence est normalement fournie. Un accompagnateur du projet (interprète) est le plus souvent présent avec le stagiaire.Hébergement et nourriture sur le terrain : prise en charge partielle, à l'exception de Bogor.

PROFIL DU STAGIAIRE SOUHAITE :

Agronome, curieux, aimant le terrain et les discussions avec les producteurs.

LANGUE EXIGEE :

Anglais impératif.
Indonésien : stage de langue sur place impératif.

Ce stage est proposé par le CIRAD-CP.

Outputs

Un « executive summary » en anglais est demandé par ICRAF, résumé large du rapport, dépose au départ d'indonésie (obligatoire).

CIRAD TERA pourrait preter un micro-ordinateur pour la rédaction du mémoire pour le durée du stage (selon disponibilité).
Il est souhaité que la rédaction finale se fasse en France sous la direction du co-encadrant en France (E Penot), 1 mois. Il est enfin souhaité que le travail débouche également sur une publication commune, stagiaire (s) et les deux co-encadrants pour une valorisation scientifique commune du travail, ce qui engage le futur stagiaire sur une période de un de collaboration commune pour finaliser l'article).

Annex 5

Extract from "Smallholder rubber agroforestry --- in the light of current rubber overproduction", M v Noorwick 22/08/02

Main hypothesis

Hypothesis 1

Smallholder rubber producers with extensive systems are a key 'security valve' in the global rubber production system: their flexibility in production decisions is much greater than found in the plantation sector and allows the sector as a whole to adjust to price signals.

As labour for tapping is the main cost component in the smallholder system, a fine-control based on actual financial returns per day of labour is feasible, as long as there are sufficient other livelihood options in the landscape. The extensively managed rubber agroforests have allowed at least part of the secondary forest to survive within the reach of villagers and providing an 'escape' if rubber trees have to rest because of drought or because prices are low.

Stability is an aspect of systems that does not readily transfer across scales: stable components don't necessarily lead to stable systems, as they have a tendency to deflect variability in external conditions to each other, while variable (unstable) subsystems can have the complementary and elasticity that allows a larger system to fluctuate within narrow bands only (be stable). The various actors in the rubber sector may this have different objectives and interests in a 'price stabilization' mechanism, and it may or may not serve their real purpose.
If price stabilization means that the market price signal of oversupply is not transmitted, and it may thus destabilize the system on a longer time scale (once the market regulation mechanism becomes too expensive to be maintained, its accumulated stocks may depress prices for a considerable time period -- as the post-INRO experience shows...).

Resilience of the production system as a whole should be based on at least two components:

- resilience at the producer level can be increased by maintaining other options for productive use of labour on farm, in the rural landscape, or within the migrational range of households,
- resilience of the market and processing channels requires sufficient flexibility in the capacity used (low 'fixed costs').

Hypothesis 2

Diversity of livelihood options within the extensive rubber agroforest, within the rural landscape and on the basis of off-farm and off-site employment while maintaining the stock of rubber trees allows smallholders to maintain income in the face of rubber price fluctuations

The 'replanting subsidy' form of allocating financial resources to support the rubber sector represent just one of a larger range of options (Table 1).

Hypothesis 3
The government funds required for interventions in the rubber sector that maintain rural income can be more effectively used by mechanisms that provide rewards for 'environmental service functions', rather than for 'replanting subsidies' or direct price-support efforts

It is highly relevant for the rubber sector as a whole to explore these options, based on a realistic representation of the rubber production sector as a whole and the elasticity of the various actors. Existing CGE (computable general equilibrium) models that represent the macro-economy at national scale (e.g. Indonesia) can be used to help in such analysis, especially where labour absorption in other sectors of the economy is involved. Current CGE models, however, do not recognize sub-systems such as plantation versus smallholder (let alone agroforest versus clonal plantation), so considerable effort will be needed to refine these models. A complementary approach can be to start from existing landscape level models that represent farmer decisions and their impacts on environmental services, and add the other production subsectors, plus explicit ways to represent the various policy options. The FALLOW model can be used for this second approach.

We propose that the current CFC supported project on smallholder rubber production systems maintains its overall objectives in improving rural livelihoods and exploring the benefits of diversity at plot, farm and landscape scale, but that the activities under the project are re-oriented towards a better understanding of the rubber sector as a whole, the positive role of 'safety valve' that the current system provides (at least according to hypothesis 1) , and the quantification of the various elasticities in smallholder production decisions that influence the behaviour of the sector as a whole. These studies can lead to a tool that can be used to evaluate the various policy options for balancing supply and demand

Table 1. Initial tentative evaluation of a number of policy options for addressing rubber overproduction, evaluated from a number of perspectives

Policy options	balancing supply to current demand	maintaining rural income, avoiding poverty	maintaining long term production options	balancing supply to future demand	environmental impacts
1. Replanting subsidy	+	+ (distribution?)	+	-- to +	-/0 (depending on replanting technique)
2. Price guarantee and stockpiling	--	+	+	--	-?
3. Quota for production with guaranteed prices	+	+/0	+	+	0
4a. Free price fluctuations, income support via 'environmental service rewards'	+	+	+	+	++
4b. Free price fluctuations, support for establishment of 'ecolabels as 'environmental service reward' mechanism via premium prices	+	++	+	+	++
5. Free price fluctuations, income support for all producers	+	0/+	+	+	0
6. Free price fluctuations, local development support via infrastructure investment	+	0/+	+	+	-/0
7. Subsidies for switch to e.g. oil palm	+	0/+	-	?	-?

Annex 6

Summary of CFC Planning Workshop on *Improving the Productivity of Rubber Smallholdings through Rubber Agroforestry System.*
Bogor, 7 September 2002
Extracts and comments in note /italic from E Penot

Introduction

Technically the proposal on *Improving the Productivity of Rubber Smallholdings through Rubber Agroforestry System* **was initiated during 1997 and the decision of principle was accepted by CFC, as soon a 1998 . Negociations began to lead to projet inception in 2004..**

. However Gapkindo as the Project Executing Agency (PEA) received the operational fund for the project on May 2002. The important time lag (4 years) between the submission of the original proposal and the fund realization needs a deep review on the overall objective of the project, in order to produce both good scientific and technical operational results. There are various current issues that have to be adapted to the original proposal, including the change of site conditions.
Beside of that, the project that was planned as the counter-part project for this CFC project, such as 'Multistrata agroforestry systems', funded by DFID and other project related to rubber agroforestry were partly accomplished and have produced various results (modeling, farmers' decisions, ecological knowledge), then the activities of this CFC project have to take into account those results and to go a step ahead.

Based on those conditions, then it was agreed that this work would be modified following the current circumstances. This is very important to avoid the un-necessary overlapping activities within this CFC-funded project. Topics on policy has also considered as an important activity, which was not specifically issued in the original proposal.

Note : this has been done partially during the CFC meeting in 2002 and confirmed in details at the inception CFC project meeting in April 2004

Mis en forme : Anglais (Royaume-Uni)

The next CFC-funded project needs also to be linked to the various research activities that exist within the participant institution (ICRAF, IRRI, UPS), in order to reach a good synergy, either at field level or at program level. This planning workshop was carried out to review the progress of various research results on rubber-based agroforestry and to explore current issues that need to be accommodated in the activities of this new project.

Workshop Results

After the four presentations, participants of the workshop were divided into three Groups that were expected to recommend various issues that are necessaries to be considered in this CFC funded project. Summary of the issues resulted from the three groups and its relation to the original research components is presented in Table 1

Table 1. **Issues that are proposed by three working groups and its' link to the research components, mentioned in the original CFC proposal.**

No.	Topic Group	Component CFC
1	**How can latex, timber, fruit and other biodiversity deliver more benefit to farmers?**	5
2	How to improve marketing of rubber and of products originating from non-rubber species to increase income and to reduce the investment cost and **how does elasticity of farmers response contribute to global market functioning.**	5
3	Environmental services (C sequestration, watershed function, biodiversity…) are farmers aware about the value of biodiversity?	4
4	**How can farmer have access to training on improving rubber quality, tapping and grafting techniques.**	
5	**The need for quantification of production in Rubber Agroforestry Systems, in Jungle Rubber Agroforestry and in improved systems**.	1 & 2
6	Quantification of relationship between various components in Jungle Rubber Agroforestry (simulation model).	3
7	How to improve the availability of planting materials for smallholders.	3
8	How to improve farmers' organizations and extension/dissemination information.	
9	**Scaling up of the analysis: from plot to a larger context level (household, landscape level).**	1 & 2
10	**How can a broader Integrated Natural Resources Management (INRM) framework (policy, spatial planning, and Landscape context) benefit the rubber agroforest farmers.**	2 & 5
		new or 5
		new or 5

Note : the paragraphs in bold are discussed in this report.

Results of the integration of the new issues from the planning workshop, may be use to strengthen the objective of the current CFC project for the following three years. Following is presented issues that need to be linked to the original research components of the CFC project:

Component I. Setting up and maintaining demonstration/training plots on small farms through effective farmer-participatory approaches to develop and test recommendations for improved clones and techniques and their acceptability by farmers. Plots will be established under varying environments and different testing strategies including: an environment similar to jungle rubber where unselected seedlings are replaced by adapted clones; the intercropping of rubber with food crops, principally upland rice NOTE A) and various fruit trees and timber trees (NORA B) ; and rubber cropping on grasslands with the use of cover crops and fast growing trees to reduce or eliminate weeding requirements Note 3. Results will be used to formulate technical recommendations for dissemination through regular extension services and/or by larger-scale projects. Outputs will include publication

and dissemination of recommendations through extension leaflets and other materials. ***Issue will be completed with tapping training that related to the monitoring activity, mainly to the farmers who participated the former SRAP project and the closest farmers.***

Note A : already done and well documented with STD III/EU project in Sembawa as well as rice intercropping trials in RAS 2 by SRAP in 1995/1998.

Note B: still further research should be done in this very promising topic.

Note C ; still efforts should be put on tree-cover-crops combination in RAS 3 to overcome alang² ?

Production control and potential as well as quality of tapping are top priority in term of technical support.

Component II. Budwood Garden Program for the production and dissemination of improved rubber planting material to farmers will be trained in nursery management and grafting techniques, so that they can produce high quality planting material at all affordable price. The main output of the budwood garden program will be the production and availability of improved genetic material at the village level. ***Issue will be completed with development and/or empowerment of farmer organizations for field developments, rubber processing and marketing.***

Component III. Agronomic Monitoring of competition between species in the rubber agroforestry systems concerned in order to optimize cropping densities, patterns and practices ill different socio-environmental situations. Outputs will include practical recommendations to farmers on planting mixtures, densities and practices***. Issue will be completed with parameterizing of rubber and other species (growth and yield), in order to develop and test the 'SeXi Model' developed by ICRAF. Including in this activity is the relation between tree canopy and yield.***

Component IV. Monitoring of Biodiversity. Biodiversity evolution will be monitored in relation to the original vegetation and fauna of the area under study. Outputs will include a complete assessment of biodiversity evolution and expectation in RAS systems. ***Issue will be completed with exploring the possibility to establish mechanism for environmental services for farmers and benefits of the system at various level of analysis (landscape and government policy).***

Note ; some previous analysis have been done by H de forest, 1992, R Bekuma, 1995, S Baudens in 1999 and S Diaz Novellon in 2000. This topic need to be explored in particular concerning the "useful biodiversity" with fruit and timber tress , medicinal plants etc…

Component V. Farming System Characterization and Monitoring. Socio-economic surveys and technical evaluations will assess the adoption of innovations, identify limitations to rubber agro-forestry techniques and recommend suitable farming systems adapted to local conditions. ***Issue will be completed with***

institutional analysis: processing and marketing of rubber and non-rubber products (timber, fruits, resin) ant impacts of various externalities (price, regulations, government projects) on farmers' decisions. Due to the close linked to other components, the orientation of this component will use various level of analysis (plot, farm, and landscape) within the frame of Integrated Natural Resources Management (INRM).

Note : this is a key component as well for CIRAD, sharing the lead with ICRAF for that specific topic. Olympe hase been selected as a tool to monitor, characterize and follow up farming systems. ICRAF staff has been trained for that purpose during this mission, with some appropriate methodology provided.

Mis en forme : Anglais (Royaume-Uni)

Component VI. Dissemination of Project Outputs. This will involve networking by farmers involved in the demonstration plots as well as by extension staff and other professionals from participating rubber producing countries and local institutions concerned. Practical action orientated extension materials, in the languages used by the farmers concerned, will be produced and there will also be a limited number of scientific documents prepared. The project will begin with an opening workshop to review existing methodologies and the necessary adaptations to local situations in Indonesia, Myanmar and Thailand. This will guide the preparation of detailed work plans. A final project workshop would seek to disseminate findings to a broad range of potential beneficiaries from rubber producing member countries of the CFC This would also result in a publication.

Note : an important topic as well, in particular with information obtained from farming systems studies that may provide significative elements for policy recommendations.

Anex 7

Training on Olympe

Exercise

Year of simulation : 2005
The objective is to create a farmer that has the following structure :

- 1 hectare of jungle rubber, planted in 1980
- 1 hectare of SRDP clonal rubber in monoculture; planted in 1990
- 0,5 hectare of RAS 2 sendiri, planted in 2005
- 2 hectare of oil palm project planted in 2004
- 1 hectare of rice ; every year

1 UNITES/UNITS
Rp
Kg
Item
manday

2 DEFINITIONS/

POUR ATELIERS /cropping/livestock systems

PRODUITS /OUTPUTS

Slab tipis : value 6000 Rp /kg
Paddy : value 2000 Rp/kg

CHARGES/INPUT COSTS

Formic acid : I liter = 22 00O Rp
Tapping knife : per item 25 000 Rp
SP 36 : .1500 Rp/kg
Urea : 1250 Rp/kg

POUR ENTREPRISE/STRUCTURAL COSTS AT FARM LEVEL

Montly expenses for the family : 500 000 Rp
PBB : tax on land and house : 50 000 Rp/year.

3 ATELIERS/CROPPING SYSTEMS

1 hectare of jungle rubber, planted in 1980

- no input at planting
- opening at 10 years after planting
- yield /ha/year: 600 kg DRC 100 so 1 000 kg slab tipis at 60 %
→ enter the yield in slab and the value of humid slab. No conversion in DRC 100 at that level

CULTURES/ANNUAL CROPS

1 hectare of upland rice in ladang (slash and burn)

local variety ; from stock
no fertilizers, no other inputs.

Yield : 500 kg/ha year

PERENNES/PERENIAL CROPS

1 hectare of SRDP clonal rubber in monoculture; planted in 1990
- planting input : covered by credit.
- Opening at 6 years after planting
- Credit reimbursement : : 30 % of the production : duration 10 years : beginning 7 years after planting.
- Annual cost of production during mature period:
  formic acid: 12 liters/year
  tapping knife : 1/year

plantation lifespan : 30 years

0,5 hectare of RAS 2 "sendiri"

Planting cost (year 1) :
Rubber :
Stumps : 600/ha at 1000 Rp/stump
SP 36 : year 1, 2, 3, 4 & 5 : 50 kg /ha/year
urea : 75 kg

Rice intercropping : Year 1 and 2
selected local variety : 40 kg seeds/ha : cost 2500 Rp/kg of rice seeds

SP 36 : 75 kg, same price
Urea : 100 kg, same price
Yield : 1300 kg/ha year 1 and 800 kg/ha year 2
Insecticide : 1 liter at 75 000 Rp/liter
Herbicide : Round-UP : 2 liters at 50 000 kg/liter

Annual cost of production for RAS 2 during mature period (production period):

- formic acid: 12 liters/year
- tapping knife : 1/year

plantation lifespan : 25 years (clone PB 260)

2 hectares of oil palm through project (PT PEGEDELAXBACH)

All costs during mature and immature period covered by credit provided bt PT.
Reimbursement credit : 50 % pf production for 10 years. Credit begin the year 3.
Beginning of production : year 3
Production : year 3 to 6 : 10 tons TBF : annual production value 2 500 000 Rp/ha/year
Production : year 7 to 18 : 20 tons TBF : : annual production value 5 000 000 Rp/ha/year

Plantation lifespan : 18 years.
Take care to the definitions of “phases”.
Phase 1 : year 1 and 2
Phase 2 : year 3 to 6
Phase 3 : year 7 to 12
Phase 4 : year 13 to 18

4 AGRICULTEURS/FARMERS

Create 1 or several farmers.

5 ALEAS/HAZARDS

See examples of use of the module , presentation by E Penot.

6 INDICATEURS/INDICATORS

Demo on how to customize Olympe and create our own formulas

7 TABLEAU DE SORTIE/PERSONNAL OUTPUT DATA TABLE

Demo on how to customize Olympe and create our own tables

8 COMPARAISON /COMPARISON

Demo on how to compare farmers on several items.