

RESEARCH AND DEVELOPMENT ON THE SMALLHOLDER RUBBER SECTOR IN CAMEROON AND GHANA

Bénédicte Chambon (CIRAD/NRRP), Thierry Chapuset (CIRAD), Simon Gobina
(IRAD)

Abstract

Since 1999, Cameroon and Ghana have been conducting research to improve the production conditions and income of small and medium-sized rubber plantations. This paper provides a brief description of the work undertaken, focusing on the methodology adopted (participatory approach with an analysis of farm functioning, on-farm trials, networks of reference farms) and on the tools used (survey design software, farm modelling and simulation software, natural rubber reference system). It also presents some of the results, particularly those concerning the constraints that smallholders are facing as well as some suggestions to improve the situation.

Introduction

Development of the smallholder rubber sector in Cameroon and Ghana has been the aim of research programmes for several years already. The work has been carried out by national organizations (IRAD's¹ natural rubber research programme in Cameroon, GREL's² rubber outgrower plantation project in Ghana) with technical and financial backing from French Cooperation and from CIRAD.

The purpose of this paper is to provide a glimpse of the research work being conducted in these two countries, focusing on the methodology adopted and on some of the results obtained.

The general approach taken and the tools and methods used were common to both countries, but the context in which they were brought into differed slightly. For instance, in Cameroon, the research programme designed to define development procedures for the smallholder rubber sector is being implemented independently of any development project, whereas in Ghana research work intended to determine the most appropriate techniques for small and medium sized rubber plantations is being undertaken with support from an ongoing development project. Consequently, the different activities were developed unequally depending on the national situations. The results already obtained are also at different level.

1. Participatory approach for on-farm research

The approach taken in both countries was participatory research, which places farmers and their farms at the centre of investigations. The need to take smallholder practices and strategies into consideration when putting forward appropriate proposals for improving production conditions on smallholdings and thereby promote smallholder rubber growing is widely acknowledged.

¹ Institut de Recherche Agronomique pour le Développement

² Ghana Rubber Estates Limited

1.1 – Analysis of farm functioning and typologies

Several studies were conducted to gain a clearer understanding of rubber farms, and their socio-economic environment.

A systemic approach was adopted. In fact, all activities undertaken on a farm are linked; production factors (land, labour, capital) are divided up between the different activities and crops. The farming environment (access to agricultural inputs, including improved planting material, access to capital, to technical information and to the markets, and competition from other lucrative activities, etc.) greatly influences the decisions taken by farmers in terms of practices, from a plot level to overall farm management.

The analysis carried out concentrated on the "family farm". Indeed, the development of small and medium sized farms is closely linked to the development and objectives of the family; the family is also closely involved in farming activities and often makes up the majority of the work force. However, particular attention was paid to rubber cropping systems³, which were examined in detail.

In Cameroon, the purpose of the rubber farm functioning analysis was to carry out a diagnosis of existing farms and identify the assets and constraints of smallholder rubber growing. Several studies have been conducted since 1999:

- an analysis of various rubber farms located in the zone covered by CDC in Southwest province and by HEVECAM in South province (Michels, 2001), which resulted in the establishment of a knowledge base for Cameroonian rubber farms and provided an initial overall diagnosis of those farms
- an analysis that concentrated more specifically on farms that had set up rubber plantations recently in Southwest province (Chambon, 2002; Chambon, 2003), which pinpointed the conditions required for farmers to set up rubber plantations using their own resources: decision-making process, practices and associated costs
- an economic study of some typical farms located in Southwest province compared the income levels of the different types, and determined the role played by natural rubber in the farming systems and in the incomes of small and medium sized farms (Plaza, 2003)
- a study of the reasons for the drop in production seen on smallholdings in Southwest province between 2000 and 2003 revealed the consequences for small and medium sized farms of dysfunctional marketing in the rubber commodity chain in the zone (Chambon, 2005).

In Ghana, an analysis of the functioning of some rubber farms benefiting from the development project, and involved in the research programme backing that project, had a dual purpose (Chambon, 2004):

- provide a characterization of farms prior to tapping, so as to establish a reference for measuring the impact of the project on farm functioning and incomes

³ A cropping system is defined as being "a set of plots cultivated in a uniform manner and, in particular, subjected to the same crop succession" (Jouve, 1984).

- describe actual farmer practices in terms of rubber plantation management, and quantify the associated costs, so as to adapt any project recommendations as well as possible.

In both countries, characterization of the rubber farms was used to establish farm typologies based on a certain number of socio-economic and structural characteristics of the production units: area, labour, socio-professional origin of the head of the farm, constitution of the farming system⁴. These typologies revealed the diversity of the rubber farms existing in Cameroon and Ghana and could be used to determine the support to be provided to the different groups of farms with a view to improving production conditions and incomes.

1.2 – On-farm trials

On-farm trials were set up in both countries, to improve or optimize production conditions on the farms, and to remove a certain number of constraints with which farmers were faced.

The experiments carried out were primarily intended to test, under new agro-ecological and socio-economic conditions, the feasibility and conditions for implementing techniques and/or organizational procedures that had already been recognised in other contexts, either on research stations, or on farms in other countries. Their main aim was not to develop new production techniques or organizational procedures. It was somewhat a matter of:

- analysing with the farmers their technical, economic and social impact on farm functioning,
- studying what the farmers thought of these new techniques and/or new organizational procedures
- determining the degree to which they were acceptable to farmers and taken on board by them.

These on-farm trials have been developed much more in Ghana than in Cameroon. Indeed, in Ghana this component of research activities was launched in 1999. Thus, several trials intended to determine the most appropriate techniques for Ghanaian rubber growers have been conducted over the last five years on various subjects (Eschbach, 2002; Eschbach, 2004).

Some results are already available and can be used by the other countries involved in this research on improving practices on rubber smallholdings, notably in Cameroon.

Since 2001, Cameroon has not benefited from any project funding research in the smallholder rubber sector; setting up the on-farm trials therefore relied on NRRP and CIRAD funding alone. Consequently, although it appeared important at the end of the diagnosis phase to set up on-farm trials on several subjects, only one trial could be set up in 2004, concerning the smallholder production of quality budded planting material.

⁴ In Cameroon, two typologies were in fact established by Michels (2001). He also proposed a typology based on the rubber plantation management strategy.

A trial has also been launched on rubber post-harvest processing on smallholdings, with the on-site construction of a prototype mini-creper, and on-station trials (and at the CDC factory). The next stage will consist in installing this type of machine, along with a hand mangle, on farms.

Results are therefore expected soon, particularly for the production of quality budded planting material by smallholders. However, it appears necessary to set up other experiments rapidly on similar subjects to the trials set up in Ghana, particularly on the comparative performance of clones on smallholdings, on plantation management during the immature period (chemical weeding of the planting row, fertilization, interrow management) and on tapping systems.

1.3 – Setting up networks of reference farms

The basis for setting up networks of reference farms has been established in Cameroon.

A network of reference farms is made up of a set of voluntary farmers who are representative of the farming situations or farms in which we are interested.

It is characterized by the development of symmetrical and close relations between farmers and technicians/researchers around processes such as diagnosis, creating innovations, and advice. It constitutes a lasting framework of collaboration with producers; it provides them with the opportunity to play an important role in research–development programmes and/or in deliberations on the support to be provided to agriculture.

Depending on the contexts in which they are developed, and on the objectives sought, the networks of reference farms may have various functions: produce knowledge on how farms function, identify smallholder innovations or validate proposals put forward by research, support the drawing up of smallholder projects, etc.

As part of the research activities in the smallholder rubber sector of Cameroon, three networks of reference farms should be gradually set up, each with specific objectives and achievables:

- test and validate techniques and/or organizational procedures that exist elsewhere in order to make technical recommendations (technical/economic references) adapted to the different types of rubber farms in Cameroon
- study the processes by which new techniques and organizational procedures are accepted and taken on board by farmers, along with their impact on the farms; this should enable us to see to what degree they are adopted/taken on board by the different types of farms, and to identify dissemination methods
- monitor changes in the running of rubber farms, to acquire a characterization of the farms over time, which will be useful for defining any farmer support policies.

Establishment of the first two networks of reference farms began in 2004; all the heads of the farms involved in the trials on smallholder production of budded planting material (first network), along with some farmers present in the villages where it was set up but not directly involved (second network), underwent the same survey, which provided an initial characterization of representative farms for each of the types of

rubber farms defined in the previously mentioned typology. Some farmers who had yet to set up a rubber plantation were also incorporated into each of the networks. Following this initial characterization, all the farms will be monitored regularly (yearly). For the farms involved in both networks, it will be a matter of detecting changes occurring in the farming systems. For the reference farms in the first network (20 farms), particular attention will be paid to what becomes of the proposed activity depending on the types of farm. For the reference farms in the second network (27 farms), more specific attention will be paid to the impact of introducing the production of quality budded planting material (creation of new plantations, type of planting material, etc.), along with the processes by which the technique is disseminated/taken on board, and the relations established with the farmers directly involved in the trial.

2. The tools used

The gathering and processing of data generated by the surveys and on-farm trials used two main tools: Sphinx software and Olympe software. A rubber cultivation database is also being compiled.

2.1 – Survey design and data analysis

Many types of software exist for questionnaire design and survey data processing. Virtually all of the surveys conducted in Cameroon and Ghana involved the same software: Sphinx. It was particularly chosen because it is user-friendly and it is easy to process open questions. Data transfer from/to a spreadsheet (Excel) or a database (Access) is easy.

Results from the on-farm trials can also be stored (or processed) using this software. By merging the files arising from the surveys with those arising from the experiments, it is easy to analyse the relations existing between the socio-economic data relative to the farms, and the results of the on-farm experiments for those same farms.

2.2 – Modelling and simulation of farm functioning

Farms are a complex study subject due to the diversity of activities, practices and sources of income. By modelling the farms, it is possible to simplify this complex reality and gain a clearer picture of their functioning, particularly from economic data. In addition, farms evolve in a changing environment and smallholders are required to make decisions (regarding crops, techniques, etc.), whose consequences in the more or less long term may be important. Simulating economic results in different possible scenarios constitutes a tool for dialogue and communication with:

- farmers in the context of management advice or on-farm trials
- decision-makers and funding agencies when development projects or the support to be provided to farmers are being defined (Penot, due out).

Olympe⁵ is software for modelling and simulating the functioning of farms. It was initially designed for farms in industrialized countries, but has gradually been adapted to the conditions found on smallholdings in developing countries, particularly those where the farming systems depend on tree crops.

This software has been used in research conducted on the smallholder rubber sector in Cameroon. For modelling, two approaches are possible depending on the objective in mind (Penot and Deheuvels, 2003):

1. Modelling of real farms for real-time testing of choices and smallholder technical hypotheses. Modelling is carried out either with true farms, or with average farms that are sufficiently representative of uniform agrarian situations
2. Modelling of theoretical farms that are representative of "farm types", hence arising from a prior typology. In this case, modelling makes complex and varied situations easier to read.

In Cameroon we worked on theoretical farms representative of the different types of farm identified by Michels (2001). Starting from the costs and income data gathered from farmers, it was possible to:

- determine for each farm the profit margins and balances on a farm level and for the different activities, along with the role played by natural rubber and the other tree crops in the farming system. This enabled us to compare the economic results for the different types of farm and characterize the rubber farms at a given moment in time
- analyse income trends on the farm over ten years when no change occurred in the farming system (no plantation creation, no premature felling), or in the economic environment of the plantations (stable price). This analysis revealed the need for certain farms to set up new plantations in order to ensure a degree of stability, or even to increase income in the long term which, without change, were set to decline in less than ten years
- study the impact that setting up rubber plantations would have on farm income trends. It was thus shown that, apart from one group of farmers (emerging rubber growers), even if plantations were created in 2004, the renewal of productive rubber growing capital would appear to have been too late to prevent the drop in farm incomes. This shows how urgent intervention is needed to encourage small and medium sized rubber farms to develop new plantations and/or improve productivity in existing plantations.

The software has yet to be used in Ghana, though it could be used to make some interesting analyses, notably to study the effect of technical changes or predict the impact of the development project on rubber farm incomes.

Sphinx and Olympe software packages are therefore very useful tools for research on the smallholder rubber sector; they have been used to that end in both countries.

⁵ Software developed by INRA/ESR (Institut National de Recherche Agronomique, Economics and Rural Sociology Department) in conjunction with AMM (Institut Agronomique Méditerranéen de Montpellier) and CIRAD.

2.3 – Natural rubber reference system

A database is being constructed at CIRAD (Montpellier).

The initial function of the database is to store all the data relative to a "tree crop based" plot in a structured form.

These data involve cultural practices and what determines them, inputs, products, along with qualitative and quantitative observations carried out in the plot.

The information can be considered in relation to the plot as a whole, or they can be assigned to operations, or products from the main crop, or to intercrops (which may succeed each other in time and in variable proportions).

Insofar as information is available, these observations are dated and costed (e.g., the cost of inputs, product selling prices, etc. which can fluctuate over time).

The source of the data varies considerably. It is possible to store data from surveys, assessment missions and experiments, in controlled environments and on farms.

Plots are situated geographically (georeferenced), soil data may be introduced. It is also possible to combine plots on a farm scale (described in terms of common factors), and on a farmer scale (socio-economic factors).

This entire initial stage concerns data gathering, structuring and storage. Sphinx is therefore one of the potential data suppliers.

Data utilization is left to the discretion of all concerned, since it is possible to extract datasets for more in-depth studies.

A technical frame of reference can be drawn up for the agricultural practices, and what determines them, of a group of farmers after establishing a typology (either with Sphinx or with another software). Likewise, it is possible to obtain a set of technical/commercial parameters per type of farm or farmer, with a view to carrying out simulations (case of Olympe). Olympe is a data consumer.

The database/technical-commercial reference system is therefore at the interface of Sphinx and Olympe.

3. Constraints faced by smallholders and suggestions to improve the situation

From the farming system analysis, the main constraints that rubber smallholders face were identified. These are mainly constraints that the Cameroonian smallholders meet now, but these are constraints that the Ghanaian farmers may have to face in the future, when they will not be supported anymore by a development project.

3.1 – Some constraints for the smallholders

The farmers have two main problems concerning the existing plantations : the low productivity and the evacuation of their cup lumps.

The low productivity of the plantations is due to an irregular tapping and a very low quality of tapping. The tapping task is also generally small (340 trees on average for the sample surveyed by Plaza, 2003). The plantations were damaged by root disease

or fire. And the tapper, who is often retired from the estate, is old which limits the size of the tack (working speed and endurance rate).

For a long time, the agroindustries transported production from smallholdings to the factory; rubber collection was billed at a lump sum. With privatization (effective or under way), the agroindustries gradually withdrew from a certain number of the services rendered to small and medium-sized farms. Consequently, producers had to organize themselves to move their production to the factories: they used private hauliers (pick-ups, small trucks). In this new situation, excess costs were incurred by the farm, leading to a drop in profits (Michels, 2001).

Farmers who wish to plant rubber also meet some difficulties: they have a limited access to budded planting material and the cost for the upkeep of the plantation during the immature period is high.

Now, the only way for farmers to plant good quality budded planting material is to buy it from the agro-industry. But, the availability depends on the estates replanting programmes, the cost is high, and the planting material is usually produced far from the smallholders which means that they have to organise and pay for the transport. The consequence of this situation is that many farmers (around 40% of the immature plantings surveyed in 2002) planted unselected seedlings. When they had the opportunity, some farmers produced the planting material at the farm level : those who had the knowledge and know-how did it themselves ; the others paid some technicians to do it for them ; these farmers are then depending on the availability of the technicians to produce their planting material. And, for most of the plants produced at the farm level, the budwood used did not come from a budwod garden. So, the origin of the budwood raises the problem of the quality of the budded plants produced and planted on smallholdings.

Once the rubber trees are planted, the smallholders have to face high cost for the upkeep. A lack of labour and a lack of cash result in a poor maintenance of the plantations : the upkeep in young plantings was far from what is recommended to guarantee optimum rubber tree growth (Chambon, 2002). As a consequence, the opening of the plantations is delayed. In order to facilitate upkeep in immature plantings, a certain number of smallholders had planted intercrops in the rubber interrow. Intercrops (annual or multi-annual foodcrops) were usually planted in the first year after planting; they then decreased steadily each year. But they were not systematically planted over the entire plot ; the factor limiting the cultivated area was usually the work force, or possibly land conditions.

3.2 – Some suggestions to improve the situation

To improve the conditions of production of the rubber smallholders and so develop the sector, some suggestions can be made.

A. It is really necessary to set up an effective and durable extension system. In Ghana, extension is provided by the development project but for Cameroon, until now, extension is supposed to be done by the agro-industries which seem to be more interested in the production than in the transfert of technology. Therefore, there is a need not only to train the trainers but also to organise a real system of extension and make sure that the information really reaches the farmers. This certainly supposes to improve the communication, maybe using radio, booklets distribution...

B. Improving the access of the smallholders to good quality budded planting material is an essential issue to improve the productivity of the plantations. This can be done through the assistance to the emergence of private nurseries selling the planting material at the village level. This can also be achieved by encouraging and training farmers to produce their own planting material.

An important matter is the quality of the budwood which is going to be used to produce this planting material. It is certainly necessary to provide the future private nurseries or the smallholders with a certified budwood nursery.

The development of the production of planting material at the village level should be an opportunity to introduce or develop the use of some new clones. Indeed, until now, GT1 has been the most widely planted clones in smallholdings. But some clones have a shorter immature period, a stronger and quicker production after opening and a higher productivity than GT1 ; they should be planted by the smallholders.

C. Intercropping is known to facilitate the management of the plantations during the immature period by generating an income for the farmers. Therefore, it is important to encourage and optimize the implementation of intercropping in the young rubber plantations. But, intercropping may not fit and interest all the smallholders. So, some alternatives should be studied in order to reduce the cost of upkeep during the immature period. This can be done through the choice of a clone with a good shading during the immature period, through the development of some techniques less labour consumer (control of forest regrowth)...

D. Pre-processing of the cup lumps at the farm (or village) level would obviously reduce the transport cost of the production. This should also contribute to the improvement of the quality of the rubber produced by the smallholders. Another advantage of pre-processing of the cup lumps is that this would eliminate the disagreement between farmers and the factory on dry rubber content (DRC) determination. The relations between these two important actors of the rubber industry would be greatly improved.

E. Financing the rubber plantations is often a problem for the smallholders because of the level of the investment required and because of the long return on investment. Some farmers have generating important income but they have some difficulties to save it and use it for later investments. Therefore, this kind of farmers should be encouraged and assisted in savings in order to be able to mobilise self-funding for their new developments. However, not all the smallholders generate enough income to be able to self-fund the creation of their plantations. For those farmers, some systems providing small short terms loans should be developed and adapted to the rubber farmers needs.

F. Farmers organisations are scarce. Yet, many of the improvements suggested above could be undertaken within farmers organisations : extension, production of planting material, pre-processing... These organisations would also give smallholders a better representation and a more important negotiating power with the other actors of the rubber chain. So, the emergence of effective and durable farmers organisations should be encouraged and assisted. This seems to be an important base for the development of the rubber smallholder sector.

Conclusion

This paper has provided an idea of research activities conducted over the last five years intended to improve the production conditions and incomes of small and medium sized rubber farms. It shows that there exists in Cameroon and Ghana:

- ongoing action and results on the improvement of incomes on small and medium sized rubber farms
- a research initiative and common tools.

This is a basis that could be taken into consideration and consolidated in connection with a possible project on improving production conditions on small and medium sized rubber farms in West and central Africa.

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