

Book of Abstracts

3rd European AGROFORESTRY Conference 2016
23-25 May 2016 – Montpellier SupAgro, France



***Celebrating 20 years
of innovations in European Agroforestry***

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EUROPEAN AGROFORESTRY FEDERATION

3rd European Agroforestry Conference

**Celebrating 20 years of Agroforestry research in
Europe**

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We thank Esther Lauri for her help on formatting this document, and the local organizing committee, in particular Sandrine Renoir

AGROFORESTRY PRACTICES TO OVERCOME PRICES VOLATILITY: THE CASE OF RUBBER IN PHATTHALUNG PROVINCE, THAILAND

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Introduction

Thailand is the top world producer of natural rubber, with 4.3 million tons in 2014 mainly produced by smallholders (90%). Natural rubber prices have always been fluctuating, but never as much as 2010-2015 period: from 5.56 USD/dry kg (SMR20 Kuala Lumpur) in 2011 to 1.5 USD/dry kg in 2015. The "golden period" stopped in 2012 and rubber price has been decreasing since, directly impacting farmers' income. Two main strategies are used by farmers to sustain their income: i) association of fruit and timber trees with rubber (or shade tolerant cash crops) in agroforestry systems (AFS) and ii) development of off-farm activities. To analyse the first strategy, a study was conducted in Phatthalung province (Southern Thailand) in the frame of the ANR/Heveadapt project to analyse how smallholders who adopted rubber agroforestry systems (AFS) deal with rubber prices volatility. The main objective was to understand the role of AFS in income stability and farm's resilience through the identification of the best rubber-based agroforestry systems. Several previous studies have been conducted on the diversity of rubber-based agroforestry systems in Southern Thailand (A. Simien 2015, B. Somboonsuke 2011 and V. Jongrungrot 2014). Our study intends to complete these works by a dynamic analysis, through the test of various price scenarios, in order to evaluate resilience to rubber price volatility.

The success of rubber development in Thailand owes to major public incentives starting in the 1960's with access to grafted planting material, technical support and funding (RRIT and ORRAF), and land ownership (ALRO) (Delarue and Chambon 2012). In the South, rubber trees seemed to have reached their maximal extension (72% of the national production with 1,894 million hectares of mature plantations). The government is now encouraging rubber farmers to diversify. Historically, rubber trees were grown from seedlings alongside a wide diversity of fruit and timber trees, known as "jungle rubber", a complex agroforestry system with a limited rubber yield of 300 dry kg/ha/year (Besson 2002). In the 1960's, ORRAF launched a replanting program with clonal trees (grafted seedlings) in monoculture to increase rubber yield. The replanting program has been especially efficient: between 1960 and 2010, 51% of rubber areas were replanted with ORRAF support and the yield reached 1,587 kg/year for 2014 with mainly plantations in monoculture. However, the agroforestry tradition didn't completely disappear in Thailand. Intercropping during immature period (pineapple, rice, corn and vegetables) has always been a common practice (for 50% of plantations, on a sample of 1000 farmers as spotted by Chambon in 2013). More than 30 years ago, a minority of farmers kept adopting Agroforestry Systems (AFS) with fruit and timber trees in spite of ORRAF official ban. Those farmers are usually organized in associations or informal networks to share their knowledge and promote their systems (Jongrungrot 2015). ORRAF lifted officially its ban in 1992, but still AFS currently remain a relative marginal practice. In 2014, ORRAF new policy promoting agroforestry was finally approved. We can currently identify three rubber based cropping systems: i) monoculture plots, ii) "simple AFS" (rubber trees and a few other perennial species) and iii) agroforests, or "complex AFS" with rubber trees and many other perennial species including several layers of canopies.

Methodology

This study was conducted in Phatthalung province. Five focus groups were organized in four districts gathering 50 people as preliminary survey for collecting global information on agroforestry systems. 32 individual farms were therefore selected and surveyed. Sampling did not aim at being representative of all rubber farmers' AFS practices, but rather intended to cover the diversity of AFS and model the most relevant ones. Data collection focused on two scales: the activity system (farming system + livelihood) and the AFS cropping systems, for the farming season 2014-2015. The data were analyzed with Excel. We identified two complementary typologies: a farm typology and a typology of AFS structure (cropping system scale, inspired by

the work of Somboonsuke and Jongrungrat). The first one is based on sources of income. The second one is built on the combination of species type (fruit, timber and/or vegetables, or livestock...). After defining AFS and farm types, we summarized their characteristics in two models: i) an average theoretic most frequent AFS system per AFS type and ii) an average theoretic farm per farm type. The compatibility with previous surveys (Chambon 2013, Jongrungrat 2014) has been checked. The main indicators were: i) the net farm income, ii) the net total income and iii) the cash balance. The average farm built for each type was used to simulate scenarios with Olympe software. Modeling scenarios enabled to measure the farms' resilience or robustness according to Gallopin (2002) definition. The prospective analysis based on plausible scenarios makes it possible to compare farmers' strategies and situations, *the most vulnerable farms* and the role of AFS to overcome the volatility of natural rubber prices. We simulated the following hazards: i) on the proportion of agroforestry areas in the farm, ii) hypothesis on "rubber prices considered as acceptable" by farmers and "high rubber prices", knowing that current prices are low and iii) hypothesis of mangosteen prices (current prices are low). We compared the farms performances to equivalent farms without agroforestry practices, in order to identify threshold effects. *The ultimate objective of those different analyses is double: i) identify the most resilient and robust systems facing downside volatility of natural rubber prices and ii) discuss those systems with farmers as viable alternatives in the frame of a local innovation platform with other actors, including ORRAF.*

Main results

8 farm types and 5 AFS types were thus established.

At cropping system level, we ended up with the following AFS type typology:

Type MatAFVeg: mature rubber only associated with vegetable species,

Type MatAFFr: mature rubber associated with fruit and some vegetable species,

Type MatAFTb: mature rubber only associated with timber species,

Type MatAFMx: mature rubber associated with fruit, vegetable and/or timber species,

Type MatAFLv: mature rubber associated with livestock and other plant species.

At the farm level, we ended up with the following farm typology:

Type AR: Rubber producers, below the minimum wage (6 farmers out of 32)

Type AO: Diversified producers, below the minimum wage (3/32)

Type B: Farmers depending on another source of income, below the minimum wage (6/32)

Type CR: Rubber producers, over the minimum wage (3/32)

Type CO: Diversified producers, over the minimum wage (5/32)

Type D: Farmers over the minimum wage with off-farm activities (1/32)

Type E: Farmers far over the minimum wage due to mainly on-farm activities (4/32)

Type F: Farmers far over the minimum wage with off-farm activities (4/32)

Types MatAFlvA and MatAFlvB are earning among the highest return due to fruit sales for the first one and wood from timber trees for the second. Associating goats to rubber trees enables to remove two significant cost items: rubber trees fertilization and goats' food cost. The type MatAFLvA makes a higher GM/ha, thanks to its fruit sales. For the type MatAFLvB, wood from timber trees represents a long-term investment, which will be paid back when rubber trees will be cut. The type MatAFVg and MatAFFr are in second position due to regular *Gnetum* (Pak Liang) production and fruit sales. When facing decreasing rubber prices, the best-bet alternatives for farmers are diversification with fruits and food-crops such as *Gnetum* (Fig 1) with good local markets. The type MatAFTb has a poor margin as timber production occurs only at the end of the lifespan.

At farm level, we created 3 farm variants for each farm type to show the impact of a more or less advanced choice of agroforestry on economic farm results: i) Variant Combination of AFS and monoculture plots (Comb) in the farm which represent the current situation with 23% to 65% of AFS according to types, ii) Variant Agroforestry specialization (AF): the same farm types if we replaced all monoculture plots by their agroforestry equivalent, and iii) Variant Monoculture specialization (Mono): the same farm types if we replaced agroforestry plots by their monoculture equivalent. Results, in the context of an "average" rubber price (Figure 2), show the impact of different levels of agroforestry on farm gross margin (gross agricultural income). Logically, with lower to average rubber prices, differences in favor of agroforestry are important. AFS sources of income are variable according to the type of AFS, areas and the presence (or not) of other on-farm activities and do increase when rubber prices decreases.

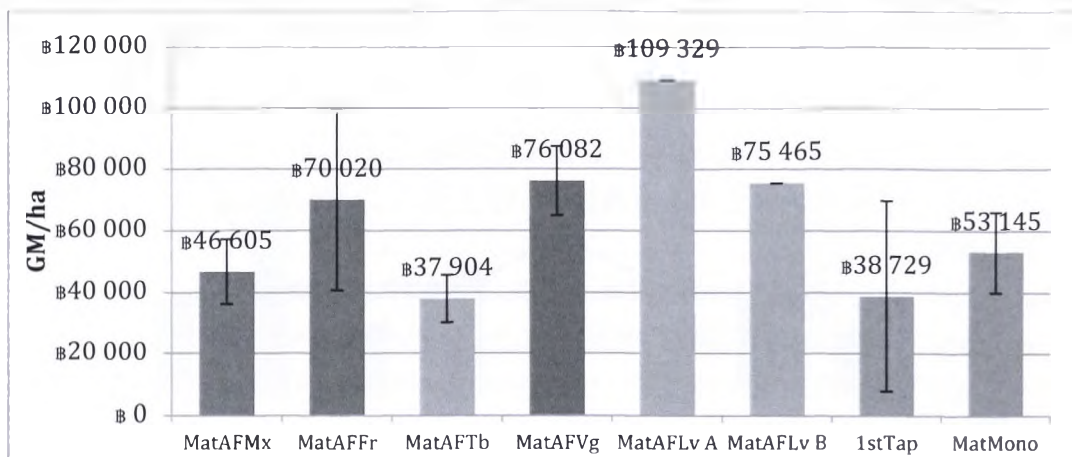


Figure 1: Gross margin/ha/year for various AFS types and rubber monoculture (Matmono).

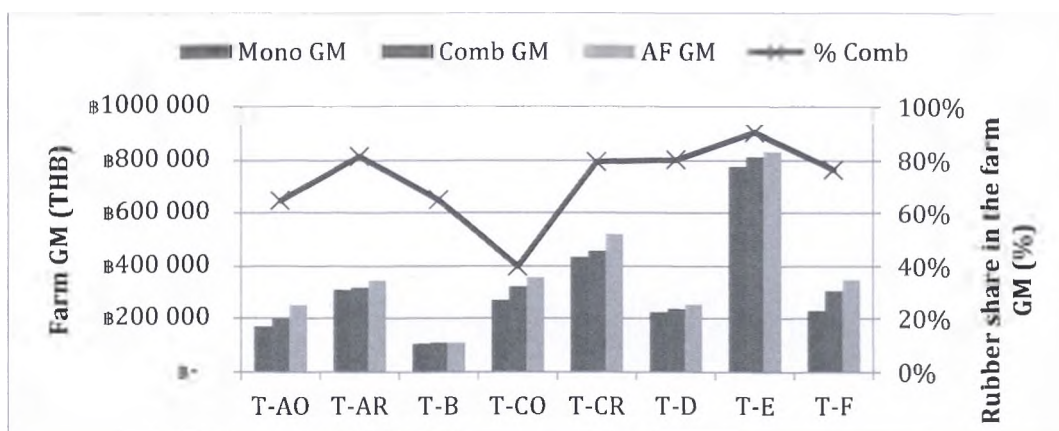


Figure 2: Comparison of farm variants "Mono", "Comb" and "AF" for the eight farm types, with an « average » rubber price (RubA) (Indicator: Farm Gross Margin). %Comb refers to the rubber share of the total farm area in the current situation, for each farm type.

We calculated the rubber price required for monoculture system to reach the same income as agroforestry system (Figure 3). For a given rubber price, we obtained a threshold price or a break-even point for monoculture. As soon as rubber prices are going under this value, it becomes very interesting to have agroforestry practices. With low rubber prices (the current situation), the gaps are again more striking (Figure 3). For type F, the first farm type by its agroforestry area, the threshold price is three times the current price. It means that, to hope reaching the same farm Gross Margin, a monoculture plantation should benefit from a price three times higher than the current one. Therefore, the lower rubber price is, the better agroforestry (with fruit trees and/or vegetable crops) show a capacity to sustain the on-farm income, in compensation of rubber price volatility. Prospective modelling with the tool Olympe (Penot 2012) displays that farms are more robust to rubber price volatility due to the flexibility of their agroforestry systems with major interest in having the crops on the same plots for a more intensified land-use. Most farmers may have some fruit trees plots as well to diversify the sources of income but having rubber and fruit trees (or timber or any other crops) do improve return to labour at plot level compared to separate monoculture plots while less land is required meanwhile.

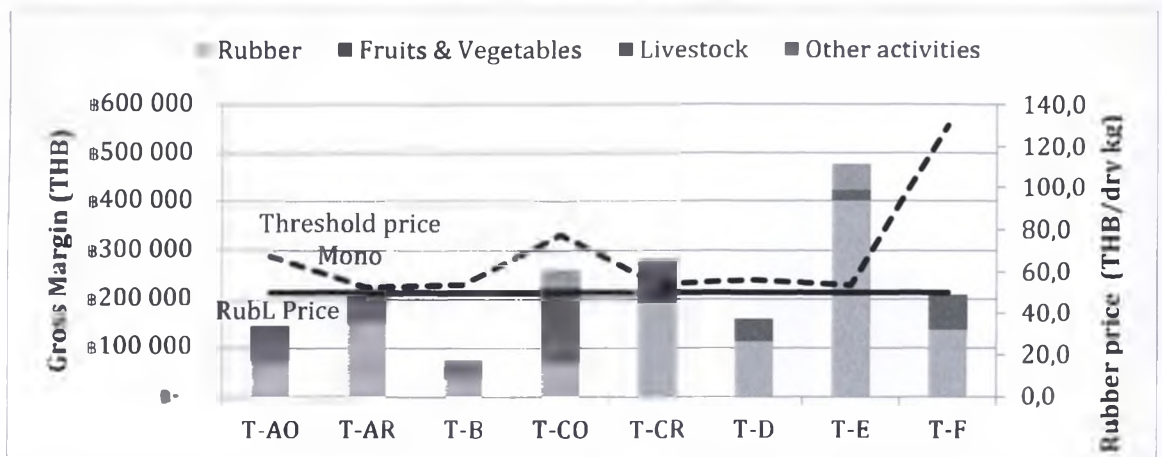


Figure 3: Threshold prices for the eight farm types (variant Comb), in a low rubber price context (RubL) (Indicator: Farm Gross Margin)

Conclusion

Farmers who chose agroforestry didn't do it for economic reasons in the first place. They first refer about growing fruits trees and vegetables crops to feed themselves, their families, their guests, and even visitors. In rural societies of Southern Thailand, the gift of fruits has a huge social value. This reason is consistent with the context in which current agroforestry practices with rubber clones were introduced. The market-oriented purpose comes in the second place, behind the availability of fruits and their social role. However, with the increasing volatility of rubber prices and low current prices on a long period, farmers are quickly acknowledging the market-oriented interest of these systems: fruits can represent 5 to 60% of the farm gross margin/ha in 2015. Some even reoriented their production system and get most of their income from fruits sales. Rubber trees provide an almost daily income source, which makes cash flow management easier. Thus, agroforestry is slowly shifting from one function to another, partly to adapt to a new economic context. Even if income diversification is considered as a common feature to improve global farm resilience, it is still a novelty in the context of southern Thailand with growing interest in combining production on one plot in order to save land in a context of local land scarcity. AFS systems may be as well technically more adapted on slope land and in former irrigated rice fields.

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