Agence Française de Développement

Working Paper

January 2011 | 96

Thailand: The World's Leading Exporter of Natural Rubber Owing to its Smallholders

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Publications Director: Dov ZERAH

Editorial Director: Robert PECCOUD

ISSN: 1954-3131

Page layout: Marcelle LARNICOL

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Executive Summary

Thailand is currently the world's leading exporter of natural rubber, accounting for 33% of the annual volume traded (3.167 million tonnes produced and 2.75 million tonnes exported in 2008). In addition to its quantitative performance, the case of Thailand is noteworthy in that this output is driven by smallholders, who own 95% of the total area planted with rubber trees (Siriaraya, 2009), and that much of the processing is done by small farmers' cooperatives. At the time of writing, nearly 10% of the Thai population makes its livelihood from the production, trade and processing of natural rubber.

This working paper analyses the remarkable development of smallholder rubber farming in Thailand.

Thailand's performance has been due in part to population dynamics and to the fact that farmers benefited from the information and technical know-how of industrial rubber plantations, but the main driver has been a public policy maintained for nearly 50 years. The main instrument of this policy is the Office of Rubber Replanting Aid Fund (ORRAF), created by the government in 1960 to promote the use of selected clones that currently cover 80% of total rubber planted area. These measures were largely financed through a quasi-tax on exports of natural rubber.

The development of smallholder rubber farming has primarily been concentrated in the areas where rubber farming first emerged in Thailand. Through politically motivated government intervention, it has also reached certain areas inhabited by ethnic or religious minorities. For example, the government encourages the extension of rubber farming in the north-east of the country, a generally poor and less populated region, but one where the soil and climate are less well suited to this crop.

Thus, the government's backing of smallholder rubber farming is intended to serve the goal of poverty reduction, and we shall seek to assess the share of smallholders' incomes that is attributable to rubber. For the same reason, the government is also willing to intervene on rubber inventories (as it did in 2009) in order to regulate prices when they fall too low.

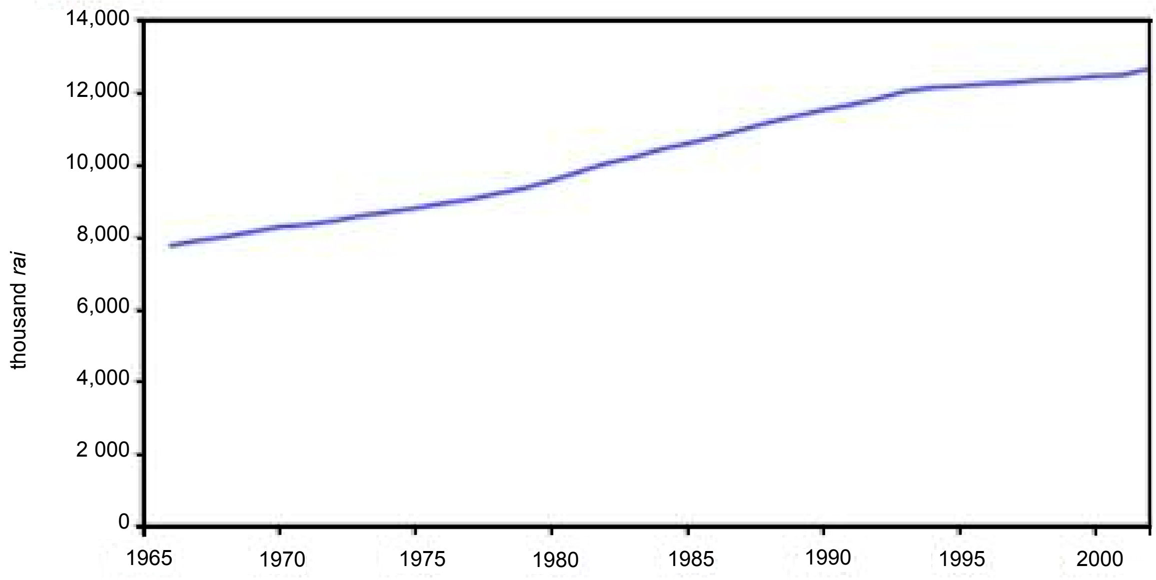
KEYWORDS: PUBLIC POLICY, RUBBER TREES, NATURAL RUBBER, THAILAND

Introduction

Asia produces more than 95% of the world's output of natural rubber, which amounted to 9.9 million tonnes in 2008. Thailand is currently the foremost exporting country, with 33% of the volume traded annually: in 2008, Thailand exported 2.75 million tonnes of natural rubber out of 3.167 million tonnes produced (Prommoon, 2009).

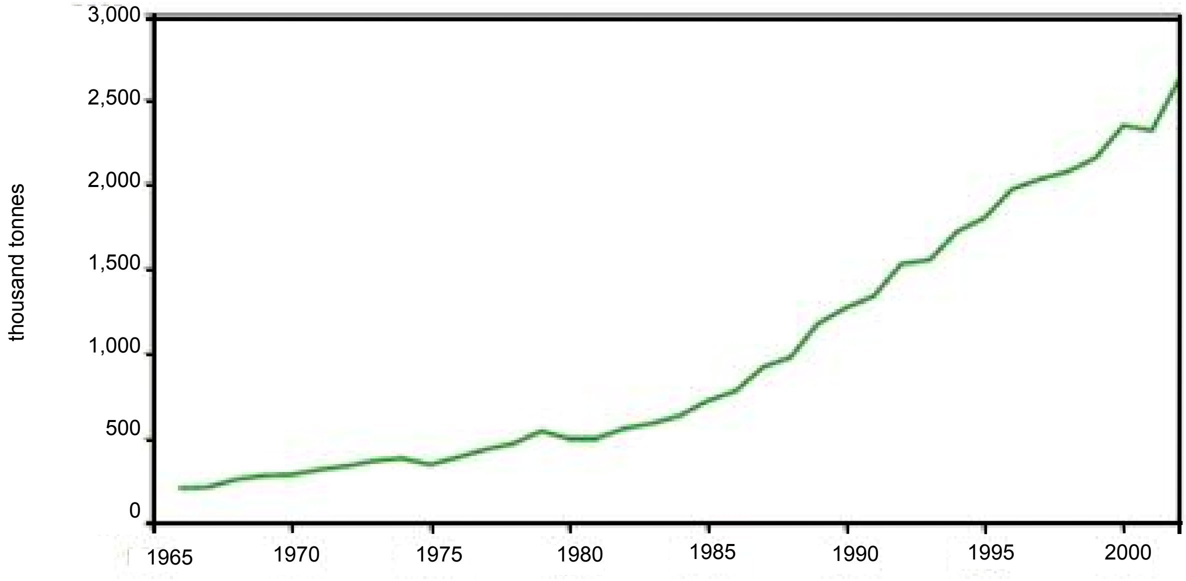
Between 1960 and 2001, Thailand's share in world output rose from 9% to 40%. Figures 1 and 2 show the gradual increase in area planted and the strong surge in output between the late 1960s and the early 2000s. The area planted with rubber trees doubled between 1966 and 2008, rising from less than 8 million *rai* (1,280,000 hectares [ha]) to more than 16.7 million *rai* (2,675,000 ha). Over the same period, output increased by a factor of 13, from less than 250,000 tonnes to 3,167,000 tonnes (Burger and Smit, 2004; Prommoon, 2009).

Figure 1. Land area planted with rubber trees in Thailand, 1966-2004 (thousand *rai*)



Source: Burger and Smit, 2004.

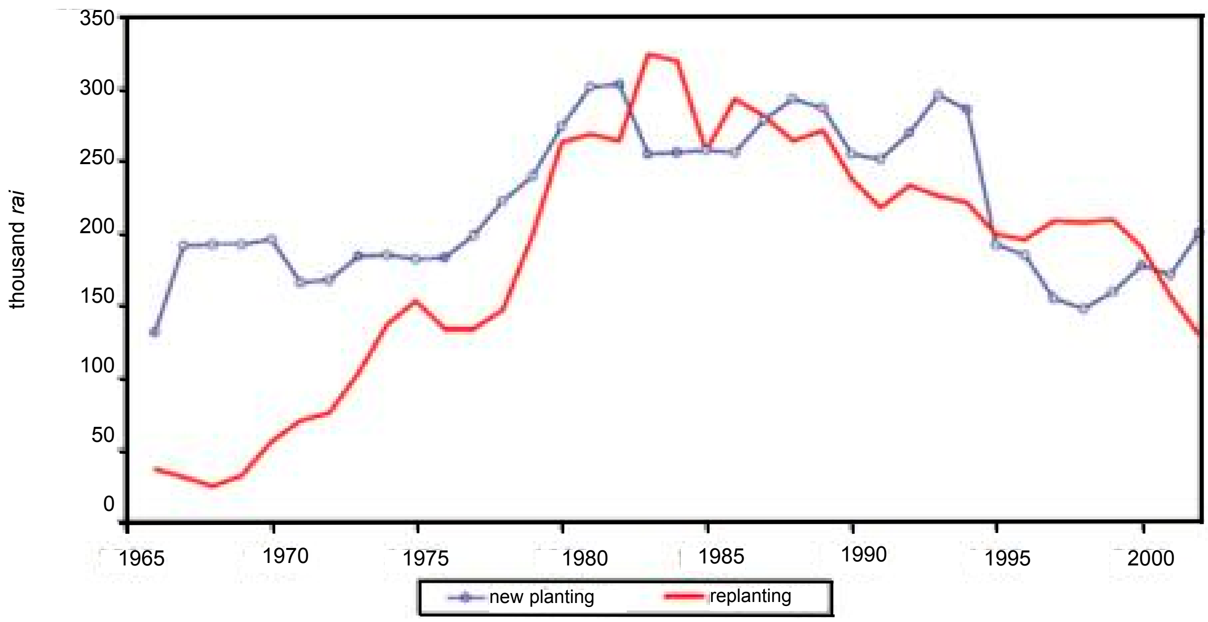
Figure 2. Thailand's output of natural rubber, 1966-2004 (thousand tonnes)



Source: Burger and Smit, 2004.

A more detailed analysis distinguishing between new planting and replanting provides a first insight into this apparent contradiction between the trends in output and in rubber planted area. The increase in area is wholly attributable to new planting, which amounted to 150,000-200,000 *rai* per year (25,000-30,000 ha) from 1965 to 1975, then rose to 250,000-300,000 *rai* per year (40,000-50,000 ha) over the 1980-1995 period. In addition, the pace of replanting increased very rapidly as from the 1970s, so that the area replanted annually also exceeded 250,000 *rai* (40 000 ha) in the 1980s, before tapering off in the 1990s.

Figure 3. Area newly planted or replanted with rubber trees in Thailand (thousand *rai*)

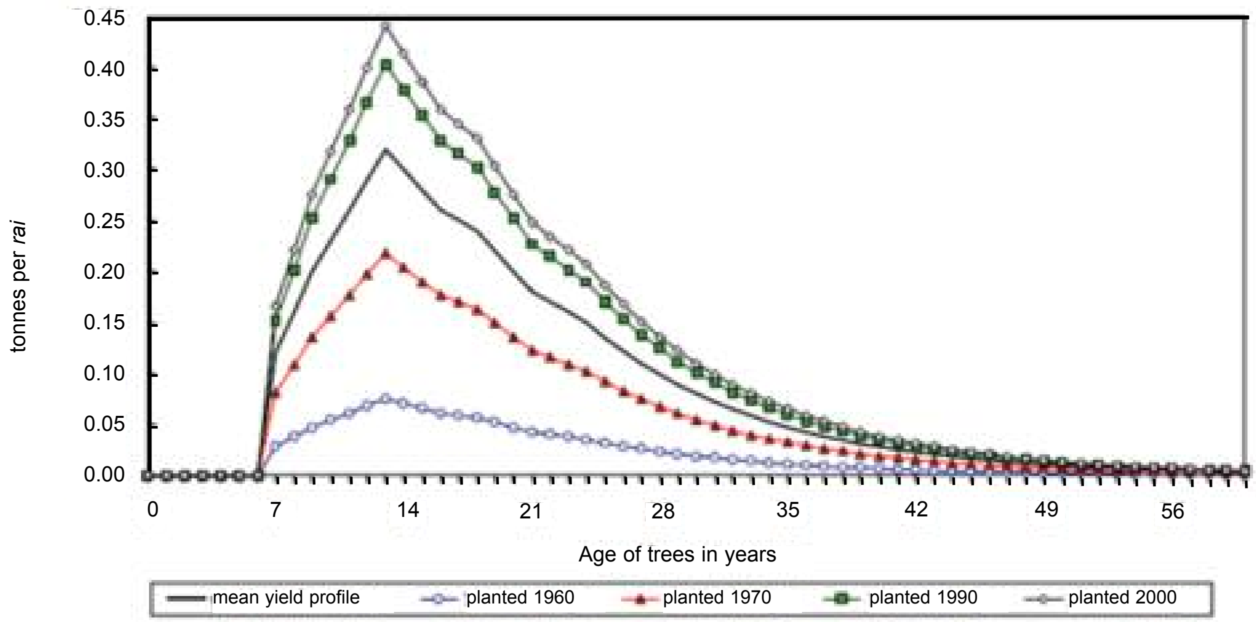


Source: Burger and Smit, 2004.

Figure 4 provides another piece of information needed to understand the huge increase in output. Between the 1960s and 2000s, the average yield of newly planted rubber trees increased by a factor of at least five.

What caused these strong increases in the planted area and yield of the Thai rubber-farming sector? What role is played by public and private stakeholders, and what economic forces are at work? Which regions are affected by this development? Does it help to reduce rural poverty?

Figure 4. Average yields of selected generations of rubber trees in Thailand (tonnes/*rai*)



Source: Burger and Smit, 2004.

1. Strong Government Intervention to Promote Replanting

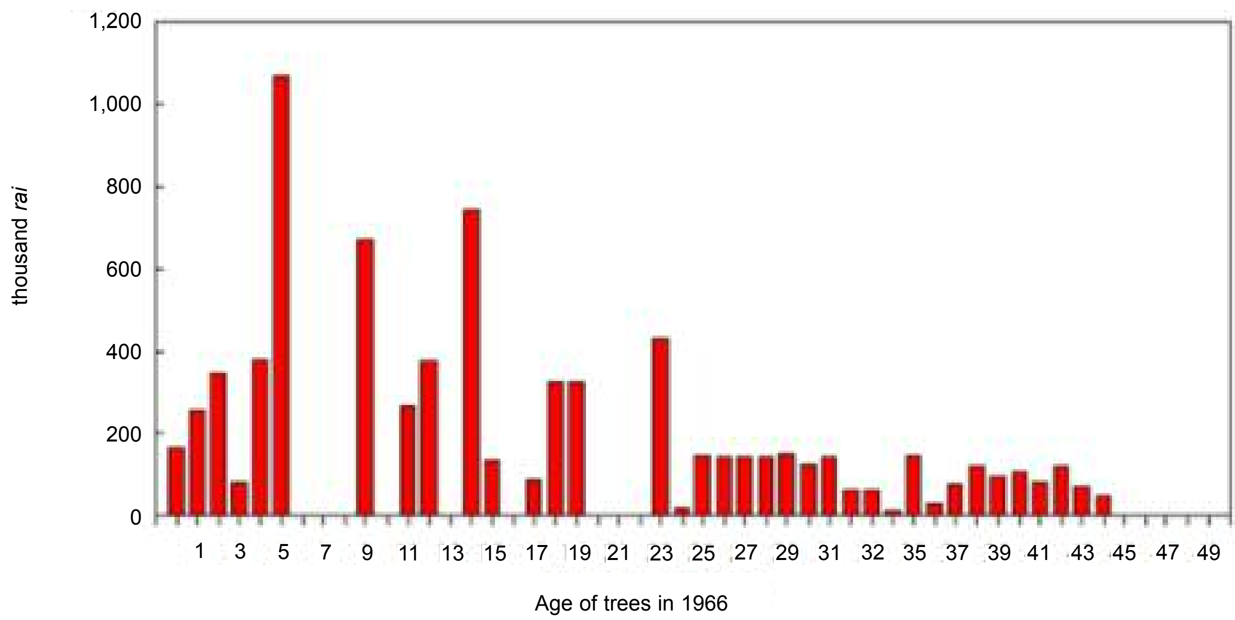
1.1 The situation of smallholder rubber farming in the 1960s

The first rubber plantations in Thailand were developed in the late 19th century by Sino-Thai and English investors. Even as long ago as that, however, the government limited the development of industrial plantations, not wishing to sell land to foreign investors or even to corporations established in Siam. For this reason, Siam played only a small part in the region's first rubber boom in the 1920s (Besson, 2002).

Village-level planting of rubber, in imitation of the large plantations, began in the 1920s and 1930s, primarily in southern Thailand east of Bangkok. Farmers planted very small parcels, either near the village houses or following slash-and-burn rice cultivation on hillsides. These parcels were planted with seedlings from the large plantations and received only a minimal investment of labour on the part of farmers; they probably produced yields of 0.2 to 0.5 tonnes per ha (Besson, 2002).

Despite this poor agronomic performance, in the 1950s rubber became Thailand's second-largest export item in value terms, after rice. The total area planted was estimated at 1.2 million ha in 1966 (Kermel-Torrès, 2006).

Figure 5. Age distribution of rubber tree stocks in Thailand, 1966



Source: Burger and Smit, 2004.

The age distribution of Thailand's stock of rubber trees in 1966 illustrates the phases mentioned above. Over a considerable share of the rubber planted area, the trees were over 25 years old and yields were very low, owing to the planting material used (seedlings), farming techniques and the ageing of the trees. The government therefore decided to initiate a major replanting programme to promote the use of clonal varieties and improve yields.

1.2 The creation of ORRAF to support replanting

ORRAF was created in 1960, modelled on an equivalent institution created in Malaysia in 1952. This parastatal organisation is responsible for all activities in support of the planting of clonal rubber varieties and other perennial crop species to replace all or a part of the stock of old rubber trees.

ORRAF finances the entire cost of planting: the planting stock, all inputs and labour costs.[1] Since ORRAF was created, the amount of aid provided has fluctuated around an average of 57,778 baht per ha (in constant 2000 baht), or about $1,450 per ha (see Table 1).[2] Since 1995, the amount is set by a tripartite commission consisting of representatives of smallholders, of the Thai Rubber Association (comprising processors and exporters) and of the government agencies concerned (Besson, 2002).

Table 1. Replanting subsidies paid by ORRAF, 1961-1997 and 2008

Period in effect	ORRAF subsidies (baht/ha)	ORRAF subsidies (constant 2000 baht/ha)
1961-April 1966	9,375	63,932
May 1966-December 1968	11,563	73,497
January 1969-December 1975	12,500	63,188
January 1976-December 1979	17,500	56,572
January 1980-December 1980	24,375	58,201
January 1981-October 1982	26,563	54,853
October 1982-December 1986	30,000	57,565
January 1987-1995	33,125	48,995
1996-1997	41,250	46,628
2008	68,750	54,442
Average	**23,314**	**57,778**

Source: Besson, 2002; Siriaraya, 2009; World Bank, 2009.

This support is provided only to farmers owning fewer than 8 ha of rubber trees in all[3] and meeting the following eligibility criteria:

(i) they must hold a land title, even a temporary one;
(ii) they must have a holding of at least 2 *rai* (32 ares);
(iii) before felling, there must be at least 10 rubber trees per *rai* and an average of over 20 per *rai* over the entire holding.

[1] Technical standards are set by the Rubber Research Institute of Thailand (RRIT). For labour costs, an hourly wage equal to two-thirds of the urban daily wage is used.

[2] Based on the baht/US dollar conversion rate in 2000.

[3] Little support is provided to growers who own more than 8 ha. For many years, however, ORRAF granted its subsidies solely on the basis of the area of the replanted parcel, without verifying beneficiaries' total amount of land planted with rubber trees (World Bank, 1991).

These criteria are by no means restrictive for growers having smallholdings of old rubber trees, even very sparsely planted ones.

The resources of the Replanting Aid Fund come from two taxes levied on rubber sales, calculated on the basis of the sales certificates of processing or exporting companies. All the proceeds of the first tax – called the "cess" in English, but literally "Replanting Aid Fund" in Thai (Besson, 2002) – are transferred to ORRAF, which must use at least 85% of them to finance replanting (5% to 10% is used to pay ORRAF's operating costs, and the remainder goes to agronomic research). The second tax is a customs tax on rubber exports, levied since the 1930s and dedicated in part to the financing of replanting.

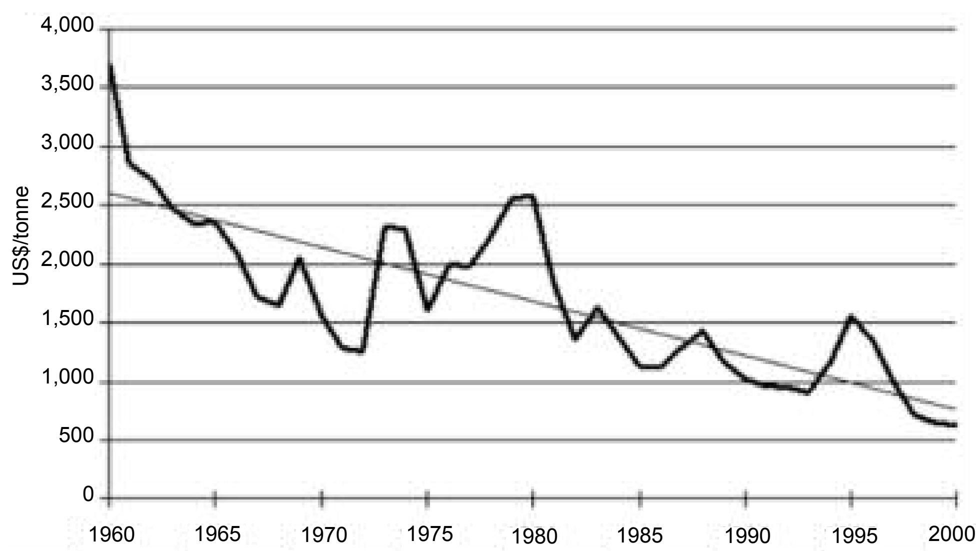
The Replanting Aid Fund is thus prefinanced by rubber producers through these two taxes. The fact that replanting assistance is targeted on smallholders reflects the Thai government's desire to make rubber farming an instrument for poverty reduction.

1.3 The achievement of quantitative replanting targets

ORRAF's quantitative replanting targets have changed considerably since its founding. From 1961 to 1972, the government endeavoured to achieve a target of replanting 3% of the planted area per year. Its targets were subsequently raised to 25,000 ha per year in the 1970s and 50,000 ha per year in 1980.

The cess, which is the main mechanism used to finance replanting, does not suffice by itself to reach these targets. The amount of this tax, which is generally defined as a percentage of the free on board (FOB) price, with a floor rate, is passed on to the producer price. Owing to fluctuations in rubber prices, which trended downwards in the 1980s and 1990s (Figure 6), the method of calculating the cess was constantly being revised so that the tax would not have a disincentive effect on producers.[4] Collection of the cess (and the export tax) was even suspended in 1989 (World Bank, 1991).

Figure 6. Price of RSS1 natural rubber, 1960-2000 (constant 1990 US dollars)



Source: Budiman, 2001.

[4] In 1983-1984, the cess and export tax levies amounted to twice the level of taxation in effect in Malaysia, leading to extensive smuggling of rubber near the border (World Bank, 1991).

In the early 1970s, the government began to allocate additional funding to the Replanting Aid Fund from central budget resources and subsequently contracted three international loans to speed up the programme (see Table 2).

Thanks to this additional funding, the replanting target of 50,000 ha per year was nearly attained from 1982 to 1985.

The total land area replanted with ORRAF financing from the institution's creation to 2007 amounts to 1,472,000 ha, or 55% of the country's total area planted with rubber trees. In all, 93% of the area replanted with ORRAF's support was planted with high-quality clonal rubber trees, and 7% with other perennial crops (Siriaraya, 2009).

Table 2. Rubber replanting financing programmes in Thailand, 1961-1993

Period	Government action	Funding sources other than the cess	Area replanted with ORRAF's assistance		
			thousand *rai*	thousand ha	annual average (ha)
1961-1971	Creation of ORRAF	-	474.6	75.9	7,590
1972-1976	"Emergency" replanting project	Supplement from central government budget	715.4	114.5	22,890
1977-1980	Emergency replanting project - Phase 1	International loans	921.9	147.5	36,880
1981	(Transition year)	-	264.4	42.3	42,310
1982-1985	Emergency replanting project - Phase 2	International loans	1209.7	193.6	48,390
1986	(Transition year)	-	265.8	42.5	42,530
1987-1990	Emergency replanting project - Phase 3	International loans	975.5	156.1	39,020
1989-1993	Article "21a" enters into force	-	71.1	11.4	2,280
1989-1993	New planting in the north-east	Central government budget	156.3	25.0	5,000

Source: Besson, 2002.

2. Aid for New Planting: Multiple Objectives

It should be emphasised once again that the replanting aid programme is an instrument that enables the government to reach only those growers who are already engaged in rubber production, since it applies only to holdings that are already planted with rubber trees. The development of rubber farming on new parcels and/or for new growers required different instruments specifically for that purpose.

The Thai government's rubber planting aid programmes have three objectives:

- to encourage the use of high-quality planting material in order to develop rubber exports;

- to settle and develop isolated areas or areas that are "difficult" politically;

- to combat rural poverty.

We will return to the first objective, which is also an objective of replanting aid policies, in Section 3. We describe here the measures taken to target aid for rubber planting to certain areas and certain categories of growers.

2.1 Self-Help Land Settlement schemes of the 1960s

In the 1950s and early 1960s, the Thai government decided to encourage the settlement of isolated, mostly mountainous areas, or to integrate politically sensitive areas, such as the Muslim far south, border areas and communist party strongholds in the north-east. The land granted to farmers was not confiscated from the "original inhabitants", as much of it was sparsely populated.

The opportunity to occupy new land was therefore offered both to local farmers, who might thereby own land further from their villages, and to migrants, both Thai and (as was common at the time) of Chinese origin. The eligibility criteria for migrants required that they own no land, have no criminal record, and be fit for agricultural work (Besson, 2002).

These Self-Help Land Settlements (SHLS) were initiated through the construction of roads, provision of prefabricated housing to "migrants" and extension services for family farms. The farmland distributed amounted to some 4 ha per family, for annual or perennial crops: oil palm and rubber were the only ones authorised and were financed by loans from the Bank for Agriculture and Agricultural Cooperation (BAAC). Farmers did not obtain definitive titles for the land until they had repaid their start-up loans.

2.2 Land reform

In 1975, the Thai government undertook a far-reaching agrarian reform based on public land and created the Agricultural Land Reform Office (ALRO) to implement it.

Since 1975, the land reform has affected 21% of the country's total farmland (98% of this coming from public land) and 1.85 million households (see Table 3).

The reform has focused mainly on the north and north-east (75% of the land distributed), which were only lightly populated before the government's encouragement of settlements. However, some of the public land concerned consisted of degraded forest reserves, which were distributed with the aim of regularising illicit timber harvesting.

The distribution of land by ALRO was accompanied by agricultural extension services (supply of inputs, farming advice, organisation of the downstream end of the sector, etc.) and the possibility of access to credit. The land distributed under the reform remained the property of the state, and growers could neither sell it nor transfer it to third parties. As shown by Table 3, the lots distributed were of modest size, with an average of only 2.59 ha per grower.

At the national level, the land reform was not particularly conducive to the development of rubber farming, as farmers allocated less than 9% of the land distributed to this activity. However, this national average masks some sharp disparities between regions (see Table 4): in southern Thailand, 64% of the area distributed under the land reform is planted with rubber, in stark contrast to the north (0%) and north-east (1.8%).

Table 3. Distribution of publicly owned land under the land reform

Region	District	Sub-district	Growers	Area (ha)	Avg. area per grower (ha)
North	159	759	451,291	1,057,190	2.34
North-east	284	1,499	984,999	2,526,412	2.56
Centre	86	315	208,344	700,893	3.36
South	122	470	206,564	505,585	2.45
Total	**651**	**3,043**	**1,851,198**	**4,790,080**	**2.59**

Source: Thongnamchaima, 2009.

Table 4. Area planted with rubber in land reform areas

Region	District	Sub-district	Area planted with rubber	
			ha	% of land distributed
North	3	4	32	0.0
North-east	81	217	46,055	1.8
Centre	31	107	48,568	6.9
South	126	458	323,082	63.9
Total	**241**	**786**	**417,737**	**8.7**

Source: Thongnamchaima, 2009.

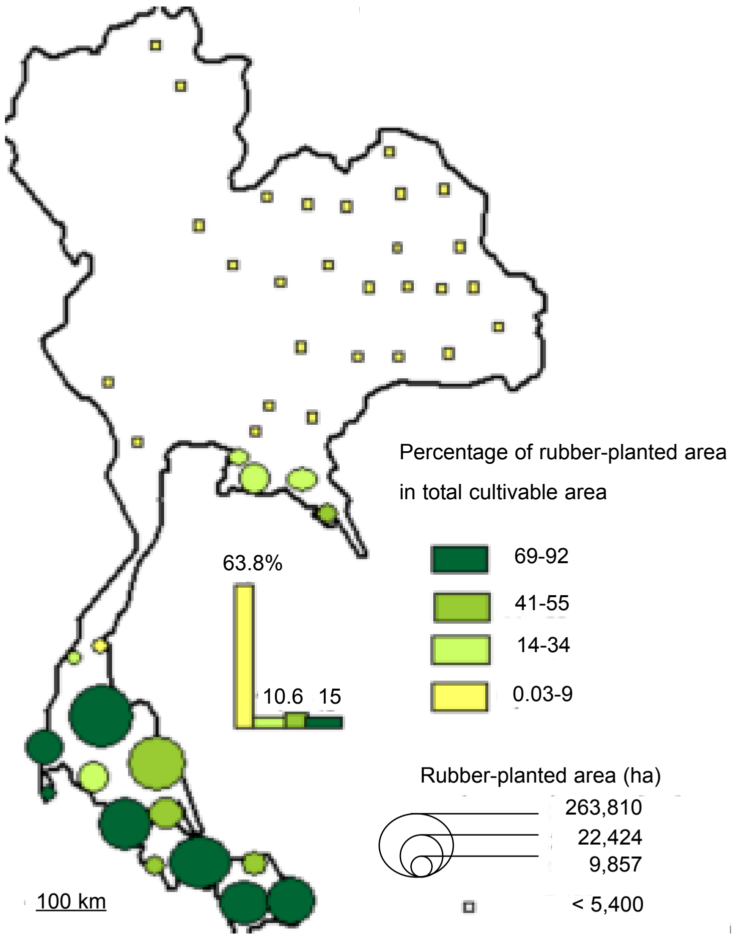
2.3 Rubber planting development programmes

BAAC is a publicly owned agricultural development bank that gets Central Bank resources at a preferential rate. In 2008, its long-term loans for rubber planting amounted to 26,500 baht[5] per hectare, which is slightly less than half of the amount of ORRAF subsidy for replanting. Loans were granted with a grace period of seven years and a base interest rate of 10.5% (author's survey). The rate could vary depending on the borrower's past relations with the BAAC, or on subsidies provided by certain targeted agricultural development programmes. This was the case in particular for rubber development projects in the north-east. It is worth noting that ORRAF plays a role in this scheme, since it is responsible for the technical monitoring of all rubber plantations financed by BAAC.

In the south, the main rubber-growing region

The acreage newly planted with rubber trees increased very quickly in southern Thailand until the mid-1980s and subsequently gradually stabilised. In the south and east, rubber now accounts for 2.144 million ha, or 80% of total farming area. Lots distributed under the land reform account for 15% of this total (Prommoon, 2009; Thongnamchaima, 2009).

Map 1. Rubber farming (by province, 1995)



[5] Constant 2000 baht.

Today, rubber farming seems to have reached its limits in these areas, where it can cover more than 70% of total cultivable area (see Map 1). ORRAF ensures that replanting is undertaken regularly, but the government is also encouraging diversification, and some growers have started to replace rubber by fruit trees or oil palms.

In the north and north-east

In the mid-1980s, the government commissioned a feasibility study on the development of rubber farming in the north and north-east, considering that this potentially high-profit cash crop could help to develop these disadvantaged rural areas. This objective was supported by the development of research programmes on which rubber varieties and technical options should be recommended in these areas, which are less well-suited to the growth of rubber trees.

Beginning in 1987, ORRAF was authorised to finance new planting, limited initially to 15 *rai* (2.4 ha) per beneficiary. This planting programme in the north-east was financed out of the central budget (rather than from the proceeds of the cess) as from 1989.[6]

Today, the government's New Planting to Increase Revenues and Stability project, implemented by ORRAF, delivers clonal planting material at no charge to growers in the north and north-east who engage in new planting of a maximum area of 4.8 ha. Other planting costs are financed by a loan from BAAC. In addition to the financing provided by ORRAF and BAAC, in some cases subsidies may be obtained from other branches of government (the Ministries of the Interior, of Agriculture and of Armed Forces) (Besson, 2002).

The area planted with rubber in the north and north-east, though increasing steadily, amounts to only 0.528 million ha, which is less than 20% of the country's total rubber-planted area (Prommoon, 2009) and less than 10% of the total cultivable area of these regions (Kermel-Torrès, 2006).

[6] The programme concerns five categories of new growers: (i) participants in a Self-Help Land Settlement programme; (ii) participants in a Land Settlement Cooperative programme; (iii) beneficiaries of the land reform; (iv) individuals receiving land grants from the civil or military administration; and (v) "ordinary" farmers.

3. Improvements in Productivity and Quality

The encouragement given to the development of rubber farming was accompanied by additional public measures to increase productivity and improve the quality of the rubber exported.

3.1 Access to high-quality planting material

The dissemination of clonal planting material has been one of the pillars of Thailand's rubber farming development policy. Selection of the clones is the exclusive responsibility of the public research sector, particularly the Rubber Research Institute of Thailand (RRIT), which sends directives to government and private budwood nurseries. During the early years of the replanting programme, ORRAF played the preponderant role in the production and supply of clonal planting material to growers. Targeted training programmes gradually made it possible to let private firms produce and sell the planting material and enabled growers to identify the clones at the time of purchase (Besson, 2002).

The private sector's output of planting material has proved to be of better quality, at lower cost and with more flexible supply methods than that of ORRAF. Today, the latter's role is mainly confined to certification of budwood gardens and nurseries and to visual identification of clones on the grower's parcel when ORRAF is financing the replanting.

Growers used stumps for many years, but today they prefer budded plants in polybags, which are more expensive but require one or two years less to mature.

The clone most frequently used in the early years of the replanting programmes was the GT1 clone, a relatively hardy variety well suited to the conditions of small village farms. As from 1983, growers began to prefer the RRIM 600, which is more delicate but gives very high yields (World Bank, 1991): today, this clone accounts for 90% of the country's rubber-planted area. A new clone developed by Thai research, the RRIT 251, is currently emerging (Prommoon, 2009).

3.2 Planting advice

Planting advice is provided by ORRAF for the beneficiaries of its programmes and in some cases by the extension services of other programmes involving rubber planting. This support lasts until the seventh year after planting, in order to ensure that growers do not begin tapping too early (World Bank, 1991).

Initially, the extension services used standards developed in other countries (World Bank, 1983), but the Thai research system has gradually produced its own work on rubber farming. However, very few research protocols are conducted under real conditions (Besson, 2002); planters are considered to be the recipients of innovation rather than as contributors. In particular, research does not take account of the variability of socio-economic conditions from one village or farm to another and the effects of this on planting methods.

Large industrial plantations probably conduct their own experiments, but there seems to be no exchange of information with the public research system. At the time of writing, research topics at RRIT are focusing on reduction of the immature period and the link between fertiliser use and productivity (Prommoon, 2009).

3.3 Support to production

The Ministry of Agriculture's extension services take up where ORRAF leaves off, providing advice to growers during the rubber production phase. The training provided to growers during this phase is crucial, because a mastery of tapping techniques is a key determinant of a parcel's short- and long-term productivity. The recommendations stemming from research and disseminated by extension services are aimed at attaining optimal production levels from the tree for about 20 years.

In theory, the fact that growers bear no up-front costs at the time of replanting, owing to ORRAF subsidies, could lead them to act less responsibly as regards the long-term management of their trees (World Bank, 1983). However, verification of the parcel's age before replanting (the trees must be at least 25 years old) seems to prevent fraud to some extent (Besson, 2002).

That said, producers generally do not use the recommended tapping system, preferring a system that is *apparently* more intensive: it offers higher yields for the first nine years but exhausts the tree more quickly. The real risks of this tapping system cannot be measured, however, owing to the lack of scientific observations in the field. Besson (2002) maintains that the growers' system may be economically better than the one recommended by RRIT.

In conclusion, a set of measures implemented by ORRAF, BAAC, RRIT and the extension services is what enabled growers to plant very high-quality rubber trees and thereby obtain a huge increase in yields: from at most 0.30 tonne per hectare for land planted with seedlings, as the majority of holdings were in the 1960s (Besson, 2002), to an average of 1.737 tonnes per hectare today (Prommoon, 2009).

In addition to supporting productivity improvements, the Thai authorities took steps to increase growers' share of the value added created by improving processing at village level and by organising marketing channels.

3.4 Support to rubber processing at village level

In the 1920s, rubber was exported directly in the form of coagulate. The appearance and spread of calendars, around 1935, enabled growers to take over the first step in processing from latex to thick unsmoked sheets (USS). Dealers then smoked the sheets and exported them in bulk. Around 1945, industrial units became involved in smoking the sheets and manufacturing crepe rubber, bringing further quality improvements.

Since the 1960s, the extension services have incessantly urged growers to improve the USSs that they produce, since buyers pay less for smallholders' rubber because of the risks arising from the variable weight of the sheets and the difficulty of checking quality on site. Although the sheets are now much thinner and of better quality, this buyers' discount persists to some extent: apparently, quality is insufficiently remunerated to compensate for the additional work hours required (Besson, 2002).

In the 1990s, the situation changed considerably as a result of an ORRAF project to establish village cooperatives to produce ribbed smoked sheets (RSS). The objective was to build and equip 1,500 cooperatives over five years (1993-1997). These small factories employing village inhabitants obtain their latex supply from growers and produce high-quality RSSs. BAAC regularly grants loans to the cooperatives for working capital or investments. This programme has been successful, since ORRAF has guaranteed a producer price for RSSs that often offers a better return on the producer's labour than did the manufacture of USSs (Besson, 2002).

3.5 Organisation of marketing channels

In the 1960s and 1970s, there were no more than 20 processing and exporting firms in the Thai rubber sector, including five principal buyers that accounted for 60% to 80% of national output. This market structure allowed these exporters to keep farmgate prices relatively low, while exporting rubber of mediocre quality. At the local level, the number of middlemen-collectors was rather high at the time, which restricted their margin and still enabled growers to receive a substantial share of the international sale price.

This situation changed in the 1980s, as Japan became the leading market for Thai rubber. Since Japan's demand was mainly for blocks of standard Thai rubber (STR), industrial firms invested in the production of this new grade of rubber. Subsequently, in the 1990s, a new generation of manufacturers invested in latex concentrating equipment, in order to capture village output by offering better prices to producers. The reason is that collection of latex required the establishment of new networks for daily collection, engendering competition with the existing collectors. Moreover, once the initial investment was amortized, the recurrent costs of producing latex concentrate were lower than those for other products, while the sale price was equivalent. For certain growers in good locations, the price offered for latex could be higher than that paid for USSs. This trend was confirmed in the mid-1990s with the creation of village cooperatives producing RSSs, which also purchase latex as an input.

Table 5. Production of natural rubber in Thailand by type of product

Year	RSS	STR	Latex	Composite	Other	Total
2000 (t)	1,055,900	868,200	350,975	9,700	61,712	2,346,487
2000 (%)	*45*	*37*	*15*	*0*	*3*	*100*
2008 (t)	973,243	1,282,036	587,047	154,485	92,910	3,089,751
2008 (%)	*31*	*42*	*19*	*5*	*3*	*100*

RSS: ribbed smoked sheet; STR: standard Thai rubber

Source: Thai Rubber Statistics, Rubber Research Institute of Thailand, 2009.

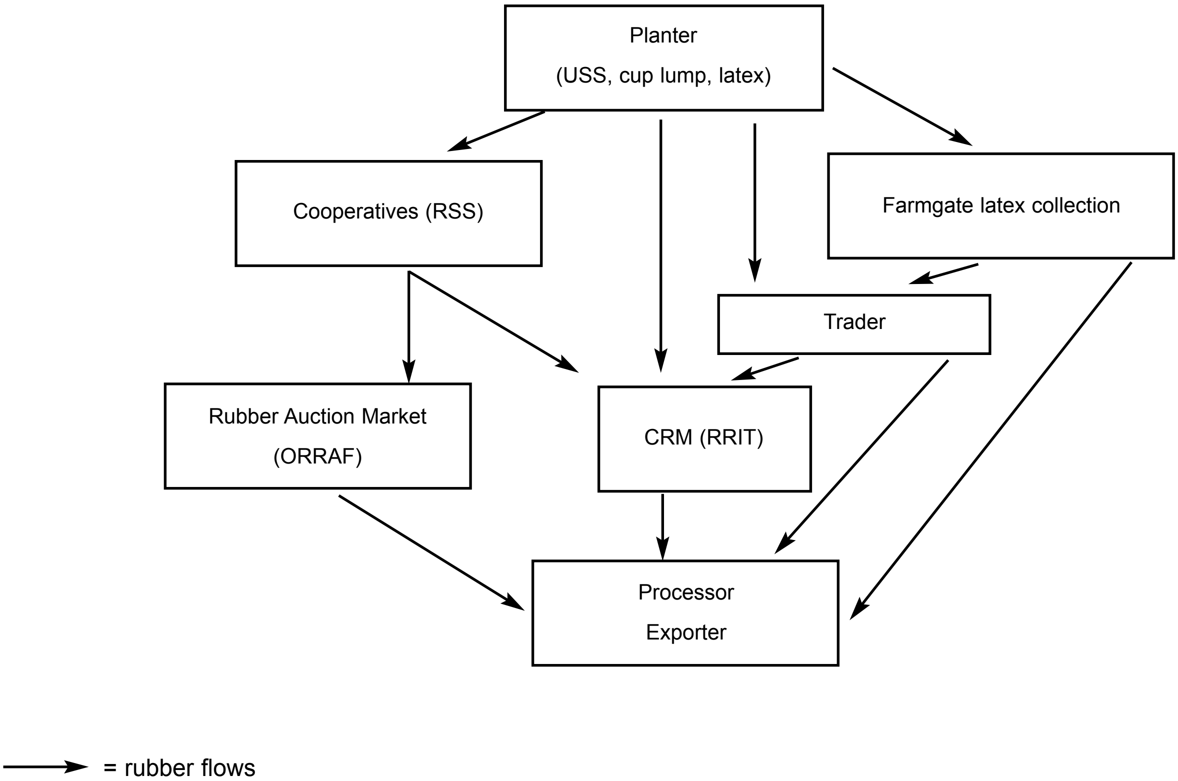
As from the 1990s, moreover, RRIT and ORRAF helped to organize, at national level, a market offering higher profits for growers. In 1991, a first rubber purchasing centre, the Central Rubber Market (CRM), was established in Hat Yai, the main trading city in southern Thailand. At the time of writing, there are three CRMs in existence, and three more are being created. Their primary function is to organise the marketing of USSs produced by growers by organising the bidding of buyers. The Rubber Auction Market performs the same function for smoked sheets produced by village cooperatives. The CRMs and ORRAF inform growers about prices *via* various media (radio, television, e-mail, call centres, Internet, etc.).

The marketing chain for natural rubber in Thailand is generally short (see Diagram 1) and is based on intermediaries that operate at cost price (cooperatives) or are subsidised by the government (Rubber Auction

Markets and Central Rubber Markets). Thanks to this structure, growers receive nearly 90% of the FOB price (Prommoon, 2009).

The rubberwood industry has also developed gradually in Thailand due to the emergence of new wood processing techniques and the improvement of road infrastructure. This compensates for the reduction in the stock of forest timber, which has become less and less available. Sale of the timber from the felling of rubber plantations brings growers the equivalent of one year's production.

Diagram 1. Natural rubber marketing channels in Thailand



Source: adapted from Prommoon, 2009.

3.6 Price supports

Figure 6 (see Section 1.3) shows the steep decline in international prices for natural rubber between 1960 and the 2000s, as well as the very large fluctuations recorded over these four decades. The Thai government intervened regularly by supporting producer prices.

Between the 1970s and 1980s, prices in constant US dollars fell by more than 35%. In contrast, Figure 7, which presents the farmgate price in constant 1980 baht, shows a decline of only 24% over the same period.[7]

The fact that the drop in international prices was not completely passed on to producer prices is probably due in part to changes in product type and to the marketing chain, though probably also to government intervention.

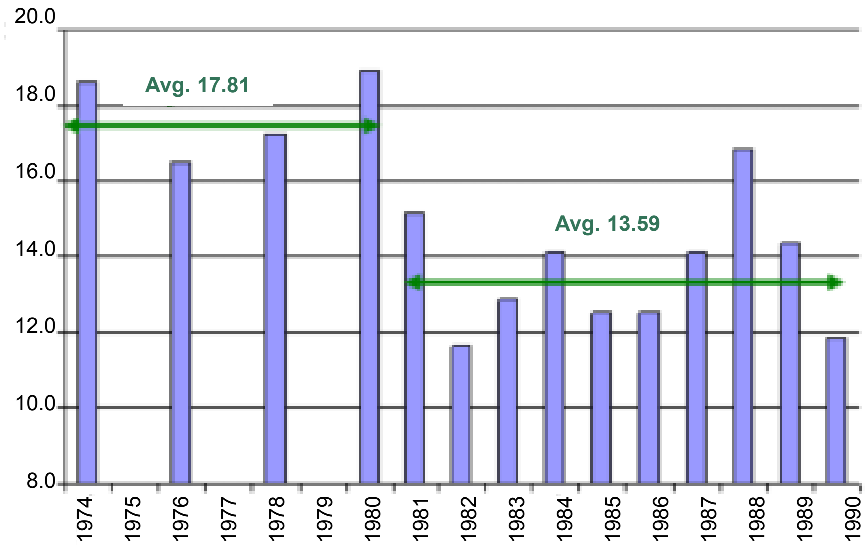
In the mid-1990s, the Thai authorities decided to withdraw from the pricing agreement concluded between producing countries and to set a floor price (Besson, 2002). This measure was implemented with a price guarantee system at two levels.

At the local level, the CRMs have the capability to purchase and store rubber in the event that prices fall. According to the surveys conducted at the CRM in Surat Thani, however, only 5% to 7% of national output passes through these markets.

At the national level, ORRAF has a mandate to purchase and store rubber produced in Thailand when prices fall below the floor price.[8]

These measures clearly improve the financial situation of growers, although their implementation depends on the adoption of a special budget to finance these rubber purchases (Besson, 2002).

Figure 7. Farmgate price for natural rubber, 1974-1990 (constant 1980 baht)



Note: inflation rates from

Source: World Bank, 1991.

[7] International prices were much higher over the 1974-1980 period than from 1970 to 1973. Although we have no data on farmgate prices in the early 1970s, we can therefore affirm that 24% is a maximum estimate of the price depreciation.

8 ORRAF is not allowed to export, however, and is obliged to sell, at the appropriate time, all its rubber purchases to private sector companies or to the Rubber Estate Organization, the only parastatal organisation authorised to sell abroad.

4. The Situation of Thai Rubber Growers

Monitoring of the planting and replanting programmes has been patchy as regards the socio-economic situation of the growers concerned. For this reason, it is impossible to know exactly how many growers have been reached by these programmes, the size of their rubber-planted holdings, their production methods or their level of poverty. However, a few studies on specific rubber-growing regions give us some idea of their situation.

4.1 Profile of the beneficiaries of ORRAF replanting programmes

According to Besson (2002), farmers in the Pattani region participated only very moderately in ORRAF's replanting programme until the mid-1970s. Growers without title deeds feared in particular that their land would be confiscated. Subsequently, the visible economic impact of the initial planting operations financed by ORRAF induced an increasing number of growers to join the programme.

In the 1980s, one of the explicit objectives of ORRAF's rubber replanting programme was to sustainably increase the incomes of the poorest farmers (World Bank, 1983), but the principal objective is to accelerate the replanting programme.

From 1977 to 1982, the ORRAF programme reached 225,000 growers (World Bank, 1983). The average size of replanted holdings was 1.2 ha.[9]

According to the feasibility for the following phase of the programme, the median grower had 5 ha of land and an annual income of $350. Of this total income, 50% was derived from non-farming activities, 35% from rubber and 15% from other crops. During the second programme supported by the World Bank, the average area replanted increased to 1.5 ha (World Bank, 1991). The third programme supported by international donors focused on financing planting for poor farmers[10] (World Bank, 1991), but we found no information concerning this programme.

Today, rubber farming in Thailand is still strongly marked by the predominance of small family farms: 1 million smallholders own an average of 2 to 2.5 ha of rubber trees per household (Prommoon, 2009).

[9] A grower may in fact have more land than this planted with rubber, as this figure indicates only the size of parcels replanted in a given year.

[10] The Needy Rubber Smallholders Development Program.

4.2 Smallholder strategies for planting and operation of rubber holdings

Planting

It is instructive to compare the planting practices of growers assisted by ORRAF with those of growers who are planting rubber for the first time. Besson (2002) shows that the costs incurred by new growers amount to only one-third of the standard accepted by ORRAF for replanting (see Table 6): the main differences in the practices of new growers are higher density of planting, less maintenance of planted areas (weeding) and less use of fertilisers.[11] They obtain additional savings by using family labour and by grafting the plants themselves, or even performing the grafts in the field. The difference in costs also shows that the ORRAF subsidy is rather generous and offers real support to growers during the period when the trees are immature.

Most beneficiaries of the replanting programme now have the resources needed to pre-finance their planting stock and inputs and to wait for reimbursement. Only those in great difficulty still use the stock provided free of charge by ORRAF. Another indication that growers have attained a measure of financial ease is that they generally do not farm the space between rows of rubber trees themselves, preferring to allow other families in the village (often poorer families) to farm this space on a sharecropping basis.

Operation

Smallholders tap their own rubber trees, whereas growers who hold more than 3.2 ha generally employ "sharetappers". These sharetappers also process the latex into dried USSs. Prommoon (2009) and Simien and Penot (2006) describe the five types of sharetapping in the rubber-producing systems of southern Thailand: in the first two systems, the owner of the estate provides the inputs and equipment and concedes 40% to 50% of output to the sharetapper; in the other three, the owner only finances the inputs and concedes 45% to 70% of output to the sharetapper. The sharetappers' percentages depend mainly on the scarcity of labour at the local level.

The production system used by all growers involves tapping a one-third spiral cut "every possible day", that is, 180 to 220 days per year, depending on rainfall and the growers' other activities. This practice was developed decades ago by growers. Besson's observations tend to show that 180-195 days of tapping per year lead to higher yields in the first four years but slightly lower yields on average than those obtained in research stations (1.8 tonnes per ha versus 1.95). Growers using the system recommended by ORRAF (division into two tasks, tapping a one-half spiral cut every other day) are probably those with larger holdings (more than 6 ha).

Table 6. Breakdown of total ORRAF subsidies in 1996-1997 by year of planting and comparison with expenditure for unsubsidised planting

Year planted	Inputs ($/ha)	Labour costs ($/ha)	Expenditure by unsubsidised growers ($/ha)
0	308	456	160
1	103	103	68
2	57	57	34
3	57	40	34
4	68	40	46
5	68	40	46
6	68	40	46
Total	**729**	**775**	**433**

Source: Besson, 2002; for the baht/US dollar parity, www.oanda.com.

[11] Research in Thailand has never clearly demonstrated the impact of fertiliser use on the time required before production can start, except in the case of sandy soils.

The impact of tapping systems on the lifetime and total output of the holding has been debated a number of times during investigations of ORRAF replanting programmes. For example, an RRIT study cited by the World Bank (1983) was conducted on a sample of 400 growers, during the first 12 years of tapping. This study showed that instead of 43 tonnes per ha in 29 years (the figure used in the economic model of the ORRAF programme), total output was only 27 tonnes per ha in 20 years, because of overtapping by growers. Besson's surveys, conducted 15 years later, show that ORRAF had still not succeeded in creating the incentives necessary to extend the lifetime of rubber holdings.

The yields from clonal stock planted at lower cost by new growers were apparently only 20% lower on average than the yields obtained by growers having received assistance for replanting. The yields from seedlings (from clonal material or not) were found to be only 0.5 to 0.75 tonnes per ha (Besson, 2002).[12]

From the standpoint of rubber sales, it seems that growers prefer to sell latex whenever possible. Conditions are favourable for such direct sales when the holding is located along major roads or near a factory or cooperative. However, manufacture of USSs offers the advantage of enabling growers to store their output and to conduct group sales to meet financial contingencies.

In some villages, groups of growers organise joint purchases of inputs and sales of output in order to obtain better prices.

4.3 The importance of natural rubber in farmers' incomes in southern Thailand

Besson's dissertation gives us an idea of the importance of natural rubber in the incomes of farmers in Buké Ekung, a village in Pattani province (Besson, 2002).

In this village, direct production of rubber accounts for at least 40% to 50% of the total monetary income of all types of production units surveyed, and its share can be as high as 70% for some groups. When sharetapping rents are included, the revenue from rubber growing accounts for more than half of all monetary income for a majority of production units.[13] In absolute value, rubber alone enables almost all types of production units to reach the subsistence level, or even the level required to replace the stock of trees.

Simien (2005) models the profitability of the various rubber-growing systems in the Songkhla and Phatthalung provinces. According to this study, there are farms planted solely with rubber trees, with no other crops whatsoever. These farms are profitable if they have more than 2 ha of rubber trees, since this size enables them to replant only one hectare at a time when it becomes necessary to replace their stock. This system might work for small farms using family labour and a very low level of investment, but generally it is used by large estates.

In both provinces, moreover, intercropping of rubber and fruit trees seems to be on the increase, notably because of the rise in durian prices. These systems are much more labour-intensive than single-crop rubber farming, but they enable farmers to cope with fluctuations in rubber prices.

The existence of sharetapping systems, described in Simien (2005), tends to demonstrate that a substantial number of farmers make their livelihoods as rubber tappers, but are too poor to have their own stock.

Regardless of which production system is used, farmers' heavy dependence on the income from rubber means that they do not suspend production even when prices are very low.

[12] While these values are worth citing, it should be noted that they are based on a relatively small number of observations made by Besson (2002), in the absence of any systematic field research by RRIT.

[13] The other income sources of farms in this village are, in order of importance, fruit (20% to 30% of monetary income), dry-season rice and livestock, although sales of livestock are exceptional for most families. Most owners of the smallest holdings (in terms of surface area) are also employed occasionally by their neighbours for farm work.

Conclusion

ORRAF is generally regarded as one of the most efficient parastatal institutions in Thailand (World Bank, 1991; Besson, 2002). The speed and scope of the rubber replanting programme are quite impressive. As a result of the measures described herein, replanting with clonal planting material became widespread and was accompanied by the spread of common farming practices and the gradual adoption of increasingly productive innovations by growers.

This development increased yields five-fold and reduced the immature period by one to two years. Support to the development of village-level processing and the organisation of short marketing channels also increased the share of value added received by smallholders. ORRAF's intervention on rubber inventories supplements this support system and protects farmers from excessive price fluctuations.

Although the taxes on rubber sales alone do not suffice to finance ORRAF's replanting system and operational costs, they do make it possible to share the cost of the ORRAF system between the government and the various stakeholders in the sector.

The development of rubber farming in new areas, particularly the north and north-east of Thailand, was initiated by rubber-specific agricultural development programmes. The creation of rubber tree clones more suitable for these regions is a major objective for Thailand's research sector. The growth of national rubber output will depend on this, because the amount of land planted with rubber trees is beginning to stagnate in southern Thailand, and the government is even trying to encourage intercropping based on the development of oil palms and fruit trees.

Information on the actual practices and socio-economic situation of growers is still insufficient, and it is unfortunately difficult to ascertain to what extent – and for whom – the development of rubber farming has reduced poverty.

Acronyms and Abbreviations

ALRO	Agricultural Land Reform Office
BAAC	Bank for Agriculture and Agricultural Cooperation
CRM	Central Rubber Market
FOB	Free on Board
ORRAF	Office of Rubber Replanting Aid Fund
RRIT	Rubber Research Institute of Thailand
RSS	Ribbed Smoked Sheet
SHLS	Self-Help Land Settlement
STR	Standard Thai Rubber
USS	Unsmoked Sheet

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