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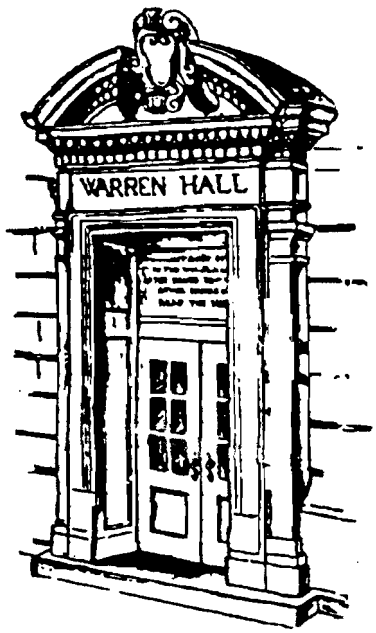

Working Paper

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THE ECONOMICS OF OIL PALM PRODUCTION IN CHIAPAS, MEXICO

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ABSTRACT

This study focuses on the economics of a scheme to plant 50,000 hectares to smallholder-produced oil palm in the Mexican State of Chiapas, a region plagued with rural poverty and political unrest. The analysis concludes that oil palm is potentially the most profitable crop for the Soconusco region of Chiapas and offers suggestions for implementing the project.

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The Mexican state of Chiapas entered the world's consciousness on 1 January 1994 when, coincident with the implementation of NAFTA, armed peasants briefly occupied the city of San Cristóbal de las Casas. The government's military response is well known. Less widely appreciated are government-sponsored projects to provide new income sources for the rural population. One such is the subject of this paper: a scheme to enable smallholders to plant 50,000 hectares to oil palm in the tropical lowlands, land hitherto given over to forest, extensive cattle grazing, or maize cultivation.

The goal of the paper is to project the profitability of oil palm cultivation for smallholders, and in doing so Ms. Wolff considers three factors. The first is the Mexican fats and oils market and the price palm oil is likely to command. Consumption has grown rapidly over the last 40 years and, as per capita utilization increases as incomes grow, it is likely to continue to do so. Mexico imports most of its vegetable oil and oilseeds, and soybean imports from the United States dominate the market. It is anticipated that soybean prices will continue to be the benchmark around which palm oil prices fluctuate.

The policy environment is a second factor. Mexico has radically reformed its agricultural policies since the late 1980s. Involvement of the state in input, credit, service, and output markets has been reduced; and guaranteed prices have been abolished. Trade barriers are being reduced. Production incentives are thus being shifted away from formerly subsidized staple foods such as maize and beans, and towards cash crops for export or the domestic market.

Finally, because oil palm fruit needs to be processed quickly, the institutional arrangement under which it is grown and marketed is of crucial importance. Forms of vertical integration which have proved successful elsewhere include plantations which own their own processing facilities, and cooperative or contract farming arrangements with processors. Two institutional arrangements have been proposed for Chiapas: contract farming or a model in which farmers are shareholders in the processing plants.

Taking these three factors into account, Ms. Wolff analyses profitability for smallholders in two ways: through farm budgets and through evaluation of the net present value of oil palm and alternative uses for land. The budgets show that the profitability per hectare of oil palm is much higher than that of maize and of most other crops. The costs of transporting the palm fruit from the field to the processing facility are very high and a better organized system of transportation could increase profits even more. The net present value analysis is based on a series of price, cost, and yield scenarios. The results indicate that oil palm is a much more profitable crop than maize under all but the most pessimistic assumptions.

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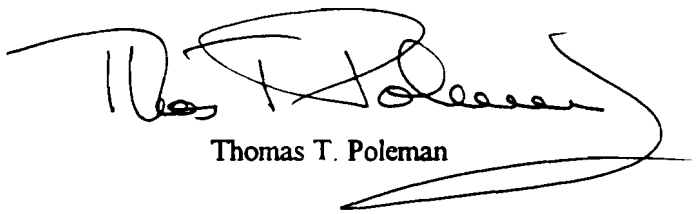

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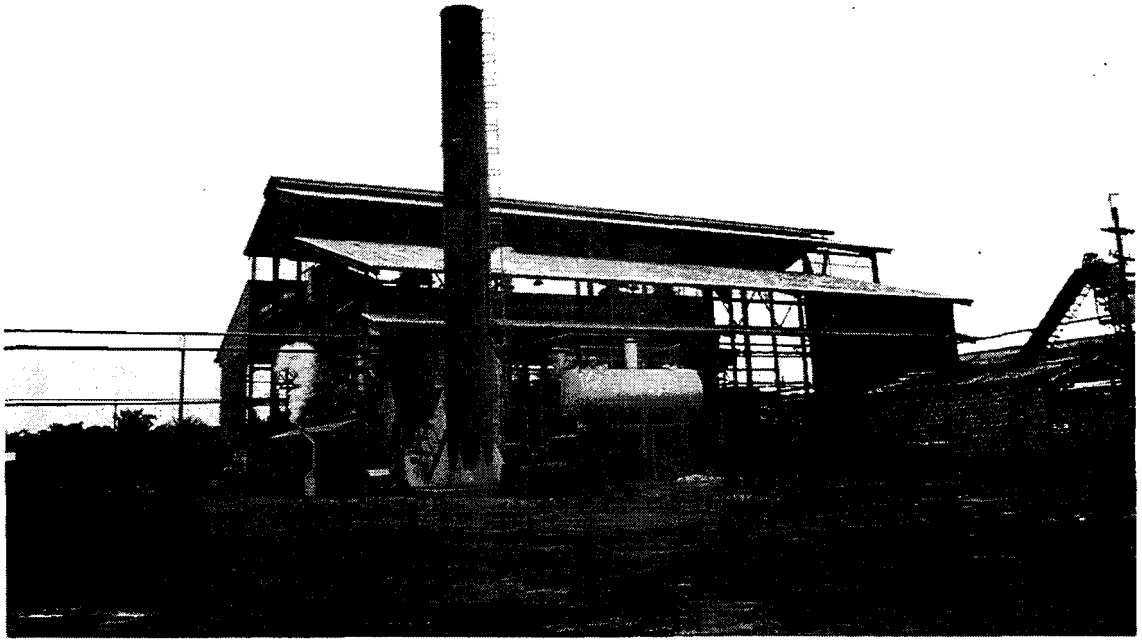

PHOTOGRAPH 12. THE EXTRACTION PLANTS ARE FUELED WITH FRESH FRUIT BUNCH STEMS, AND WITH THE FIBERS LEFT OVER AFTER THE OIL IS REMOVED FROM THE MESOCARP OF THE FRUIT.

GLOSSARY

ACEPALMA	a farmer association in Zone 3 that is requesting an additional processing plant from the state.
BEPASSA	Beneficiadora de Palma Africana Soconusco S.A. One of the cooperative processing plants in Zone 2. It was founded in 1993.
cajete	a circle with a radius of 1 m around each palm that should be kept weed-free.
campesino	small farmer.
Chiapanecos	the people who live in Chiapas.
coyote	a Mexican term for the traders who buy corn and other crops from farmers, usually at the farm gate.
desgranadora	maize sheller (a small machine that farmers usually rent).
ejido	a Mexican agrarian community characterized by communal land ownership; the land is usually divided in *parcelas*.
ejidatario	a member of an *ejido*.
EZLN	Ejército Zapatista de Liberación Nacional, or Zapatista National Liberation Army, the guerrilla movement in Chiapas.
ffb	fresh fruit bunches.
ha	hectare; an area of 10,000 square meters, or 2.47 acres.
jornal	a working day, in the Soconusco from sunrise to lunch time, or about 6 hours.
jornalero	a person who engages in wage labor.
latifundio	a large land holding.
milpa	the traditional maize field cultivated by Chiapas' peasants.
NAFTA	North American Free Trade Agreement
nuevos centros de población	agrarian community established by land distribution after the reform of ejido law.
parcela	the plot of land assigned to an *ejidatario* for individual use.
pequeña propiedad	literally "small property"; refers to farms that do not belong to an *ejido*. These "small properties" can be quite large.
pequeño propietario	the owner of a *pequeña propiedad.*
peso	refers to constant 1997 Mexican pesos unless otherwise specified. 1 peso = 0.13 US $.
SAGAR	Secretaría de Agricultura, Ganadería y Desarrollo Rural, formerly SARH.
t	metric ton.
Zapatista	a member of the *EZLN*, Chiapas' guerrilla movement.

Chapter I
INTRODUCTION

On January 1, 1994, when the Zapatistas took over San Cristóbal de las Casas, one of Mexico's poorest states suddenly became famous. Formerly known only to a few tourists interested in the ruins at Palenque or in the colonial architecture of San Cristóbal, Chiapas suddenly became the focus of national and international attention. Journalists, activists, anthropologists and other scholars suddenly went on pilgrimages to study this remote region, producing a stream of literature on everything from indigenous cultures to social movements, agricultural practices, natural resources, socioeconomic indicators, history and future of the area and its people. Most Chiapanecos are at the low end of Mexico's widely unequal income distribution. The state's polarized land-tenure pattern and insufficient physical and social infrastructure are accompanied by a lack of democratic structures to give a voice to the disadvantaged population. The Mexican government answered the campesinos' demands with military violence. Although the amount of attention international media and internet resources devote to Chiapas has forced the government to think about peaceful solutions, conflict and repression continue to this day. The government promised to improve its performance on social programs in the area.

While social services such as education and health care are essential to improve the Chiapanecos' situation, sustainable income sources are just as important. Since 54 percent of Chiapas's population work in agriculture, raising farmers' income is a key way to reduce poverty. The Chiapas rebellion was partly a response to a changing policy environment which, through the reform of land tenure laws and the North American Free Trade Agreement (NAFTA), seems to threaten poor farmers' livelihood. To avoid further violent conflicts, the Mexican government implemented policies designed to ease the transition to the market-oriented rural sector it envisions. One such policy is the search for profitable cash crops for small farmers combined with the promotion of private investment in processing industries. Since domestic production is far from meeting oilseed demand, and the market for vegetable oils is growing rapidly, oil palms are a potentially profitable crop for tropical areas which could constitute a sustainable source of rural income.

This paper will evaluate the profitability of oil palm cultivation for farmers, analyzing several factors that affect profitability. First, farmers depend on the price they receive for their products. This price in turn depends on fats and oils prices in general, which are determined in domestic and international markets. Second, as the Mexican government reduces its heavy involvement in agriculture, incentives to produce certain crops are likely to shift. The policy environment is therefore an important influence on relative oil palm profitability. A third factor determining the economic viability of oil palm arises from the importance of close connections between palm growers and the processing industry. Since palm fruit are not edible and spoil quickly, farmers need a secure market for their product; likewise the processing industry depends on a steady supply of raw materials. The main chapter is devoted to studying the impact of oil palm cultivation on farmers in the project area, analyzing the sensitivity of oil palm profits to variations in yield and price. The last chapter evaluates the results, and ends with recommendations to consider in the design of the institutional connection between farmers and the processing industry.

Before the analysis of palm oil production in Mexico begins, this chapter provides an introduction to Chiapas and the oil palm project area, a statement of purpose, and a preview of some of my conclusions and recommendations.

Section A. "A Rich Land, a Poor People"[1]

The contrast between vast wealth and stark poverty which characterizes much of Mexico is especially pronounced in Chiapas. Figure I.1 shows the location of Chiapas in Mexico, and two maps of Chiapas. The political map includes towns and roads, while the other map shows rivers and the major agricultural areas. The state's rich natural resources have done little to ensure a minimum living standard for its people. Chiapas accounts for only three percent of Mexico's population, but it produces five percent of total oil and twelve percent of natural gas, 13 percent of maize, 46 percent of coffee, and 50 percent of all hydroelectric power generated in Mexico. Yet only one third of Chiapaneco households has electricity. In 1990 only 58 percent had running water, well below the national average of 79 percent. Social services are notoriously insufficient, and literacy in Chiapas lies 17 percent below the national average at around 70 percent (Renner, 1997).

The majority of Chiapanecos engage in agriculture, which differs greatly in the state's major geographic zones. The central highlands are poor, and small peasant farmers still widely rely on traditional systems like milpa maize and bean production. The small plots, often located on precarious hillsides, can no longer sustain the rapidly growing population. Between 1970 and 1990 the state's population doubled to 3.2 million; and although the area under cultivation is still expanding, cropland per capita has been declining since 1975. Growing population pressure, as well as timber and cattle enterprises are responsible for increasing exploitation of the eastern lowlands, including the Lacandón rainforest. Since 1960, population in the Lacandón forest has increased 25-fold, and most of the people in the eastern lowlands are deeply impoverished (Renner, 1997). The relatively prosperous western part of Chiapas where the oil palm scheme is located is dominated by large-scale commercial farming in the Grijalva Valley and coffee plantations in the hills close to the Pacific Coast.

Agriculture on the Pacific slopes, in the central depression and the northern part of the state accounts for 80 percent of Chiapas's production, on three-fifths of all cultivated land. The wealth generated by the large farms in the area is concentrated among the landowners; day laborers (jornaleros) and small farmers have remained poor. The state's main crops include coffee, rice, sugar cane, potato, sorghum, tobacco, sisal, oils and vegetables, cocoa, cotton, maize, kidney beans, and wheat (Alvarez, 1988).

Approximately 36 percent of Chiapas's households live in extreme poverty. The Mexican revolution and ensuing land reform in the first half of the twentieth century gave peasants access to land, generated widespread political support among the campesinos and maintained peace for decades, while agricultural development policies favored large-scale irrigated farms in the northern part of Mexico. In 1992, the reform of land tenure laws implied the end of land redistribution[2]. The passage of NAFTA further demonstrated that the Mexican government gave priority to industrial and agribusiness interests in the north of the country. Although the plan to lower maize prices to international levels represents a threat to small farmers, the connection between the Zapatista uprising and NAFTA (which both occurred on January 1, 1994) is mostly symbolic (Lustig, 1995). The free trade agreement represents the fact that peasant agriculture no longer plays a central part in Mexico's political agenda, and that changes in agricultural policy will mean a gradual end to subsidies and transfers to the peasant sector. The lack of political alternatives and democratic structures left Chiapanecos without a way to make their needs known. The Zapatista uprising succeeded in attracting attention to a part of the population excluded by Mexico's successful growth record. It called attention to the flip side of the country's petroleum-led economic expansion that

[1] Title of a book by Thomas Benjamin (1996).

[2] Chapter III includes a more detailed analysis of land tenure and agricultural policy.

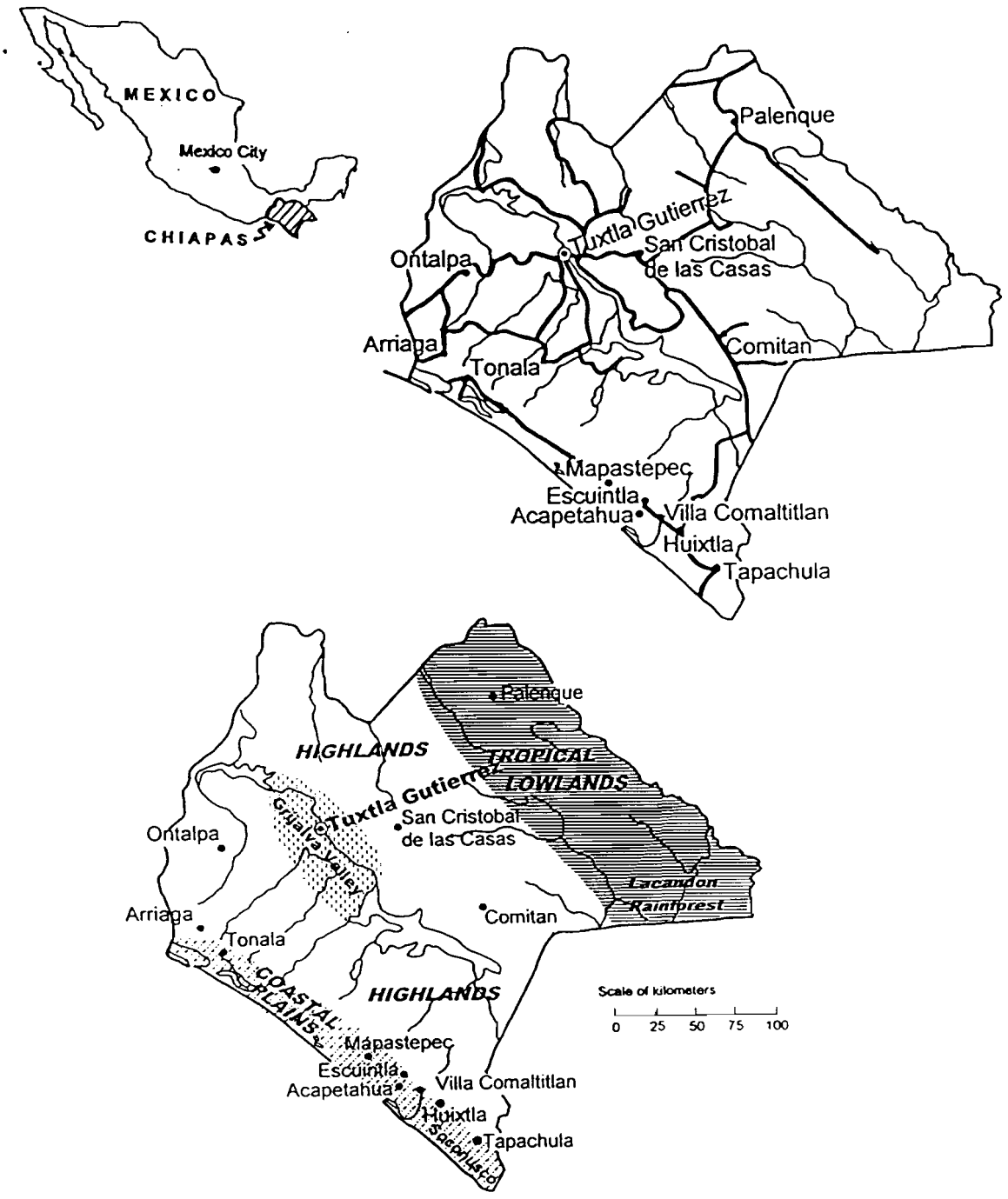

Figure I.1. Political and Agricultural Maps of Chiapas

fueled development of the industrial and large-scale agricultural sectors, but neglected rural poverty and peasant production.

Section B. The Coastal Plains: "El Soconusco"

Historically, the Soconusco has had closer contact to Guatemala than to Chiapas or the rest of Mexico. In the maps in Figure I.1 it comprises the lowlands and slopes between the Sierra, the Guatemalan border and the Pacific Ocean. During colonial times, the Soconusco was part of Guatemala and produced mainly cocoa for export to Europe. Although after independence the state of Chiapas was annexed to Mexico by majority vote in 1824, the Soconusco remained neutral until Guatemala and Mexico settled their border conflict in 1842. The Soconusco's close ties to Guatemala continued; people moved across the border freely until immigration regulations were put into place in 1917. When coffee land in Guatemala became scarce at the turn of the century, German capital and entrepreneurs bought up land on the Pacific slopes and established plantations. They relied largely on migratory Guatemalan laborers, many of whom settled permanently in the area (Alvarez, 1988; Bartra, 1997). While coffee and cocoa production were concentrated on the slopes, the lowlands were always dominated by cattle production, and in the early decades of the century rubber plantations were established with US capital.

The Soconusco's population differs from that of Chiapas; it only has five percent indigenous population, compared to two thirds in the rest of the state. Most farmers in Chiapas work on family-based holdings, including ejidos, while in the Soconusco 47 percent of the population engage in wage work, often on commercial farms and plantations. About 12,000 laborers from the highlands work temporarily on the Soconusco's coffee plantations each year, in addition to about 30,000 migratory Guatemalan workers. Commercial agriculture in this area produces most of Chiapas's export products, including 65 percent of the coffee. In the plains, cattle still dominates as the most important large-farm product, but fruit production for export, including bananas and papaya, is gaining importance. While traditionally most highland farmers engage in subsistence food crop production, smallholders in the Pacific coastal plains produce a variety of cash crops apart from maize, including tobacco, rice, sesame, mango, cocoa, plantain, and oil palm. Cattle, once popular because it allowed farmers to overcome the Soconusco's isolation which made access to markets very difficult, has maintained and increased its importance. Larger landowners switched to livestock because the Agrarian Reform Law allowed larger plots for cattle than for crop production, as long as a minimum number of animals was maintained on the property. Cattle raising is very extensive; farmers use an average of 20 hectares to raise one steer. Increased demand for meat in northern and central Mexico, combined with improved roads and communication links have helped to further increase the popularity of cattle.

The plains, where oil palms are cultivated, are densely settled; cultivable land is becoming scarce. Virtually all the land is deforested, much of it is pasture with isolated trees. Two or three decades ago, ejidatarios received about 20 hectares each; now the plot size has been much reduced. Although officially land distribution ended in 1992, the government is still distributing land in the Soconusco. Landless peasants' organizations such as the Emiliano Zapata Proletarian Organization invade large landholdings, and though it contradicts official policy, the government has been buying up large landowners' land and distributing it among invaders. These new communities are called "new population centers" (Nuevos Centros de Población), but people still refer to them as "ejidos," ignoring the unpopular change in government policy. The land most recently distributed tends to be close to the mangrove swamps by the coast; soil quality is rather low. Farmers receive about five hectares each; they generally are much poorer than those who received better quality land earlier on. Some older ejidatarios have managed to increase their plots through land purchases, and often more than one family member owns a plot, leading to a polarization in land tenure.

Section C. Why Oil Palms?

To decrease dependence on government subsidies, as well as to reduce expenditures, the Mexican Secretariat for Agriculture (SAGAR) is encouraging private investment in the production and processing of cash crops, one of which is oil palm. Since oil palms are already successfully cultivated in the Soconusco, it is clear that they grow well in the area. Oil Palms require an evenly distributed average annual rainfall of 2000 mm or more, which is found on the pacific coast of Chiapas close to the Guatemalan border. A tropical rainy climate with no dry season is ideal. The Soconusco has a short dry season. While palms can survive a dry season, yields fall when precipitation is low. Temperatures (between a minimum of 22-24°C and a maximum of 29-33°C) are ideal, as well as at least five hours of sunshine per day. The Soconusco has average annual temperatures between 25 and 28°C. Apart from the existence of a short dry season, the Soconusco thus seems almost ideal for oil palm cultivation, which is confirmed by high yields and fast growth of palms when they are well taken care of. During the dry season yields decline as expected, and farmers harvest less frequently.

Oil palms furthermore have both economic and ecological advantages which make them a desirable crop both for small- and large-scale producers. Ecologically, tree crops are more sustainable on tropical soils than annual crops. Previous cash crops such as tobacco exhaust the tropical soils, and afterwards the land is only suitable for cattle grazing. Oil palms have a productive life span of two to three decades. After about 25 years yields start to decrease and, more significantly, the palms are so tall that harvesting costs rise and it becomes more desirable to replant. While monoculture never has the same ecological value as forest, oil palms do not exhaust the land; rather the permanent cover protects the soil and prevents erosion, especially when palms are combined with leguminous covercrops (Tailliez, 1995). During the rapid expansion of oil palm areas in Malaysia and Indonesia, the crop received criticism for its association with deforestation, but since the Soconusco is already deforested, additional loss of tropical forests is not a concern in the area.

Economically, palms have several advantages besides their profitability, which will be explored in great detail later on. Their main attraction lies in the relatively steady income stream they provide for farmers, as compared to other crops which are only harvested once or twice a year. Additionally, oil palm production exposes farmers to less production risk than most alternatives. Other crops in the area such as maize and plantain are very susceptible to diseases and pests, while oil palms have not been significantly affected by either of the two problems. In an area subjected to frequent flooding, the palms' resistance to water is a great plus. Virtually all other crops fail when the fields are inundated, but oil palms survive, though the yield is lower than in the absence of flooding. Plantains are affected by storms which induce lodging; palms are sturdy enough to withstand even the most serious winds in the area. Furthermore, palm cultivation demands less drudgery than annual crops. Once they reach a certain height, they almost take care of themselves. Some skilled labor is required for pruning and harvesting, weed control is necessary from time to time, but overall, farmers can reduce the amount of hard physical labor required to earn a living or hire workers to carry it out.

Lately, cattle theft has been a serious problem in the Soconusco; many farmers remarked that they are switching to oil palm because palms cannot be stolen. Even plantains are subject to theft, but since oil palm fruit have to be sold at the extraction plant, they are less attractive to thieves. Farmers do not constantly have to watch their fields to avoid theft, which reduces risk, worries, and labor requirements. Large farmers cite an additional advantage: in an area where land invasions by landless peasants are common, land already planted to oil palm seems to be less attractive to settlers than pasture.

Naturally, oil palms also have disadvantages. As with any tree crop, during the first few years oil palms produce no revenue. This can be mitigated somewhat by intercropping with maize, but remains a serious concern, especially for poorer farmers. Oil palm fruit are not edible, and thus farmers are very dependent on market access for their product. In the case of adverse prices, or if a monopoly evolves in the processing industry, revenues may be seriously affected. Farmers also lose the flexibility to respond quickly to market incentives; once land is planted to oil palm, their removal is costly and time consuming.

Apart from its impact on individual farmers, oil palm cultivation has an effect on the regional economy. Farmers' increased purchasing power benefits business owners and merchants. Extraction plants can create employment for landless peasants, providing alternative rural income sources and thereby alleviating poverty. In the future, the processing industry may expand to include a refinery; bottles or packing materials could be produced locally. Thus palm oil production can help to revitalize the local economy, improving income earning opportunities in an area characterized by increasing outmigration. The possibility to earn a reasonable livelihood in the countryside lowers the probability that people will migrate to the cities, helping to avoid higher urban unemployment and the problems associated with Mexico's enormous cities, as well as illegal immigration into the US. Where migration networks are firmly established, raising rural income is not effective in lowering migration; alternative activities simply cannot compete in profitability (Winters, 1996, cited in de Janvry and Sadoulet, 1997). Initiatives to lower migration thus have to concentrate on areas where migration is not very common yet, but where it is likely to happen in the future, as is the case with Mexico's Southeast (de Janvry and Sadoulet, 1997).

Beyond regional benefits, oil palm has advantages for the country as a whole. Since Mexico has a large deficit in vegetable oil production and imports large quantities of oilseeds, mainly US soybeans, the government views oilseed production very favorably. Oil palms present the opportunity of producing oilseeds in tropical areas not suitable for traditional oilcrops such as soybean or sunflower. Furthermore, oil palms yield more oil per hectare than any other crop, over ten times more than soybeans (Pigott, 1995), reducing the need for imports and thus freeing up foreign exchange for other purposes.

Section D. The Purpose of this Study, and a Preview of Some Conclusions

This study evaluates the viability of smallholder oil palm production in the Soconusco region of Chiapas. Chapters II through IV analyze vegetable oil markets, the Mexican policy environment, and institutional setups in oil palm production. I conclude that the Mexican market for vegetable oils is expanding rapidly, and that therefore demand for palm oil should not constitute a problem. The policy environment is characterized by a reduction in state intervention in the market, accompanied by reduced support for producers of primary food crops such as maize. The policy environment is thus favorable for a switch from maize production to the production of cash crops, including oil palm. The analysis of institutional arrangements shows that while oil palms are often grown on larger plantations, they can successfully be produced by smallholders. The institutional arrangements, and especially power dynamics in this institutional arrangement can have important effects on fresh fruit bunch pricing, and thus profitability.

To evaluate oil palm profitability, I first analyze the farm budgets of existing oil palm producers, comparing the per hectare profitability associated with different crops. The major alternative to oil palms for most farmers is maize. To introduce a time element into the comparison of profitabilities, I calculate the net present value of one hectare of oil palm and maize, using price and yield data obtained in farmer interviews during the summer of 1997. Predicting returns from oil palm requires establishing different cost, price, and yield scenarios and analyzing their effect on net present value. The aim is to determine how sensitive profitability is to future price and yield developments. The information gained from already

producing palm farmers serves as a starting point to judge the impact oil palm production will have on new farmers.

Farm budgets as well as field observations show that oil palm has a positive impact on farm income. The crop is profitable for those farmers who already produce it, and yields higher returns than virtually all alternative land uses. The net present value analysis shows that returns on investments in oil palm are higher than returns from maize cultivation under most scenarios. Only the most pessimistic assumptions regarding costs, prices and yields lead to such a low return from oil palm cultivation that maize appears superior. Costs have a major impact on profitability, especially transport costs. A better organized transport system could thus lead to a significant reduction in farmers' costs. Although naturally prices have an impact on profitability, returns from oil palm are more sensitive to changes in yields. Thus extension services which improve farmers' care for palms and thus yields can have a major impact on farmers' incomes.

The first few years, until oil palms become productive, constitute a critical phase in determining the project's success. Farmers have committed to oil palm, but are not yet receiving any benefits. Maize intercropping mitigates income loss, but this loss can still be important, especially for poorer farmers. The project tries to make oil palms more accessible by distributing the seedlings for free, and furthermore giving each farmer a subsidy of 900 pesos for the first two years. This subsidy is partly distributed in kind (i.e. fertilizer), and partly in cash. Technical advice is also available for free. The farm budgets also serve to evaluate the farmers' cash flow situation during the first few years. This analysis shows that most farmers' economic situation is comfortable enough to make the cash subsidies dispensable. For the poorest farmers however, the oil palm subsidy can make up an important part of total income. Targeting subsidies to the poorest farmers may enable the project to avoid wasting money while having a greater impact on those who really need the support.

Chapter II
FATS AND OILS MARKETS

Since oil palm profitability is directly connected to vegetable oil prices and thus to fats and oils markets, this chapter provides an overview of these markets, both globally and in Mexico. The aim is to assess future demand for palm oil both on the world market and in Mexico. The fats and oils market is both among the most important and among the most complex markets in agricultural products. Its importance derives from the value of international trade in oilseeds and products; in 1992 it constituted the third most valuable component in total world agricultural trade, after meat products and cereals (Hui, 1996). Virtually every country cultivates some of the world's hundreds of oil producing plants, and oils, fats and protein meals are consumed everywhere in growing amounts. Oilseeds are not only used for cooking oils and shortenings, but also for industrial purposes, and to produce oilcakes and meals for animal feed. The complexity of the fats and oils complex stems from the intense competition between products within the group. This group consists not only of annual oilseeds and perennial oil crops, but also includes animal fat, marine oils, and synthetic (petroleum-derived) products (World Bank, 1991). Many of these products can be substituted for one another, which makes their prices very highly correlated. Furthermore, most oilseeds contain both oil and protein meal, and depending on relative prices, either product can be the driving force in oilseeds markets.

The international market for fats, oils, and protein meals has changed substantially in the second half of this century. Not only have traditional producer countries found increasing competition from new producers (such as Southeast Asia, South America and Europe), but, simultaneously, traditional oilseeds have encountered growing competition from new oils (such as palm oil and canola oil). After giving an introduction into the substitutability between oils and the possible uses of palm oil, this chapter demonstrates how closely oil prices are correlated. It shows how the relative importance of different oils has changed, focusing on increasing competition between soybeans and palm oil. As income and population grow in many countries, demand for fats, oils and oilmeals increases. Since Mexico is undergoing both population and income growth, its vegetable oil consumption is likely to continue to increase in the future, providing an expanding market for palm oil from Chiapas. In the United States and other developed countries, rising income has also led to increasing concern with the health effects of different oils. Therefore, after a section on income and dietary change, a section in this chapter examines the health concerns associated with palm oil and other fats and oils, and the effect these concerns may have on preferences for different oils.

Mexico satisfies part of its growing demand for fats, oils and protein meals with domestic production, but most of the supply is imported in the form of oilseeds or their products. Since NAFTA implies the elimination of tariffs on soybeans, and US soybeans and products are the most important source of oils and meals for Mexico, the US soybean oil price constitutes a price ceiling for vegetable oil in Mexico. Soybean imports are expected to increase with Mexico's expanding livestock industry and the corresponding demand for protein meal. To be successful, palm oil from Chiapas will have to compete with US soybean oil, which is readily available as a by-product from meal production. Oil palms produce only very limited quantities of meal from the palm kernels, and palm oil producers thus depend virtually exclusively on the vegetable oil price for their profits.

Section A. Substitutability Between Fats and Oils

The fats and oils market is even more competitive than most commodity markets. This is due to the high degree of substitutability between vegetable oils for most end uses, which implies a very high

elasticity of demand for individual oils, although the demand elasticity for oils as a group is quite low. In contrast, the short-term supply elasticity of most vegetable oils is relatively low because palm oil and other tree crops take a long time to mature, and other oils, such as soybean oil, are by-products of oilseed crushing for animal feed (Nusbaumer and Franco, 1978). Thanks to techniques like fractionation and interesterification[1], today palm oil can be used for a much wider variety of end uses than a few decades ago, and interchangeability of different oils in general has increased. As a result, vegetable oil prices have become very highly correlated.

Technically, substitutability is high within certain categories of oils, but lower between categories. Economically, there are factors apart from technical constraints which limit substitutability. Thus, consumers have preferences for certain oils, for example because of taste or health concerns. Customs and lack of information lead to a preference for domestic oil in many countries, although increasing trade and global communication are making consumers more accepting of foreign oils. Furthermore, relative prices reduce the substitutability of oils even where it is technically possible. Consumer preferences are more important where price differences are small (Meinunger, 1975). For industrial uses, vegetable oils do not only compete with each other, but also with synthetic oils, and to a diminishing degree with marine oils and animal fat. The complexity of competition between different fats and oils makes the prediction of demand developments extremely difficult.

Oil and Fat Classification and Uses

Classification According to Sources

There are five sources of fats and oils: Oilseeds, oil-producing trees, domesticated animals, marine animals, and petroleum. Oilseeds include mostly annual varieties grown in temperate climates, such as soybean, rapeseed, and sunflowerseed; others such as peanuts are grown in tropical climates. Some of these oilseeds are grown mainly for oil, such as sunflowerseeds, while other crops, such as cotton, produce oil as a byproduct. Most vegetable oil worldwide is produced from oilseeds. Oil producing trees have become increasingly important with the rise in palm oil production; other trees include coconut, olive, and babassu trees. Most oil-producing trees grow in warm or tropical climates; their oil production per hectare is much above that of other oilseeds (Hui, 1996; Palma-Gómez, 1977). Animal fat is mostly from hogs, sheep or cattle. Major animal fat products include butter, lard and tallow; they are very important in countries with a large livestock industry. Marine oils have lost much of their importance with the growth of synthetic oils, which has had a positive impact on the whale population.

Classification According to End Uses

There are several ways of classifying fats and oils according to their chemical properties, but for the purposes of this study, a classification according to end uses is most relevant. However, one chemical distinction is important as it determines the range of products that can be obtained from an oil: drying versus non-drying oils. As their name suggests, drying oils dry to a uniform, resistant finish and can be used to produce paints and varnishes. They include polyunsaturated oils such as soybean, castor and linseed oil, as can be seen from Table II.1.

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[1] The process called fractionation consists in separating the liquid (olein) and solid fractions (stearines) contained in palm oil and other oils. Interesterification involves exchanging the fatty acids of different types of fat or oil, for example to change the melting point. Both processes are quite complicated; for a more detailed description see Hui (1996), vol. 1, pages 8-10.

Table II.1. Drying and Non-drying Oils

Drying	Semi-drying	Non-drying
Linseed	Maize	Palm
Castor	Sesame	Palm kernel
Fish	Sunflowerseed	Coconut
Soybean		Cotton
Tung		Olive

* Source: *Bailey's Industrial Oil and Fat Products*, 1964.

While only drying oils can be used for paints, oils from all three categories can be used for many other purposes, including human consumption.

For simplification, fats and oils can be divided in two basic groups: liquid oils and solid oils or fats. Palm oil has an intermediate consistency and can be fractionated into a solid and a liquid oil. It is usually classified as a solid fat, because it is "usually used as such in Western countries" (Voituriez, 1996). Solid oils and fats include animal fat as well as solid vegetable fats, while both marine oil and vegetable oil are liquid.

Solid Fats and Oils[2]

- **Butter fats** contain a high percentage of butyric acid and are almost exclusively used for butter production due to their high price.
- **Animal fats** such as tallow and lard are becoming less popular for human consumption due to their high degree of saturation. Their price is low compared to other fats and oils, and they are frequently used for soap production.
- **Vegetable butters** such as cocoa butter are relatively valuable. Most are from the seeds of tropical trees. They can be used in confections, chocolate coatings, and for pharmaceutical products including cosmetics.
- **Lauric oils** receive their name from their high lauric acid. The two most important lauric oils are coconut oil and palm kernel oil. They are relatively inexpensive and are suitable both for edible uses and for soap production.
- Palm oil is the most important **palmitic acid oil**; it contains between 32 and 47 percent palmitic acid, and 40 to 52 percent oleic acid. It can be fractionated into its solid and liquid fractions (olein and stearine). It is usually used for shortenings, margarines, and in soap. Its price tends to be slightly below that of other vegetable oils.

Liquid Oils

- **Oils with a high oleic and linoleic acid content** are highly unsaturated and include oils made from oilseeds such as cottonseed, peanut, sunflowerseed, safflower, sesame but also tree oils like olive oil and almond oil. Although they are mostly non-drying, the oils in this group are very versatile in their uses. They are good for human consumption, and can be hydrogenated to a semi-solid consistency. Their price is low compared to vegetable fat such as cocoa butter, but tends to be higher than that of other vegetable oils.

[2] The following two sections are based on Hui (1996) and Palma-Gómez (1977).

- **Oils high in linolenic acid** include mainly soybean and linseed oil. Selective breeding of rapeseed plants to reduce erucic acid contents has led to a recent addition to this group: canola oil. It has the lowest content of saturated fatty acids of the vegetable oils. These oils are good drying oils and are widely used for paints and varnishes; but they are also extremely important for human consumption. They are generally cheaper than the oils in the previous group, although there are exceptions.
- **Marine oils** are usually mostly unsaturated and are used principally in the elaboration of soaps and varnishes, although they can be an important source of Vitamin A and D in human consumption. Their price is very low and their importance has declined rapidly with the introduction of synthetic oils.
- Castor oil is the only important **oil with a high content of ricinoleic acid**. It can be used for paints and protective films, but is unsuitable for edible uses or soap production. It also has specialized uses such as lubrication, hydraulic fluid, and in the textile industry.

The substitutability of different fats and oils is summarized in Table II.2. The table illustrates that most oils have many uses. In general, processed oils are more interchangeable than crude oils, but their storage and transport costs are higher. Since oil crushing creates relatively little value-added, local processing may not always be desirable (Nusbaumer and Franco, 1978). The dynamic rise in palm oil production and exports is explained both by its low and falling production costs, and by its versatility in edible and non-edible uses. The substitutability among oilcakes and meals is lower because the "usefulness of oilcake as a livestock feed stems primarily from its digestible protein content, which varies substantially among different kinds" (Meinunger, 1975).

The Relationship Between Oils and Meals[3]

Most oilseeds contain both oil and protein; the latter is used as animal feed. Some oilseeds have a relatively low oil content; soybeans contain only 18 percent. When soybeans are crushed and the oil is removed, the residue is a meal that contains about 44 to 50 percent protein. Oil palm fruit contain mostly oil (around 50 percent of the mesocarp), but almost no protein (Hui, 1996). Palm kernels can be used as animal feed, as can palm kernel meal. Both meal and oil are experiencing rapid growth: "Increasing production and trade of oilseeds and their products have occurred due to both the rising consumption of livestock products and the concurrent rapid growth in meal demand, as well as strong demand for vegetable oils" (Hui, 1996:53).

Since demand for oils is quite independent of meal demand, oil and meal prices do not necessarily move together, although they are interrelated because the two products are usually produced together. Thus, strong demand for soybean meal will have an impact on the world supply of vegetable oil, and influence the prices of other oils as well (UNCTAD/GATT, 1990). Castaneda (1995) explains: "Soybeans are crushed primarily for soybean meal -- used mainly as a protein ingredient in animal feeds -- with oil generally a by-product. However, [in 1993/94 and 1994/95], soybean processing has been heavily influenced by the demand for vegetable oils".

Oil Palm Products

Until the beginning of the twentieth century, palm oil had mostly industrial uses, for example in tin plating, and the production of stearic candles and soap. In West Africa, where the oil palm originated, crude palm oil is consumed directly. It is a good source of Vitamin A, but its red color and strong taste make it unacceptable for most consumers in other areas. With growing demand for liquid oils and better fractionation techniques, refined, bleached and deodorized palm oil (RBD palm oil) increasingly went to

[3] I use the terms protein meal, oilmeal and oilcake interchangeably.

Table II.2. Fat and Oil Substitutability

Fat/Oil	Cooking/ salad oil	Shorte-ning	Mar-garine	Confec-tionery	Soap	Paints etc.	Lubri-cants	Cosmetics etc.
Almond								X
Babassu					X			
Castor					X	X	X	X
Cocoa butter				X				X
Coconut				X				X
Copra		X	X		X			X
Corn	X	X	X		X			X
Cottonseed	X	X	X					X
Fish						X		X
Lard	X	X	X		X			X
Linseed					X	X		
Olive	X				X			X
Palm	X	X	X	X	X		X	X
Palm kernel	X	X	X	X	X			X
Peanut	X	X	X					
Rapeseed	X	X	X		X			
Sesame	X	X	X		X			X
Soybean	X	X	X		X	X		
Sunflowerseed	X	X	X					
Synthetic			X		X	X	X	X
Tallow					X			
Tung						X		

Source: Based on Hui, Y.H. 1996. *Bailey's Industrial Oil and Fat Products.* John Wiley & Sons, Inc. New York; and Palma-Gómez, A. 1977. *Substitución de Importaciones de Productos Agropecuarios Alimenticios en México: Analisis de Posibilidades; el Caso de las Grasas y Aceites* (sic). Cornell Agricultural Economics Staff Paper No. 77-7. Ithaca.

edible end-uses such as margarine and shortening, and later also to salad and cooking oils (Nusbaumer and Franco, 1978; Pigott, 1995). Today, 90 percent of world palm oil production goes to food uses, while 10 percent is used in other applications such as cosmetics, detergents, and even fuel (Garcés and Cuellar, 1997). Figure II.1 shows products made with palm oil, and the processes through which they are produced. Possible uses include margarine, shortening, vanaspati (a type of shortening used in tropical Asia), frying fat, ice cream, salad dressing, confectionery, bread making, frying and cooking oil, and infant formulas. Palm oil is the most widely used industrial frying fat because it has no unpleasant odor, and a high resistance to oxidation when compared to unsaturated oils (Hui, 1996). In addition, there are non-edible uses such as diesel substitutes, lubricants, cosmetics, soaps and detergents, and uses in plastic and rubber processing.

Palm kernels can be ground, which yields meal (for animal feed) and palm kernel oil. This solid oil belongs to the group of lauric oils and can be refined and used in margarines and shortenings. It is also used to substitute for milk fat in ice cream, non-dairy creamers and creams. Due to its high melting point, it is ideal for use in confectioneries, chocolate coverings for ice-cream and sweets, and cream fillings. The price of lauric oils is generally above that of palm oil, and correlation between palm oil prices and palm kernel oil prices is lower than correlation between prices within one group of oils.

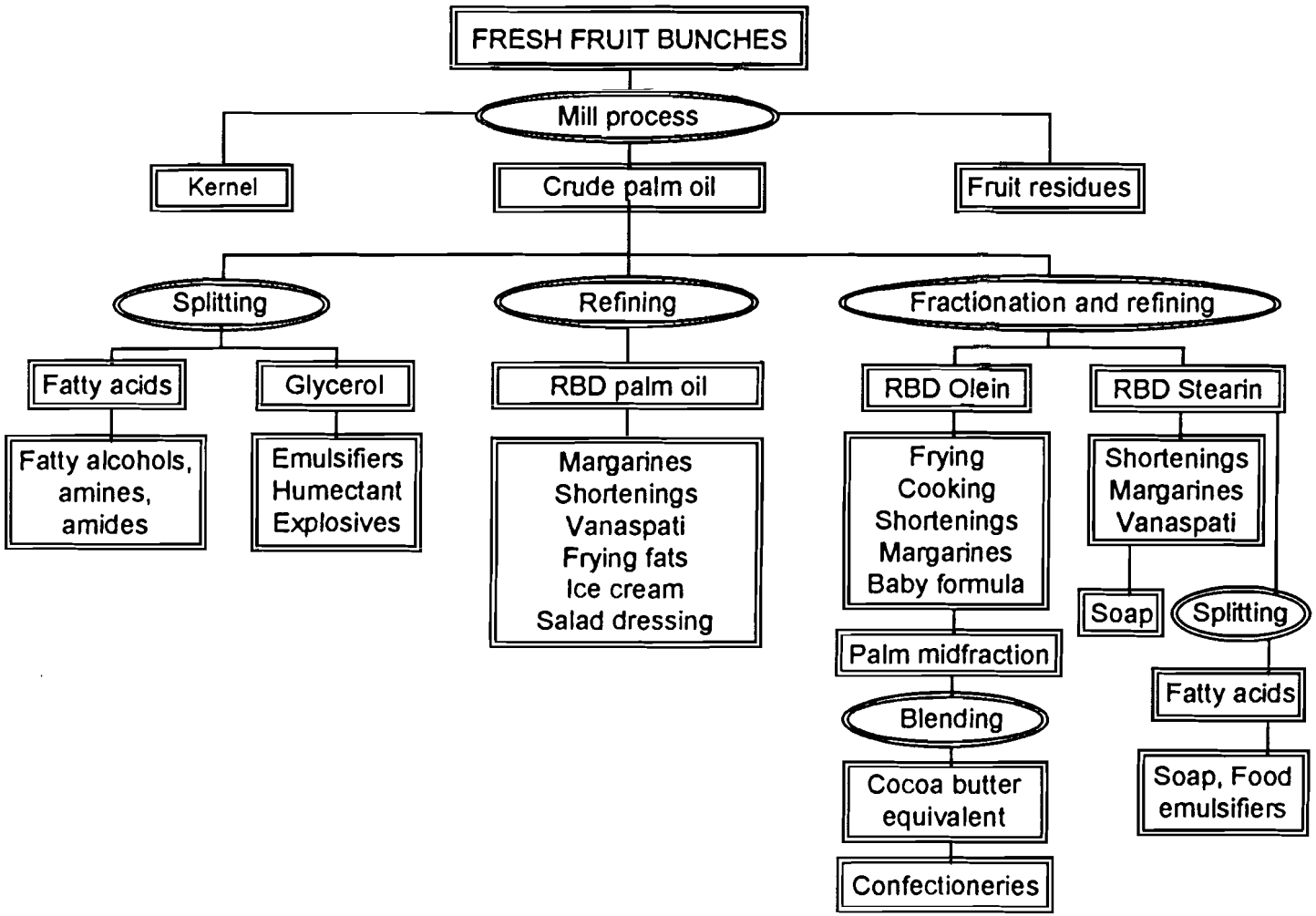


Figure II.1. Palm Oil Utilization

Sources: Hui, Y. H. 1996. *Bailey's Industrial Oil and Fat Products.* John Wiley & Sons, Inc. New York; and Garcés, I. C. and M. Cuéllar Sánchez 1997. "Productos Derivados de la Industria de la Palma de Aceite. Usos." *Palmas*, Vol. 18, No.1.

Section B. Prices and World Supply

Like most commodity markets, the fats and oils market is very dynamic. Not only can buyers choose from many different vegetable fats and oils, they also decide whether to buy them as oilseeds, or in their processed form as oil or meal. Both oilseeds in unprocessed form, and processed vegetable oil and meal are traded internationally. The value of trade in oilseeds has increased with world population and income as oilcrops are an important component of the world's food supply. Morgan and Sanford write: "(t)he growing globalization and complexity of oilseed markets have resulted in ever-growing uncertainties and risks" (Hui, 1996). Over this century, production of oilseeds has moved geographically; first from mostly tropical countries to temperate zones. In recent decades, this trend was somewhat reversed by the phenomenal growth of palm oil production in Malaysia. The move to temperate growing areas coincided with the emergence of soybeans as the most important oilcrop, which has dominated production and trade for most of the century. Again, palm oil has been responsible for reducing the dominance of soybeans on the world vegetable oil market, becoming the most widely traded oil. To understand the supply and trade of oilseeds, it is necessary to study the complex way in which their prices are interrelated. They are examined in the next section, to be followed by a closer look at supply.

Prices

Oilseed price formation is not simple; it depends on product prices:

> Determination of oilseed prices is unique, because seed prices are normally a function of the value of their products (meal and oil). The production of protein meal and vegetable oil is determined by the spread between the value of the products and the price of the seed -- the gross crush margins. Crush margins vary constantly, influenced by the demand for both protein meal and edible oil. Because soybeans are the largest oilseed produced in the world and soybean products are the most widely consumed, their prices usually reveal the movement in the overall oilseeds markets (Castaneda, 1995:16).

Soybean and product prices can thus be used as an indicator for world oilseed and product price trends.

As can be seen from Figure II.2, vegetable oil prices are extremely volatile. Real prices have a downward trend since 1950, interrupted by high prices in the early 1970s during the world food crisis. The prices of major vegetable oils move more or less together, but their relative positions change periodically. The graph shows how closely palm oil prices follow the soybean oil price. Coconut oil is a lauric oil, and since substitutability between lauric oils and soybean and palm oil is lower, their prices are not as highly correlated. Groundnut oil is a special case whose price was kept artificially high, more affected by government policies than by supply and demand. Figure II.3 makes a similar point, although the great number of oils it includes makes it hard to follow individual developments; rather the focus is on general trends. The graph shows how the seven major vegetable oils have evolved since the 1970s. The prices of lauric oils (coconut and palm kernel) are consistently above the other oils except groundnut oil. Rapeseed (or canola) oil, which used to be one of the cheapest, is now sold at a premium because of its health benefits. Sunflowerseed, rapeseed, and soybean oil prices are extremely highly correlated as they have virtually identical uses. Palm oil almost consistently has the lowest price, but it also closely follows the ups and downs of soybean oil.

Over the last twenty years, the rise of new oilseed production areas outside the US corn belt have decreased the influence of US weather and policy shocks on world markets, thereby reducing a source of price variability (World Bank, 1991). The joint production of oils and meals however ensures a continued

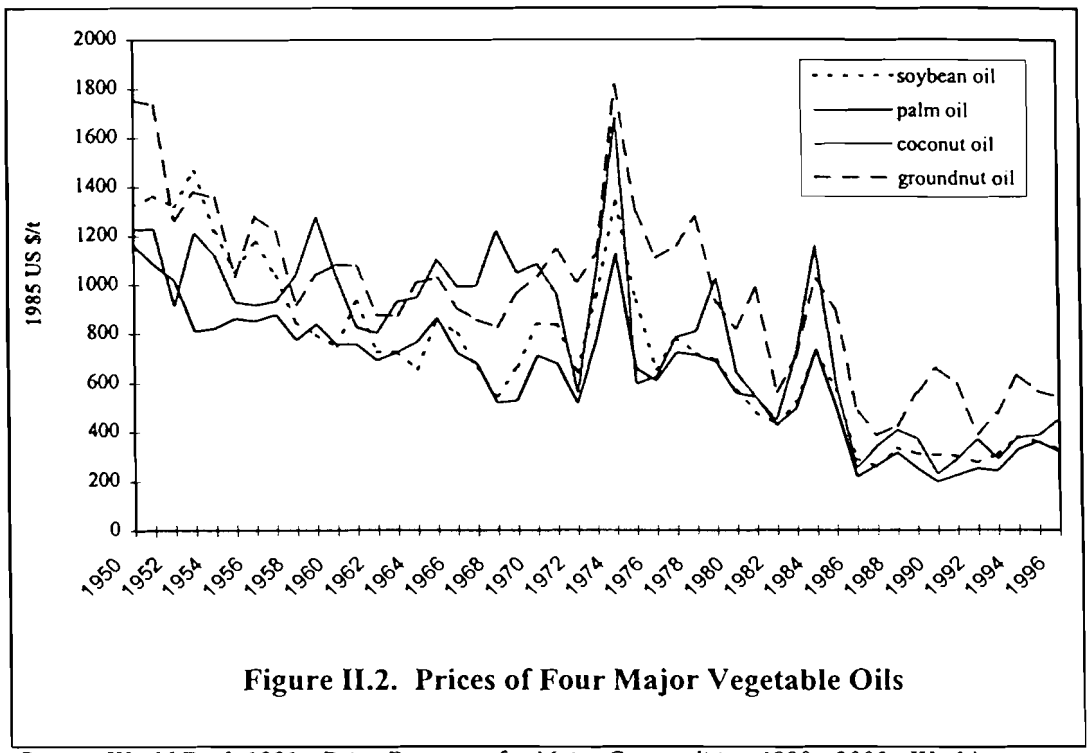


Figure II.2. Prices of Four Major Vegetable Oils

Source: World Bank 1991. *Price Prospects for Major Commodities, 1990 - 2005.* Washington.

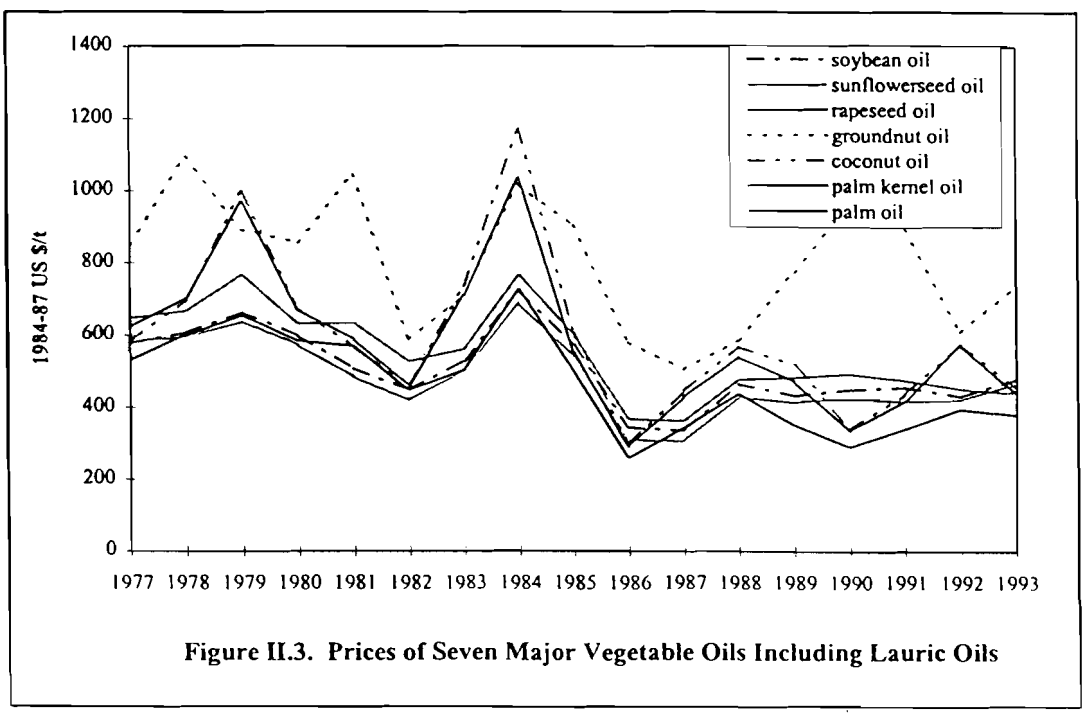


Figure II.3. Prices of Seven Major Vegetable Oils Including Lauric Oils

Source: FAOSTAT: http://apps.fao.org

high volatility in the market. Conditions in those two markets can be quite different, which leads to interesting market developments. For example as oil prices drop, vegetable oil supply need not decline if meal prices happen to rise during the same time period (World Bank, 1991). Figure II.4 shows soybean, soybean oil and soybean meal prices since 1950. Clearly these three prices are much less correlated than the prices of different vegetable oils. While initially soybean oil was much more valuable than soybeans or meal, over the last decades their prices have become closer, reflecting the availability of competitive tropical oils such as palm oil. Soybean and meal prices display a very high correlation, illustrating the fact that soybeans contain mostly meal. When oil prices are high, increased soybean crushing for oil raises the price of soybeans relative to meal prices. Despite the growing importance of palm oil, soybeans and products are still the most important oilseed worldwide, and their prices can be used as guidelines for most other oil products.

World Vegetable Oil Supply

The structure of world fats and oils supply has changed considerably during this century. Not only the relative importance of different producers has shifted; some oils have grown considerably faster than others, altering the market's composition. While historically, colonies in Asia and Africa produced most of the world's oilseeds, after World War II the market became dominated by the major soybean producers, specifically the United States (Hui, 1996). In the 1990s most oilseeds are produced in temperate zones, with the exception of palm oil and coconuts. While most oilseeds can be traded in processed or unprocessed form, both coconuts and oil palm fruit cannot easily be stored and transported and are thus processed in the country of origin and exported as copra and crude palm oil, respectively. Thus trade in other oilseeds reacts to changes in both meal and oil prices, but palm oil trade depends only on oil prices.

Figure II.5 shows the evolution of world vegetable oil production between 1960 and 1994/95. Overall production has grown fourfold over this time period, but this growth has not been evenly distributed. Soybeans are still the most produced oilseed, and their production has grown faster than the total, or about six-fold. The most dynamic oils were rapeseed (or canola) oil and palm oil, growing about 10- and 12-fold respectively. Other oils, such as cottonseed, peanut (or groundnut), and olive oil did not experience such dynamic growth, partly due to their small role in international trade. The lauric oils experienced some growth, although it was not spectacular.

The success of palm oil in the world market is striking, especially when looking at exports in Figure II.6a. Palm oil production was consciously promoted by the Malaysian government as an alternative to rubber. Starting in the late 1950s and during the 1960s Malaysia implemented extensive programs called FELDA schemes to lessen political unrest in the countryside and reduce rural poverty. Peasants were settled in newly developed areas, where they produced crops such as rubber, and, increasingly, oil palm. These projects have a relatively long gestation period, and results are reflected in the percentage of palm oil in total production of the major oils included in Figure II.5. From less than one tenth of total vegetable oil production in 1960, palm oil grew to almost one fourth in 1994/95. Soybean oil, by comparison, grew more slowly from one fifth of world production in 1960 to a little less than one third in 1994/95. Figure II.6a shows palm oil's even more impressive growth in world exports. Palm oil exports grew sixteen-fold during the time period, compared to a fivefold increase in total vegetable oil exports. Its growth is surpassed by that of canola oil, which grew 25-fold, starting from a very low level. Other oils displaying rapid export growth are sunflowerseed oil and olive oil. In 1960, both production and exports were almost evenly divided among several important oils, none of which were dominant. Over the last four decades, some oils, such as palm oil, soybean oil, rapeseed oil, and sunflowerseed oil displayed rapid growth rates, while others stagnated and lost relative importance, for example peanut oil and cottonseed oil.

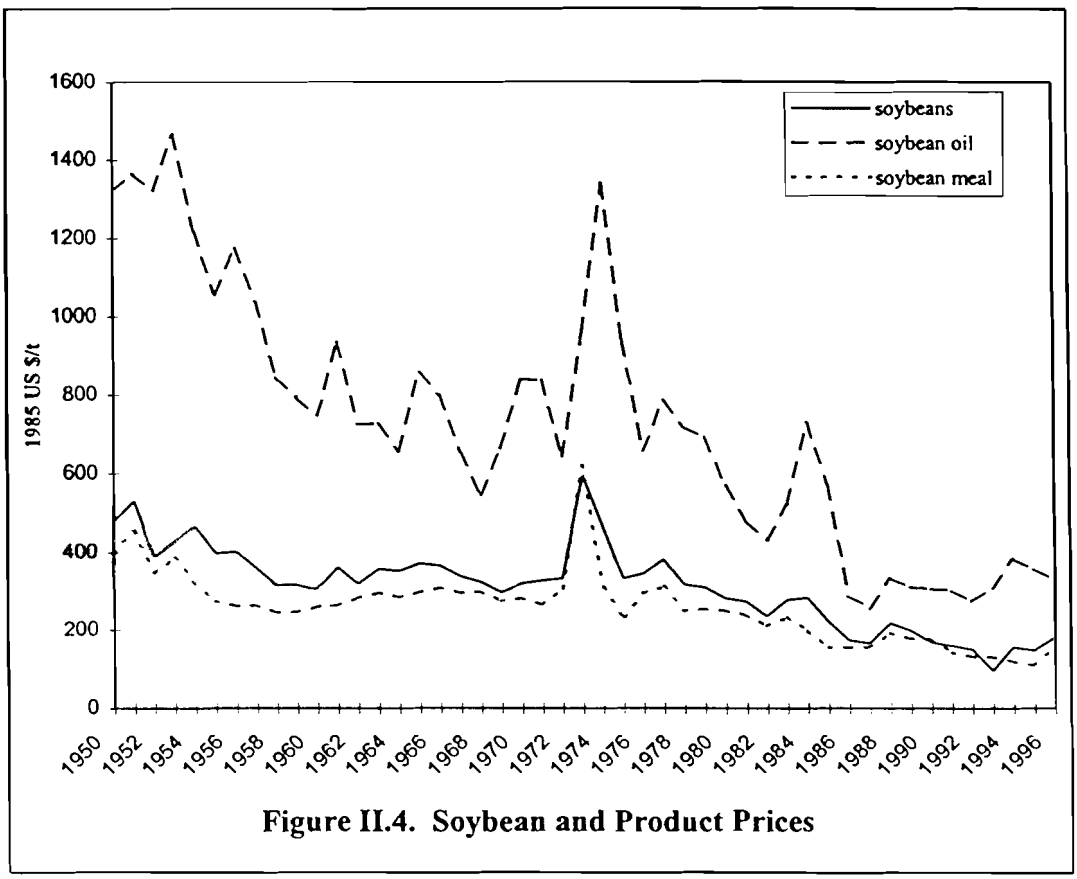


Figure II.4. Soybean and Product Prices

Source: World Bank 1991. *Price Prospects for Major Commodities, 1990 - 2005.* Washington.

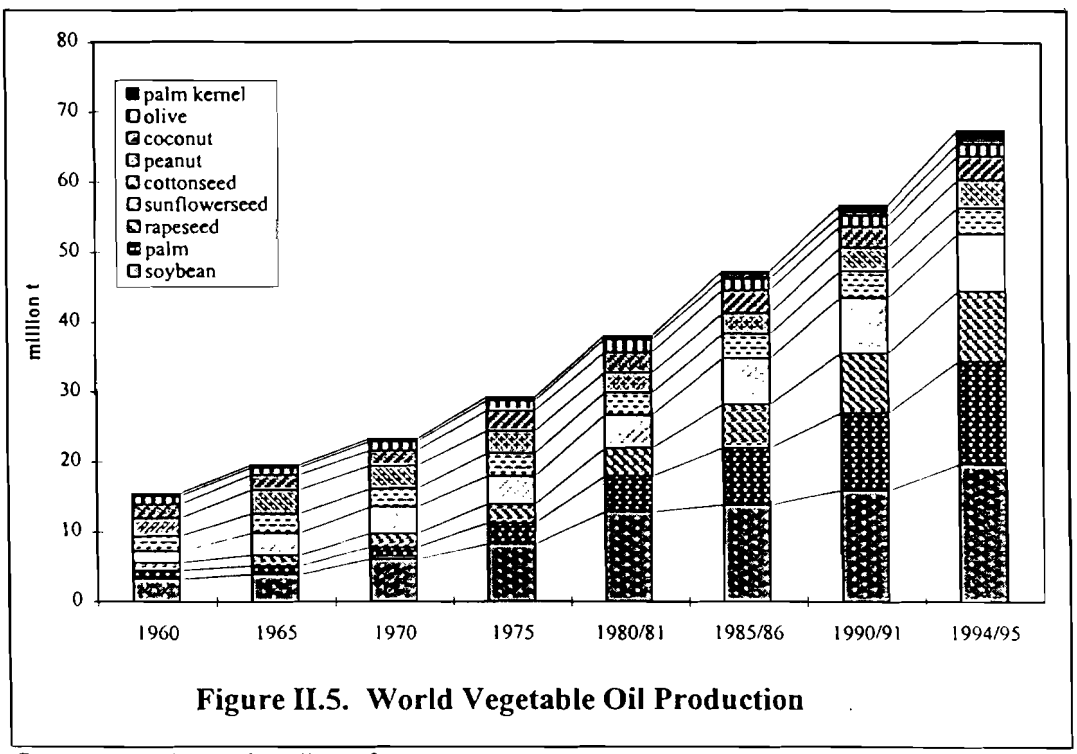
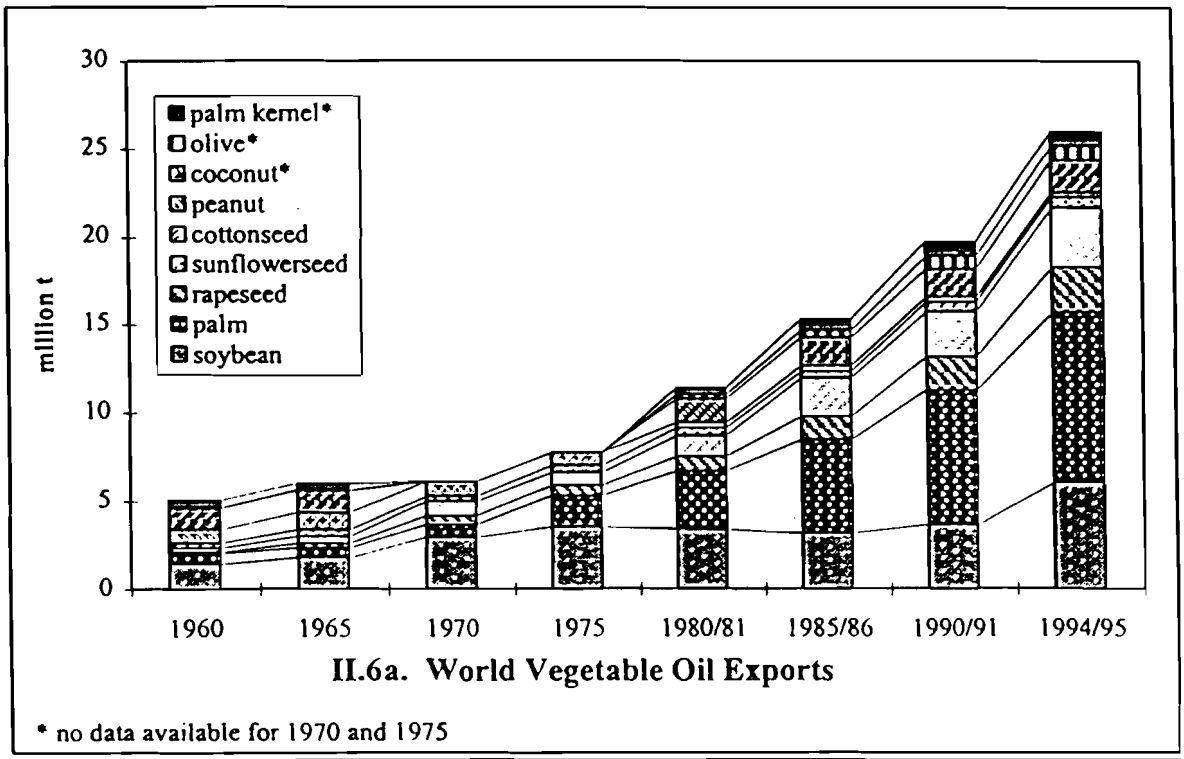


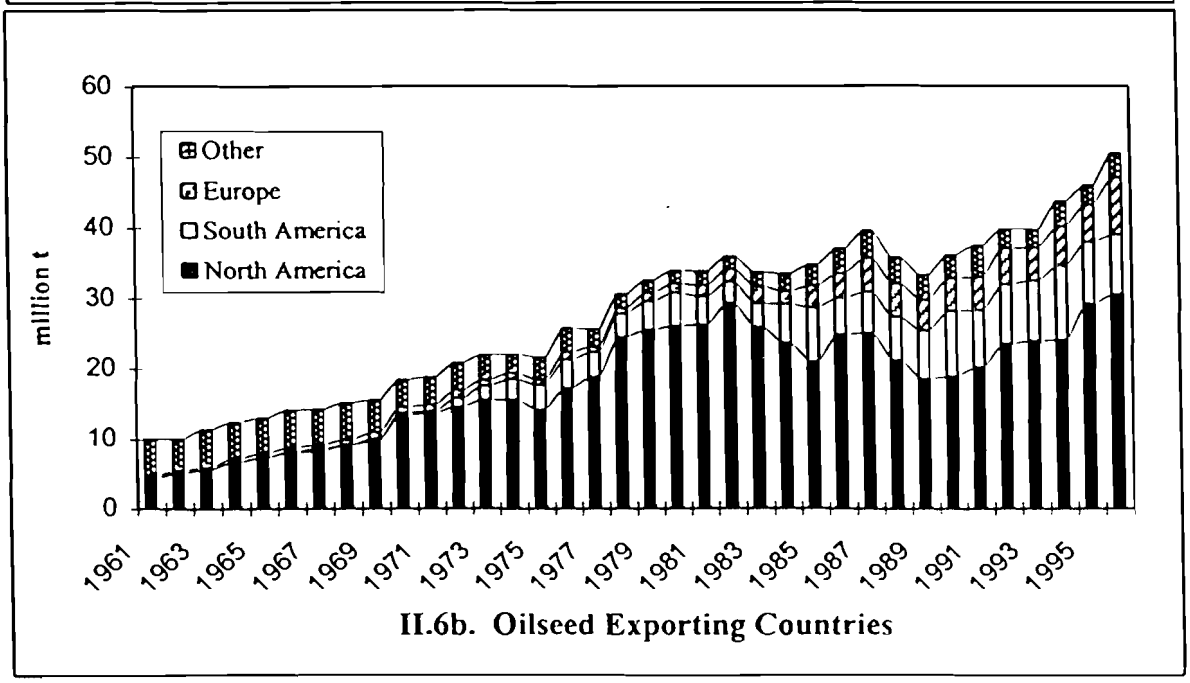
Figure II.5. World Vegetable Oil Production

Sources: FAOSTAT: http://apps.fao.org, and
ERS: http://usda.mannlib.cornell.edu/reports/d/ocs-bb/oil_crops_outlook



II.6a. World Vegetable Oil Exports

* no data available for 1970 and 1975



II.6b. Oilseed Exporting Countries

Sources: FAOSTAT: http://apps.fao.org, and
ERS: http://usda.mannlib.cornell.edu/reports/d/ocs-bb/oil_crops_outlook

Figure II.6. World Vegetable Oil Trade

The spectacular growth of palm oil is reflected in the increasing importance of Malaysia and Indonesia as oil producing countries. The major oilseed producers are illustrated in Figure II.7. North American production, mostly of US soybeans, is still the largest component, although competition from other areas has increased. Overall, no one country predominates oilseed production; it is spread out fairly evenly. In exports, however, illustrated in Figure II.6b, North America is predominant, although Europe and South America now each have a significant share of the market. Oilseed exports do not include palm oil, which is traded as oil; therefore Figure II.7 only includes oilseeds traded in their unprocessed form. Palm oil exports are shown in a separate graph in Figure II.8. The international palm oil market is dominated by Malaysia and, to a lesser degree, Indonesia. Malaysia accounts for roughly half of world palm oil production, and almost two thirds of exports. Other important new producers, mostly of soy-beans, are Argentina and Brazil in South America; Canada and its canola oil and the European community have experienced rapid growth as well.

Ironically, the loss of US predominance in the market was partly a result of US policies. Until the 1970s, North American oilseed production dominated the world market. Soybean cultivation had expanded rapidly in the US to meet the growing demand of the feed-lot and poultry industries. Prices fell due to abundant supply, and the government instituted support prices to protect farmers' incomes. Support prices resulted in huge stocks of agricultural commodities, and were eventually replaced by direct payments to farmers in exchange for reduced production. When in 1973/4 a failed crop in the USSR and in Asia triggered the "World Food Crisis", the US sold huge amounts of grain to the USSR, and oilseed prices rose together with prices of most agricultural commodities (Poleman, 1975; Johnson, 1975). This provided incentives for South American countries to increase their soybean production dramatically. Simultaneously South-East Asia expanded its cultivation of oil crops, and palm oil expanded its market share from 26 percent of total vegetable oil exports in 1975 to over 40 percent in 1992/93[4]. US vegetable oil exports declined from 15 percent of world exports to six percent over the same time period (Morgan, 1993). Since the mid 1980s, growth in demand for oils has outpaced the demand for feed protein and the associated supply of oils from "conventional" oilseeds such as soybeans. The gap has been filled by palm oil, which yields ten times more oil per hectare than soybeans.

In 1997, the USDA published the *Agricultural Baseline Projections to 2005, Reflecting the 1996 Farm Act,* accompanied by the *International Agricultural Baseline Projections to 2005*. The reports are published by the ERS, based on analysis carried out by committees including the World Agricultural Outlook Board, the ERS, the Farm Service Agency, and the Foreign Agricultural Service. These projections do not forecast the future; rather they are based on certain assumptions such as steady economic growth, continuation of the current trade and agricultural policies in the US and abroad, and average weather. Although US oilseed policy aims to give more importance to price incentives in the future in the framework of the 1996 Farm Act, the ERS does not foresee any dramatic changes in production levels as a result of policy changes. The expected modest decline in area planted will probably be offset by small gains in yield, leaving overall US production levels unaffected. In Europe, budget constraints are restricting the amount of resources available for support programs, and production growth is projected to slow down; GATT rulings should additionally reduce the use of support programs. The USDA projects South East Asian suppliers in contrast to continue their growth, especially Indonesia, as suitable land in Malaysia is becoming scarce. In Latin America, improved transportation and low production costs should also lead to gains in production. Overall, falls in soybean oil are projected to be more than offset by other oils, but

[4] The switch from the use of calendar years (like 1978) to marketing years (1992/93, from August to July) in USDA publications reflects the growing importance of crops produced in the southern hemisphere. Producers in one hemisphere can now react quickly to crop failures in another part of the world; the time delay in reaction to price incentives has become shorter in the soybean market. Tree crops such as oil palm have a much lower supply elasticity and can react only to long term price trends.

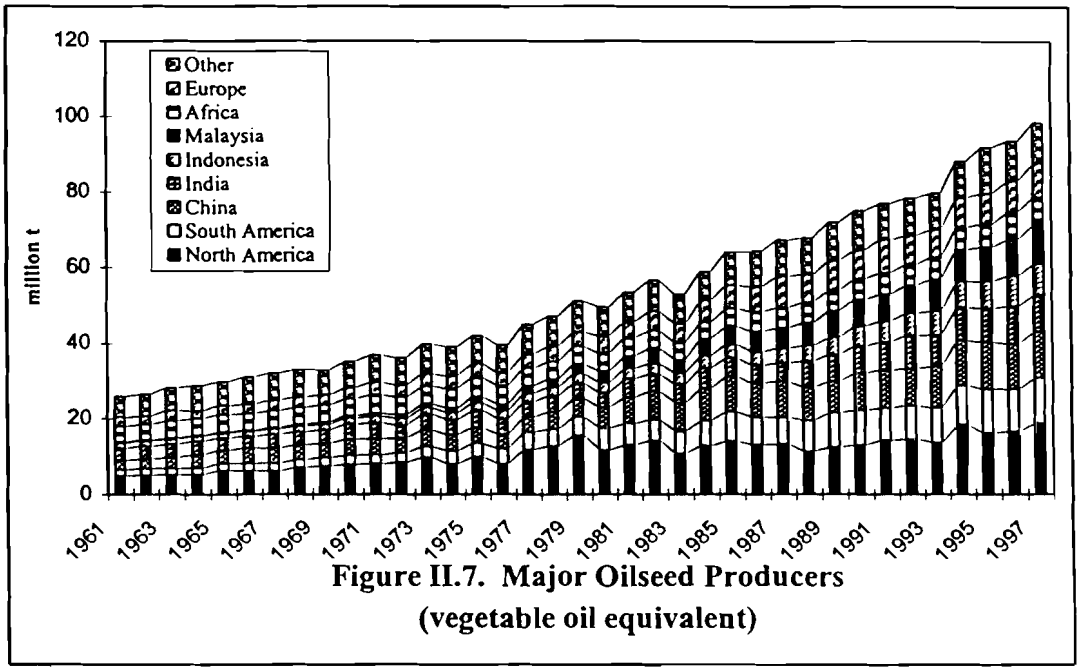


Figure II.7. Major Oilseed Producers (vegetable oil equivalent)

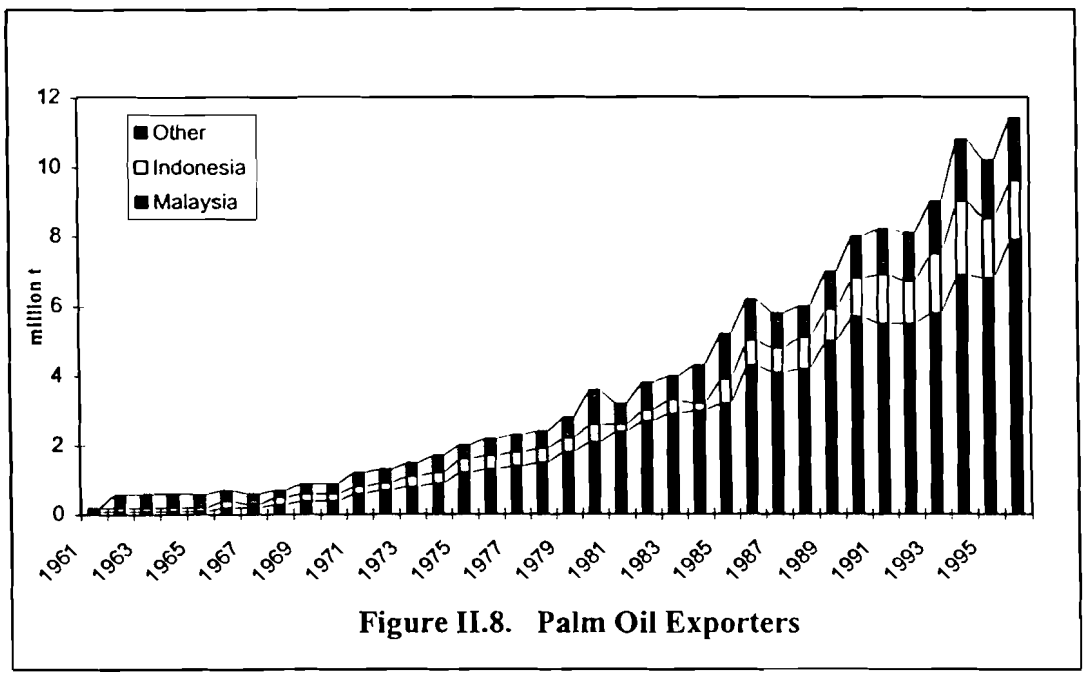


Figure II.8. Palm Oil Exporters

Sources: FAOSTAT: http://apps.fao.org, and
ERS: http://usda.mannlib.cornell.edu/reports/d/ocs-bb/oil_crops_outlook

soybean meal is too important to be replaced by other oilseeds, leading to forecasts of continued high demand for soybeans.

Section C. Global Demand

The growing production of oilseeds is driven by increasing demand for both oil and meal. Part of this growth is explained by population increases, but additionally, rising incomes, especially in developing countries, contribute to higher demand for oilseeds in two ways. First, as people have more income at their disposal, they consume more fats and oils, both directly and as part of processed foods. "The global growth in consumption of vegetable oils is outpacing that of most other agricultural products. Consumption of vegetable oils worldwide grew at an average annual rate of 4.2 percent over the past decade" (Morgan, 1993:26). Second, people consume more meat and animal products as their income rises, which fuels the demand for oilcakes and meals. The effects of rising income on people's diets is analyzed in the following section, with special attention to the consumption of fats and oils.

In addition to income effects, another factor has had a major effect on people's fats and oils consumption in the past two or three decades: health concerns. Demand for some oils has grown faster than for others, and changing consumer preferences are altering the composition of the edible oil market in most developed countries. Palm oil is one of the oils that has been most affected by this trend; its consump-tion, along with the consumption of most tropical oils, has been reduced dramatically in the US. Most of the growth in vegetable oil demand is taking place in developing countries, where people tend to be more concerned with oil prices than with effects on human health. However once their incomes reach a certain level, health concerns may gain importance, and thus after the analysis of income and dietary change, a section is devoted to health issues.

Income Growth and Dietary Change

As income grows, fat and oil consumption increases. At very low income levels, when people have access to around 2,000 calories per day, cooking oils are a luxury constituting about 2-3% of the diet. When per capita income in these very poor countries rises, people mostly increase consumption of preferred staples, but also use more oil and fat to add flavor, calories and diversity to their diets. Until people get about 400 calories per day from fats and oils, any small increase in income leads to a large increase in the consumption of fats and oils. When income increases further, to between $1,000 and $10,000[5], people add meat to their diets, which raises the demand for oilseed meals used as animal feed. Eventually, during the next stage, the amount of oil used in cooking levels off, but the consumption of processed foods and foods prepared outside the home keeps increasing. In 1997, Mexico was at this stage, where demand for higher-valued food increases. This is partly due to urbanization, which makes processed foods conveniently available for many people. Pre-prepared foods usually contain more fat than home-cooked meals, and per capita fat and oil consumption keeps rising. Above a total energy availability of about 3,000 calories per day, demand for fats and oils tends to taper off, although demand for vegetable oils continues to expand slowly as people switch from animal fat to vegetable oil (World Bank 1991, ERS/USDA 1997).

Most of world population falls into the category below 400 fat calories per day, where small changes in income lead to large increases in demand for fats and oils. Since dietary change slows down and eventually stops when income per capita has reached a level of about $10,000 per capita, most of the growth in oil demand occurs in countries whose income is growing from a relatively low level. In 1990, average world per capita consumption was around 12 kg per year. Figure II.9 shows vegetable oil consumption in different countries and the associated income level. In general, fat and oil consumption

[5] All income Figures are in 1985 US dollars, adjusted for purchasing power parity.

increases with income. Ghana, Guatemala, China and India all show low income levels, and relatively low fats and oils consumption per capita. Brazil, Mexico and Malaysia are in between, with both mid-level income and fat consumption. Finally, most developed countries display both high income and high fat and oil consumption. Japan is the notable exception, where despite high income, oil consumption has stayed at a relatively low level. In developing countries, fat and oil consumption also tends to increase much faster than in the developed world. In Latin America, vegetable oil consumption is about half that of the US, or an annual average of 9.5 kg (Stuart, 1994), and countries such as Mexico (in 1992 at about 14.7 kg) are likely to experience rapid growth in per capita consumption as their income grows. Overall, demand in Latin America tends to increase with local production and crush; imports are very dependent on the availability of foreign exchange (CEPAL, 1991).

In the future, most demand growth is likely to keep taking place in developing countries because their current consumption is relatively low, their incomes are expected to rise, and their populations tend to grow faster than those of developed countries (ERS/USDA, 1997). Today, the US and the European Union are the largest consumers of vegetable oils; together they account for about one third of world consumption (Morgan, 1993). Consumption in the Newly Industrialized Countries (NICs) of Asia is growing very rapidly, as it is in China, India and Pakistan. All these countries consume large amounts of palm oil and should provide a large market for this product, although at higher income levels health concerns may shift preferences towards unsaturated oils.

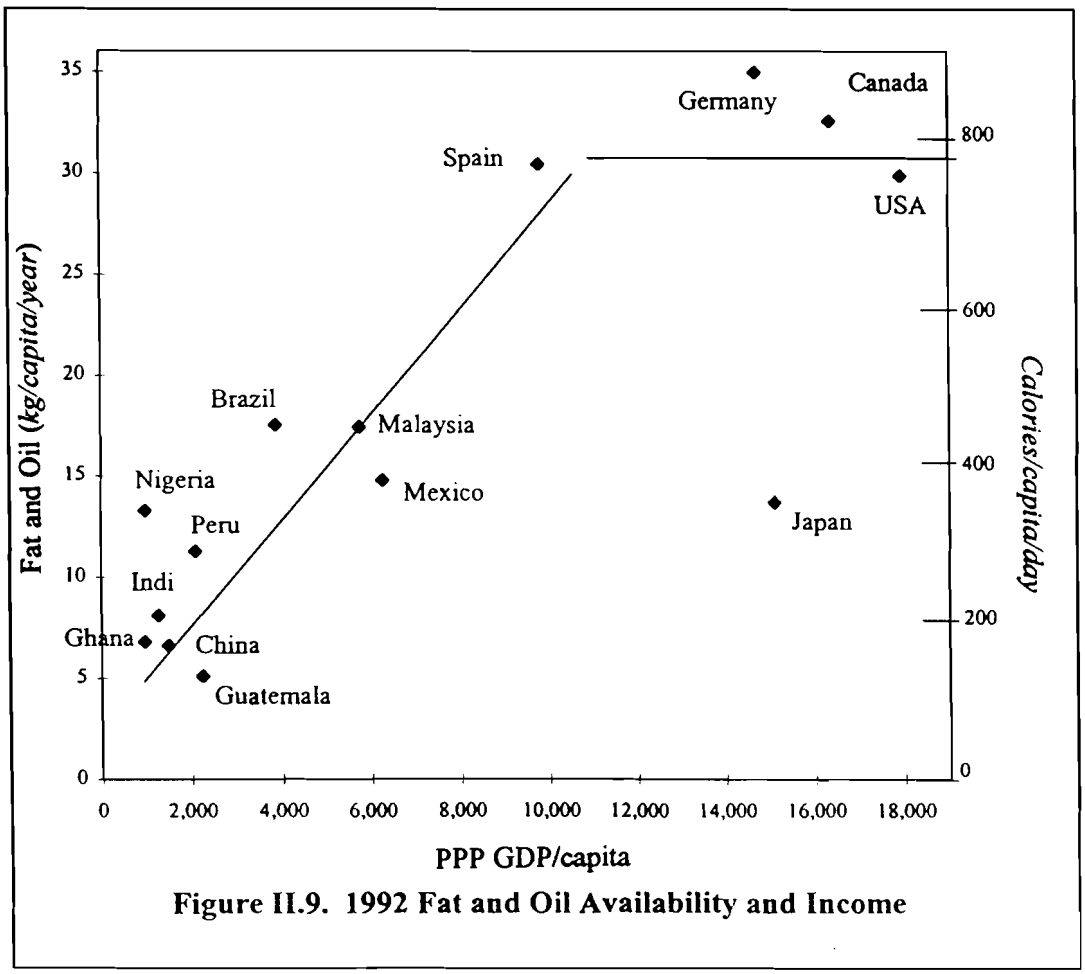


Figure II.9. 1992 Fat and Oil Availability and Income

Source: FAOSTAT: http://apps.fao.org, and Penn World Tables: www.nber.org

Other areas of potentially growing demand are the Former Soviet Union (FSU) and Eastern Europe. Recently consumption in these countries has dropped as a result of falling incomes. Since in the late 1980s, the FSU and Eastern Europe accounted for 13 percent of world consumption of fats, oils, and oilmeals; their reduced demand has contributed to a slowdown in the growth of the world oils and oilmeals economy in recent years. As their economies recover, demand in these countries in expected to rise again, but in the near future consumption levels are likely to stay constant. There may be an increase in the consumption of vegetable oil at the expense of animal fat as internal prices start reflecting international levels. The mature markets such as the US, the European Union and Japan are likely to continue growing slowly but steadily (FAO, 1994). Meal demand for livestock in the US, Japan, the NICs, China and Latin America is expanding, contributing to continued high demand for oilseeds, especially soybeans for meal production.

Health Concerns

As their income increases, people tend to switch from animal fat to vegetable oil, and from saturated to unsaturated fats and oils. This is in part due to the increasing importance of health concerns. Since the 1960s, there is growing preoccupation with the quantity and composition of dietary fat intake in the US and around the world. Oils and fats constitute a major component of daily food intake; Americans get about 37 percent of their calories from fat. Although the body can generate fat for energy storage from carbohydrates, humans need to consume at least some fat for the essential fatty acids, which the body cannot generate. Fat is also needed to absorb vitamins that are soluble in oils, such as Vitamins A, D, E, and K. Additionally, fats and oils are an important component of many foods, both in preparation and because they improve texture and flavor. Americans tend to consume more fat than they need, and in 1988 the surgeon general recommended that people lower their fat intake, especially of saturated fat and cholesterol, which can block arteries and thus raise the risk of heart disease (Morgan, 1993). The resulting concern about fat consumption has had an effect on the composition of the market. As average per capita income in Mexico rises, health concerns will probably gain importance there, too. Since palm oil is partially saturated, and along with other tropical oils has been vilified to such an extent that consumers con-sciously avoid it in the US, it is important to take a closer look at the current information available on the health effects of different fats and oils.

Although many consumers in the US and elsewhere are concerned about their cholesterol levels, few really understand the differences between saturated fat[6], unsaturated fat and cholesterol, and their effects on health. Only animal products such as butter and lard contain cholesterol; all vegetable oils are cholesterol-free. Vegetable oils differ in their saturated fat content; in general saturated fat tends to be solid, while unsaturated oils are liquid. All vegetable oils contain 100 percent oil and about nine calories per gram; their health effects are determined not by calories but by their saturated fat content, which varies even among the liquid oils. Palm oil has a liquid, mostly unsaturated component, and a solid, saturated component that can be separated through a process called fractionation. Palm oil contains about 51 percent saturated fat; canola, safflower, corn, sunflower, olive, and soybean oils all contain less. The fact that consumers have become more health conscious is reflected in the fact that US consumption of canola oil,

[6] The word "saturated" refers to the chemical bindings within fat molecules. These molecules consist of chains of carbon atoms, each of which can additionally have bindings to two hydrogen atoms. When all carbon atoms on the chain are connected to two hydrogen atoms, the chain is "saturated". "Unsaturated" fats are those where one or more carbon atoms are not linked to a hydrogen atom, but instead have a double binding to the next carbon atom. Unsaturated chains tend to be shorter; they can be monounsaturated (one double binding) or polyunsaturated (several double bindings). Saturated fat molecules are very stable and inflexible; unsaturated chains are much more flexible and therefore have a lower fusion point, which makes them liquid at room temperature. All oils contain several fatty acids, with different chain lengths, usually some saturated and some unsaturated (Reuben 1993).

which is very low in saturated fat, increased by 200 percent between 1987 and 1991, and olive oil consumption even rose by 300 percent between 1980 and 1991. Still, both oils together only account for six percent of US vegetable oil consumption, while soybean oil (also largely unsaturated) dominates the market.

Consumption of tropical oils such as palm oil has declined in the US, at least partly in response to the American Soybean Association's anti-tropical oils campaign (Overseas Development Natural Resource Institute, 1989). Palm oil's high saturated fat content induces buyers to switch to other oils; many food manufacturers advertise "no tropical oils" on their labels. Although in Europe health concerns are also gaining importance, palm oil remains attractive because of its low price. Europe continues to be a major importer of palm oil, and is in fact the world's largest importer of palm kernel oil (Morgan 1993). In Mexico, part of the city population is becoming increasingly aware of health issues related to oils, but the market is still largely driven by price considerations. As income rises and people become more health-conscious, preferences in Mexico may develop similarly as US preferences.

Originally preferred for their lower price, margarines have benefited from increasing awareness of the adverse health effects associated with the cholesterol contained in butter. Similarly, vegetable shortenings have all but displaced lard from most people's diets. In margarine and shortening production, liquid oils are hydrogenated to make them solid at room temperature. During hydrogenation, unsaturated vegetable oils are saturated in the presence of a metal catalyst at high temperatures. The degree of saturation, and thus the consistency of the final product, can be regulated. Unfortunately, hydrogenation generates a large number of bio-chemical fragments and substances whose effect on human health are unknown. Furthermore, hydrogenation transforms the structure of the fat molecule, creating so-called *trans* acids. The effect of these *trans* acids on human health is known; they raise total levels of cholesterol and in addition seem to lower levels of "good" cholesterol, which prevents heart disease. They also have a negative effect on enzyme activities and normal metabolism. *Trans* acids foment the formation of fat deposits in internal organs and in arteries, increasing the risk of heart disease and blood clots, which can be life-threatening. All margarines contain *trans* acids in varying amounts of up to 50 percent. Butter contains only three percent *trans* acids, but it contains one gram of cholesterol per pound; it is hard to decide which of the two is the lesser evil (Reuben, 1993). One alternative could be margarines from tropical oils such as palm oil, which is naturally solid (saturated) and therefore needs less or no hydrogenation and contains much less *trans* acids. Public acceptance of tropical oils in the US is very low; however, and current research is searching for a *trans*-free margarine from unsaturated sources. In other countries, margarine from tropical oils could be a better-tasting alternative, and palm oil may capture an important part of this market[7].

Section D. The Mexican Market

As was discussed in the previous sections, Mexico finds itself in a situation where income growth will lead to a strong growth of vegetable oil demand. Most vegetable oil consumed in Mexico is not produced from domestically grown oilseeds. Oilseeds and their products are Mexico's most important agricultural import. About 75 to 80 percent of the edible oil and protein meal used in Mexico is imported either as oil or meal, or as oilseeds to be crushed domestically (ERS, 1996). In the available statistics, no distinction is made between vegetable oil from domestically grown oilseeds and oil from imported oilseeds, which makes the data display rather complex. I made an attempt to distinguish between crush of domestic and crush of imported oilseeds by calculating the percentage of oilseeds available in Mexico that is imported. This percentage I then applied to vegetable oil production, which may not be accurate, but conveys a general idea of the proportions involved. Figure II.10a shows that imports of vegetable oil and of oilseeds for domestic crush increased steadily since the 1970s. Figure II.10b shows the availability of different

[7] Information on margarine and health effects from Juan José Pellecer.

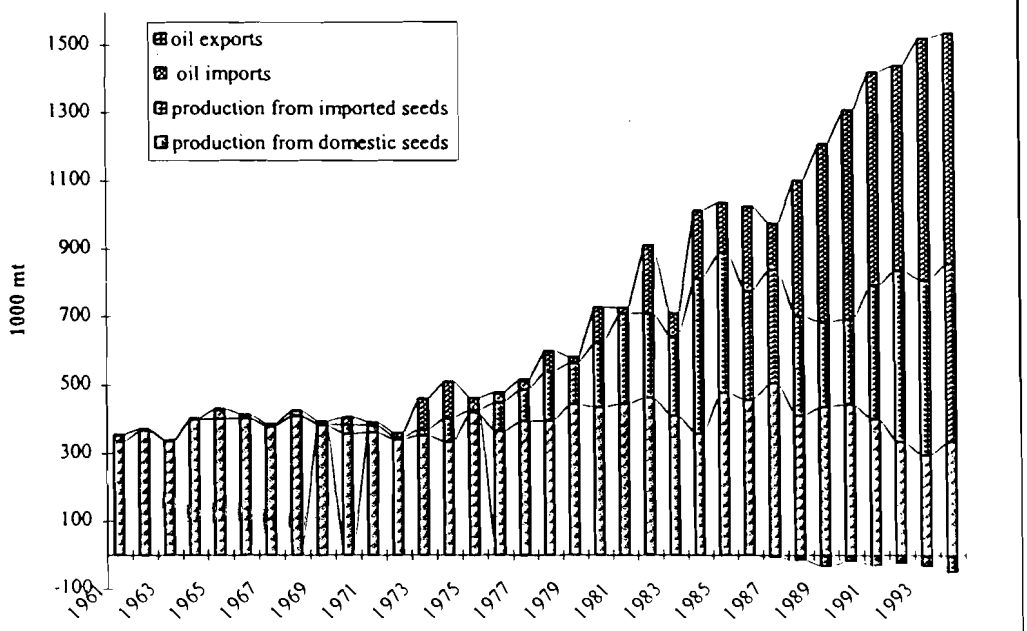


Figure II.10a. Vegetable Oil in Mexico: Production and Trade

Source: FAOSTAT: http://apps.fao.org

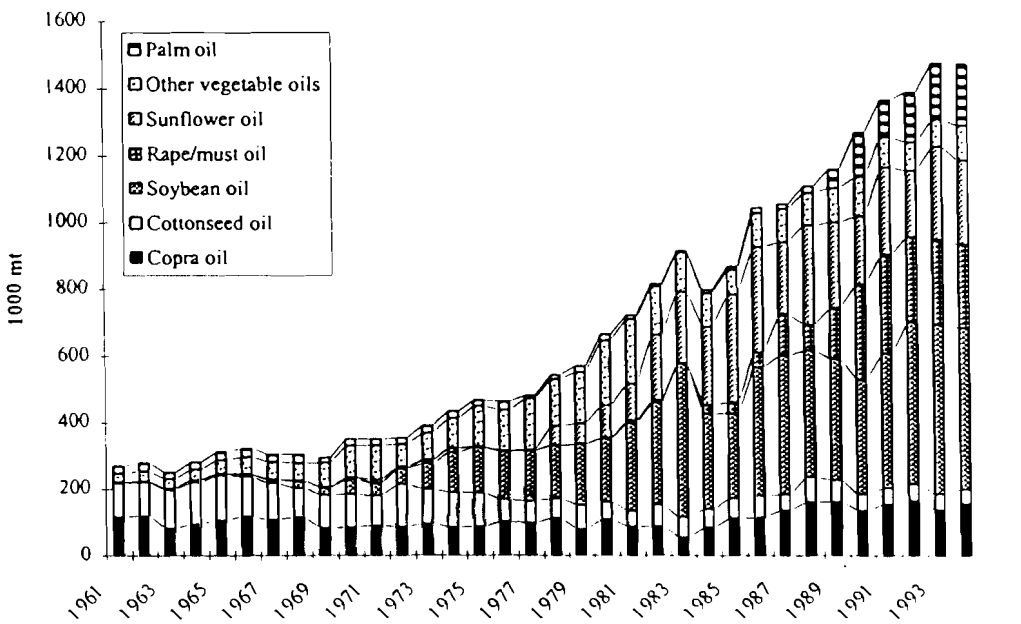


Figure II.10b. Vegetable Oil Availability in Mexico

Source: FAOSTAT: http://apps.fao.org

Figure II.10. Vegetable Oil Trade and Availability in Mexico

types of vegetable oil in Mexico. Soybean oil has the largest market share in Mexico, although other oils are gaining importance. Most soybean oil is crushed domestically from soybeans imported from the US.

To protect the domestic crushing industry, Mexico has reduced tariffs on soybeans more than those on meals and oils, giving incentives to import unprocessed oilseeds and crush them in Mexico. When NAFTA was passed in 1994, tariffs on soybeans were at 9 percent; they will be lowered by one percent every year to reach zero in 2003[8]. Tariffs on canola oil from Canada are also eliminated, which may lead to higher oil imports in place of the unprocessed canola seeds purchased at the moment. Sunflower imports switched from seed to oil and are evenly split between the US and Argentina. The traditional Mexican oilseeds, cottonseed and copra, which accounted for most of national production in the 1960s have lost importance; their growth rates have been negative. Palm oil presently only constitutes a minor part of the market.

Figure II.11 illustrates Mexican consumption of fats and oils per capita. Mexicans use more vegetable oil than separated animal fat as a source of dietary fat; on average they consumed 3.8 kg of animal fat per capita per year in 1994, while for vegetable oil the figure is 10.9 kg. Overall fat consumption has doubled since 1961, reaching 14.7 kg per person per year in 1994. This growth has not been evenly distributed over the time period, instead it is strongly correlated with periods of economic growth. It is striking how the rapid consumption growth associated with the petroleum boom of the 1970s slowed down considerably during the various debt crises of the 1980s and the peso crisis of the 1990s. During the fifteen years immediately preceding the 1983 debt crisis both vegetable oil and animal fat consumption doubled. From 1983 to 1992, in contrast, vegetable oil consumption actually decreased slightly, while animal fat consumption grew. Animal fat can be seen as an inferior good, which people consume when they cannot afford vegetable oil. As Mexico (hopefully) returns to steady economic growth, vegetable oil consumption should also grow again, until it reaches the 23 kg average currently consumed in developed countries.

To fulfill this growing demand for oil, Mexico will have to expand production and imports. "Mexico's import decisions for oilseeds and products are based on price and the availability of credit, rather than quality or strong consumer preference" (ERS, 1996:24). Demand for oilseeds and products was therefore severely affected by the 1994 peso crisis, but is expected to recover as economic growth picks up. With the growing industrialization of the poultry, egg and pork industries, demand for meal from US soybeans is expected to grow. Figure II.12 illustrates the dramatic increase in the utilization of soybeans; they are by far the most important oilseed in Mexico, especially when taking into account that the second most important oilseed shown in the graph, coconuts, does not compete directly with soybeans as coconuts are used mainly to produce lauric oil. As incomes rise, Mexicans are going to consume more animal products, which will further increase meal demand. The ERS projects soybean imports to grow at 4.2 percent annually until 2005 in its *International Agricultural Baseline Projections to 2005.* Based on information available as of 1997, these projections assume strong economic growth and expanding trade within NAFTA.

As its meal demand expands, Mexico may shift to imports of already processed soybean meal rather than whole soybeans, especially as trade barriers are eliminated. This implies that less vegetable oil would be entering the market as a by-product of domestically crushed imported soybeans. It is impossible to foresee in which way importers' preferences will shift in the future, however, and this paper is based on the assumption that Mexico will continue its current policy of importing oilseeds, and that soybean oil is readily available, both from Mexican meal producers and directly from the US. Due to the proximity of the US and intensified trade under NAFTA, soybean oil is expected to maintain its importance in the Mexican

[8] Trade policy is discussed in more detail in chapter III.

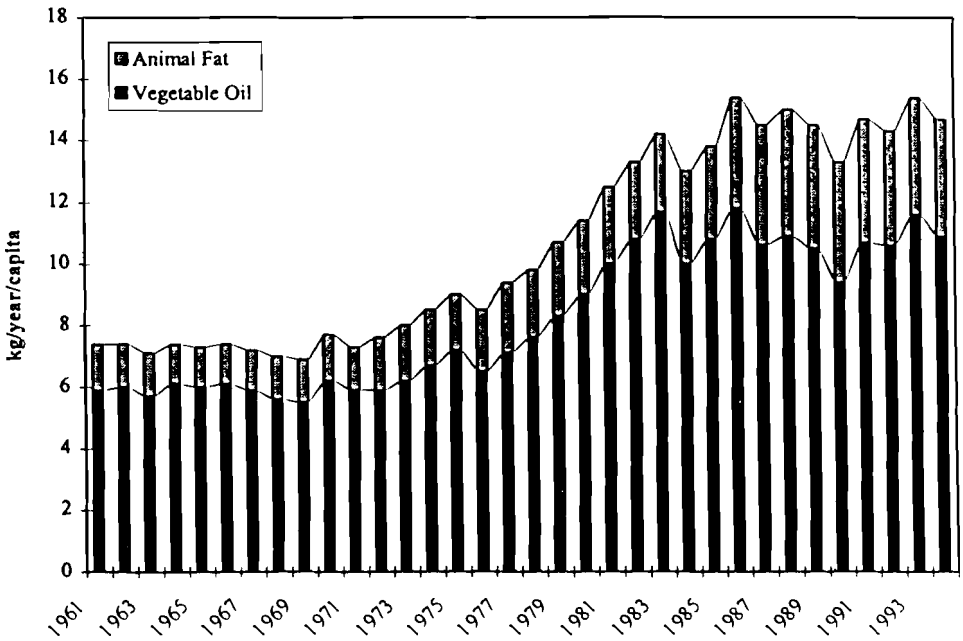


Figure II.11. Animal Fat and Vegetable Oil Consumption in Mexico

Sources: FAOSTAT: http://apps.fao.org, and

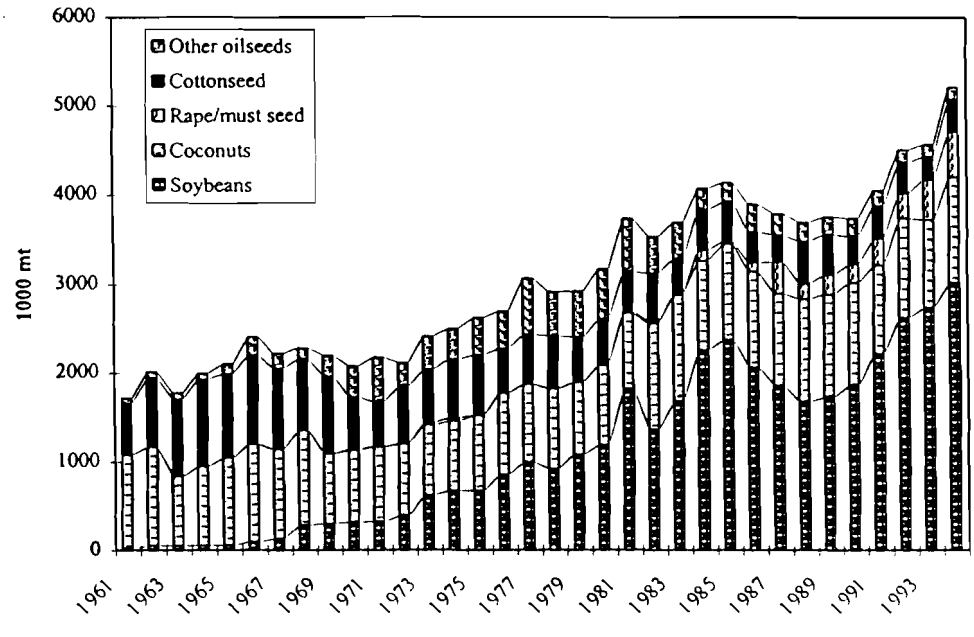


Figure II.12. Oilseed Availability in Mexico

Sources: FAOSTAT: http://apps.fao.org, and

vegetable oil market. In view of these circumstances, it is reasonable to use the likely price of US soybeans as a price ceiling. Palm oil is usually sold at a discount as compared to soybean oil. Since for shortening and margarine soybean oil needs to be hydrogenated whereas palm oil is already solid, palm oil has a competitive advantage. Considering that today the Mexican market is driven mostly by price rather than quality or health considerations, palm oil should be able to compete well with soybean oil. Soybean oil as a by-product from meal production will be available in large quantities. Economic expansion combined with population growth will lead to rising oil demand. The ability of palm oil to compete in the Mexican market thus depends primarily on competitive pricing.

Chapter III
AGRICULTURE IN CHIAPAS: LEGAL AND INSTITUTIONAL FRAMEWORK

Apart from palm oil prices, the profitability of oil palm for smallholders can be significantly affected by government policy. Production subsidies, trade barriers, and pricing policies have a direct influence on the relative profitability of different crops. This chapter attempts to give an overview of the agricultural policies which affect oil palm farmers.

Farmers in Chiapas find themselves in a rapidly changing policy environment. Accustomed to receiving inputs and services at subsidized prices from the government, since the late 1980s they have increasingly faced market prices for inputs and products that have forced them to abandon traditional maize production and adopt nontraditional cash crops, including oil palm. This change is the result of a complete change in government policy--from an interventionist method to a more market-oriented, liberalized approach. To understand Mexican agricultural policy, it is necessary to have a broad grasp of the larger economic development strategies pursued by the Mexican government in the second half of the twentieth century. Before discussing agricultural policy, this chapter will therefore give a brief introduction to the history of the Mexican economy.

From the mid-1950s until the early seventies, Mexico pursued import substitution industrialization (ISI), much like the rest of Latin America. This strategy was based on industrialization for the domestic market, with much government investment. It required strong state intervention to protect domestic production from international competition, and was accompanied by an overvalued exchange rate which made exports uncompetitive. Thanks to widespread political support for the government, and to foreign direct investment from the US, this model resulted in a period of rapid economic growth, slow inflation, and low budget and trade deficits. By the late 1960s, however, ISI began to run out of steam. The domestic markets for many domestically produced consumer goods had been exhausted, and additional capital for further investments was not readily available. Industrial development had not benefited the population evenly, and increasing inequality and persisting poverty led to the bloody student and worker protests of 1968. The government intensified its control over the economy to maintain the growth rate high, but growing inflation and deficits were signs that during the 1970s ISI was becoming unsustainable. A more profound crisis was averted by the discovery of new petroleum reserves, which led to a boom in the late 1970s, when petroleum prices were high. Although it led to renewed growth, the boom was accompanied by continued macroeconomic disequilibrium and high government spending, which was partly financed by international borrowing. Eventually this combination led to high inflation, growing deficits, and accumulating debt. In 1981 international capital fled the country at the same time as global interest rates were rising, and the Mexican balance of payments deficit deteriorated rapidly. In 1982, the petroleum price fell by 14 percent compared to a year earlier, drastically reducing government revenues, and Mexico ran out of foreign reserves. The government declared that it was unable to maintain its foreign debt payments, which was the beginning of the debt crisis.

Mexico experimented with several stabilization packages during the 1980s, but economic recovery did not start until 1989. The decade of the 1980s witnessed the continuation of a trend that had already begun during the seventies: At the beginning of his sexenio[1], each new president introduced some reforms, and the economy survived until unsustainable government expenditures and overvalued exchange rates led

[1] The Mexican period of government lasts six years, and is called sexenio. At the end of the six years, the president designates his successor from the same party, the PRI, which has been governing uninterruptedly for most of this century. In the 1997 elections other parties have been able to call one-party rule into question when other parties scored important electoral victories, including the mayor of Mexico City.

to a crisis at the end of the administrative period. Thus, the debt crisis in 1982 hit during López Portillo's last year. De la Madrid assumed power, his agreements with the International Monetary Fund (IMF) led to devaluations and, in 1983, to an orthodox stabilization policy. The reforms temporarily succeeded in reducing the current account deficit, but were unable to control inflation, and the crisis soon continued. Real wages and GNP fell during this period, although 1984 and 1985 saw a moderate recuperation of the economy with growing private investment and exports, and some improvement in real wages. This modest recovery was interrupted by more shocks, including an earthquake in Mexico City in 1985, and a renewed fall in petroleum prices. The ensuing crisis was again characterized by rapid inflation and large deficits, and big reductions in real wages. With the support of another IMF agreement, the government embarked on the next austerity program. The de la Madrid government again experimented with different policies, which were successful in reducing inflation but were unable to restore growth.

In late 1988, Salinas de Gortari assumed the presidency. He was the first president who radically questioned Mexico's state-centered model of development. Salinas implemented a much more profound reform program (including structural adjustments and external support), renegotiated Mexico's external debt, and sought additional international resources. Beyond the traditional austerity measures, this time the reforms included a drastic opening of the economy to international trade and competition, and a complete change in the state's role in the economy. This implied the privatization of state companies, fiscal reform, financial liberalization, changes in the regulation of foreign direct investment, and a generalized deregulation of economic activities. The policies begun by Salinas were continued by the current president of Mexico, Ernesto Zedillo, who assumed power in 1994[2].

Salinas' reforms in agriculture have been just as profound as the changes to the wider economy. The old Mexican parastatals which provided everything from fertilizer, credit and insurance, to marketing and storage services have been liquidated or privatized, and the accustomed system of support prices and subsidies is being dismantled. Mexico's Institutional Revolutionary Party (PRI) has used transfers to the campesino sector as a means of securing political support for much of this century (Collier and Lowery Q. 1994). Through the 1970s, Mexico's petroleum-led growth allowed it to maintain costly support programs, but the debt crisis and tight government budgets of the 1980s made the cost prohibitive. The government tried to reactivate the agricultural growth rate through subsidies and enormous public investment projects in irrigation. These efforts included the Mexican Food System (SAM) begun in 1980, which absorbed an average of 1.5 percent of the government budget, but could not be sustained during the debt crisis (de Janvry *et al.* 1995). The government was forced to rethink its agricultural policy; and the Salinas administration decided to reduce state intervention in input supply, credit, insurance, marketing, and price setting. In addition, his administration ended the land tenure system that had been instituted after the Mexican revolution, making it possible to acquire individual title to communally owned ejido land. The government's new objectives were to increase the role of market mechanisms in the sector while addressing rural poverty more effectively through area-based payments, instead of distortive price intervention. As a result, relative profitabilities, and thus incentives to grow different crops are changing. Campesinos have to adjust to an environment where income from subsidized traditional crop production and government transfers has to be replaced with more profitable crops and activities.

Trade liberalization, begun unilaterally before the free trade agreement, but expanded and cemented through NAFTA, has further affected campesino livelihoods. Mexico's traditional staple, maize, can be imported from the US much more cheaply than it can be grown in most of Mexico. Mexico not only

[2] Salinas was no exception in the aforementioned trend: His period of government ended not only with the 1994 peso crisis, but also with a wave of political scandals and assassinations which unsettled the Mexican government for years to come.

subsidized maize producers heavily; in addition it had a price policy where a government agency (CONASUPO, the National Basic Foods Company) bought maize at relatively high prices in rural areas while keeping urban prices low. Since a sudden introduction of market forces into this sector would threaten the subsistence of many of Mexico's poor, these policies cannot be dismantled abruptly. Instead, support prices are being ended gradually, and PROCAMPO, a system of direct payments to producers of traditional crops, is designed to support farmers while they switch to more profitable crops, such as fruits and vegetables for the US market and other cash crops. The changes in agricultural policy and their effect on the Soconusco region are examined in the following sections.

Section A. Agricultural Policy

Intervention in Input, Credit and Product Markets

Until the late 1980s, the Mexican government was directly or indirectly involved in providing a multitude of inputs and services to the agricultural sector. Many of the state companies were restructured at the end of the 1980s or the beginning of the 1990s. Thus FERTIMEX, the national fertilizer production and distribution company, privatized its local distribution infrastructure. The improved seed market, formerly in the hands of PRONASE, was opened up to competition from private producers. The animal feed production and distribution company ALBAMEX was privatized, and INMECAFÉ, the institute responsible for the storage, processing and marketing of coffee was dismantled in 1990 (de Janvry *et al.*, 1997).

Agricultural credit and insurance were once completely dominated by government agencies. Several different government bodies, such as BANRURAL (the National Rural Credit Bank) and FIRA (Trust Funds for Agriculture) were involved in agricultural credit, providing financial services to different classes of agricultural producers. Small farmers and ejidatarios, who formerly received credit from BANRURAL, since the reforms have to rely on PRONASOL (National Solidarity Program, since 1995 called Poverty Alleviation Program) and its credit without collateral program (crédito a la palabra). PRONASOL is a new organization which works in three ways: it supplies basic infrastructure such as housing, electricity and roads, works in social welfare programs including health, education, and nutrition, and supports productive activities, which includes the provision of financial services. It disburses interest-free loans. When repaid, these resources go into funds that were meant to be used for community projects. In Chiapas, however, the governor set up a state-wide fund under his control, and created a state Ministry of Community Participation to administer these resources (Harvey, 1994). Whereas commercial banks replaced government institutions in credit to larger farmers, ejidatarios, who usually have bad credit histories, rely mostly on PRONASOL, which gives very small loans only. These small loans are usually for current expenditures, while BANRURAL credit had a significant investment component. The decreased access to BANRURAL credit through and increased access to credit through PRONASOL implied a fall in the availability of investment credit to ejidatarios (de Janvry *et al.*, 1997). The government's crop insurance company ANAGSA, famous for its "fake disasters"[3], was eliminated. Voluntary crop insurance at market rates is since then provided by AGROASEMEX (SARH, 1994).

The company which provided heavy machinery and harvest equipment for small farmers, Servicios Ejidales S.A. was eliminated in 1990. Several new agro-industrial development organizations were created, for example the National Fund for Solidarity Businesses (FONAES) and the Capitalization and Investment Fund for the Rural Sector (FOCIR). FONAES promotes state and private investment in small and

[3] The crop insurance agency colluded with ejido authorities and farmers in claiming that the harvest had been affected by a disaster when in fact production had been normal. The insurance payment for the "fake disaster" was usually split by ejido authorities and insurance agents. This practice is also known as the "disaster industry" (industria del siniestro).

medium-sized peasant enterprises; FOCIR does similar work on a larger scale (de Janvry *et al.*, 1997). The National Basic Foods Company CONASUPO was once crucially involved in agricultural price and income support, but at the beginning of the 1990s its role was reduced to maize, bean and milk marketing. Price policies are the subject of the next section.

Price Policy

In Mexico, price controls date back to the 1950s, when low food prices were desirable for ISI to keep urban wages low. Until 1970, the government maintained low producer and consumer prices. During the 1970s, it started to support agricultural production by raising and stabilizing producer prices. Its aim was to reactivate the agricultural growth rate which had fallen after a period of expansion following the introduction of high-yielding varieties. The government implemented guaranteed prices for most basic products including maize, beans, wheat, soybeans, sorghum, rice and cotton. Producer prices were more stable than international prices under this policy; in fact real prices were kept more or less constant until 1985. After 1985, when the debt crisis had shrunk the government's budget for support policies, producer prices began falling rapidly, leading to a profitability crisis in agriculture (de Janvry *et al.*, 1995). The government abolished its guaranteed price policies for almost all products in 1989; the most important exceptions being maize and beans. Guaranteed prices for maize and beans were actually increased in 1990, as Figure III.1 shows. As a result, much land was reallocated to these two crops, until guaranteed prices were abolished and replaced by minimum prices for maize and beans.

Mexican maize policy before the late 1980s had several components. Farmers were protected from international competition through an import licensing regime, which only allowed a certain quota of maize imports and kept Mexican maize prices well above those on the world market. As a consequence of NAFTA, this system has been changed to a tariff rate quota. Under the new trade regime, in 1994 the US could export 2.5 million tons of maize into Mexico duty free (it actually exported 3 million tons). This duty-free amount will grow at 3 percent every year during the 15 year adjustment period. Imports in excess of the quota are assessed a very high tariff, initially above 215 percent. The tariff will also be phased out over the adjustment period (FAS Online, 1998). In addition, price variability was reduced both within the year and across years by the guaranteed price system, which announced producer prices at planting time to reduce uncertainty for farmers (Larson, 1993).

Figure III.1 compares the US export maize price and Mexico's guaranteed price for white maize. The export price, which is for yellow maize, has been adjusted to reflect the fact that white maize prices tend to be higher than those for yellow maize. In Mexico, 95 percent of maize production is white maize for consumption, while yellow maize is grown mostly for animal feed. The guaranteed price has mostly been higher than international prices, and it was raised again, even in real terms, in 1990, when most other guaranteed prices had been discontinued. In 1993, the Mexican government decided that the market distortions created by price support schemes had to be removed. Until a private marketing sector develops, the government will still protect producers by setting minimum prices for maize and beans. Guaranteed prices were ended, and minimum prices begun in 1995. Figure III.1 shows that the Mexican minimum maize price in 1995 was below the US export price. However, the average domestic market price in 1995 was about 40 percent above this minimum price. For the first time in decades, maize prices are allowed to vary between regions, and only areas with favorable transport and marketing connections will be able to compete. This policy change will lead to significant reallocations of land to more profitable crops.

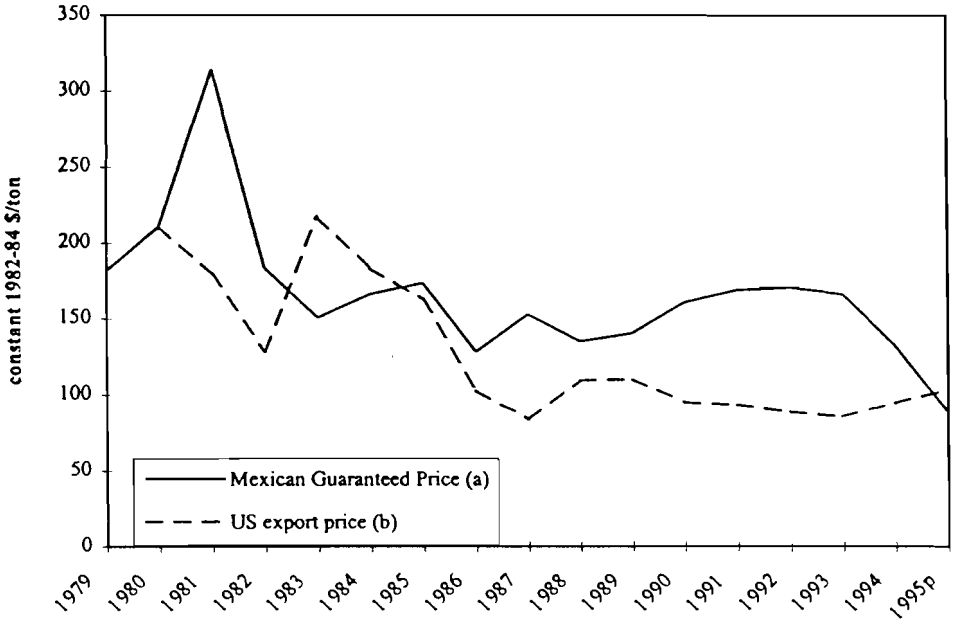


Figure III.1. Mexican and International White Maize Prices

Source: Based on OECD. *Review of Agricultural Policies in Mexico*, 1997. Converted into constant US$ with exchange rate data from the World Bank's *World Tables*.

NOTES:

p: provisional

(a): Guaranteed prices for 1979-1994, minimum price in 1995. Weighted average of of the prices of the two crop seasons. Sources: *Sexto Informe de Gobierno, 1994*, and SAGAR.

(b): US export price for yellow corn #2, fob, vessel, Gulf Ports. Source: USDA, *Agricultural Outlook*, various issues. This price in increased by 20 percent to take into account the difference between white and yellow maize. This is based on the fact that the Mexican guaranteed price for white corn was set 20 percent above the guaranteed price for yellow corn for the years 1992-1995. (Before there was only one guaranteed price for all corn.)

The National Basic Foods Company (CONASUPO) had intervened in grain and oilseed marketing until 1991, when its role was reduced to maize and bean marketing. CONASUPO used to buy maize and other basic foods at uniform guaranteed prices in the entire country, subsidizing storage and transport costs. In 1995, the share of CONASUPO in maize and bean marketing declined, and its staff was reduced to 1/15th of the original number. Instead of providing direct marketing services through CONASUPO, the government began to promote the marketing of grains and oilseeds, as well as the export of fruits and vegetables through ASERCA (Support Services for Agricultural Marketing). Initially, ASERCA made payments to domestic millers to compensate them for higher domestic prices, and thus make them indifferent between national products and imports. This policy was discontinued in 1995, and ASERCA began to play a more indirect role in promoting marketing. It provides market information and helps producers find distribution channels. Since 1994, ASERCA has been responsible for administering the PROCAMPO direct payment program which is analyzed in more detail below.

The New Policies: Free Trade and PROCAMPO

The dizzying system of government bodies and policies described above was not only complicated and costly, it was also distortive and very inefficient. The policies targeting small maize producers are an example. The government kept producer prices artificially high to benefit poor rural producers for whom maize and bean production are the traditional subsistence strategy. Since prices were the same everywhere, transport costs did not play a role in determining where farmers grew maize. Prices were also evened out over the course of the year, which prevented the development of private storage facilities. This price policy was extremely inefficient as a measure to alleviate rural poverty because 31 percent of the ejidos' maize producers do not sell any maize at all; they produce for their own consumption and are thus not affected by maize prices. In addition, 28 percent of ejidatarios are net buyers of maize (de Janvry and Sadoulet, 1997; SARH, 1994). Since the government stores that sell subsidized maize are not accessible everywhere in rural areas, farmers end up buying their maize at the higher producer price, which actually hurts them. This leaves only 41 percent of net sellers, who were benefiting from the guaranteed price; and for them maize and bean income represented only an average of 15 percent of total income (de Janvry and Sadoulet, 1997). Buying maize expensively in rural areas and selling it cheaply in the cities is thus not an effective way to fight rural poverty.

In 1994 Mexico began replacing its inefficient rural income support policies with what it hopes will be a more direct, effective and egalitarian way to improve rural welfare. Through PROCAMPO, farmers receive a payment for every hectare that they planted to a number of basic grains and oilseeds during the three-year period preceding 1994. The crops included are maize, beans, wheat, cotton, soybeans, sorghum, rice, and safflower. In 1997, the payment for maize farmers consisted of 560 pesos per hectare for each cropping season. This scheme benefits even those farmers who do not sell on the market and those whose yields are very low, which makes it more progressive than support prices. It furthermore provides incentives to switch to more profitable crops, since payments continue for 15 years, even if farmers no longer plant one of the crops covered by the policy. During the last five years, PROCAMPO payments will be gradually reduced, until they are eliminated in 2009. Apart from its positive effect on inequality and government budgets, PROCAMPO is also more compatible with the GATT, which forbids policies such as subsidies and controlled prices that affect farmers' returns from specific crops, but not income support payments which do not distort production incentives (SARH, 1994).

A National Program for the Modernization of Agriculture was formulated for the period from 1990 to 1994 to reform agricultural policy and make it more market and trade oriented. For 1995 to 2000, the Program is continued under the name Alliance for Agriculture (Alianza para el Campo), which coordinates agricultural policy to allow the sector to compete in an open economy. Its aims include raising producers' incomes, revitalizing agricultural growth, improving the trade balance, obtaining self-sufficiency in basic foods, reducing regional differences in productivity, employment and income, and contributing to the reduction of rural poverty, natural resource conservation, and better occupation of the territory by the population (OECD, 1997). The Alliance consists of a variety of specific projects to improve farmers' skills and to increase productivity through technological development.

One of the specific projects which is part of the Alliance deals with the production of oilseeds. Since oilseeds constitute Mexico's largest agricultural import, increased domestic production is expected to improve the balance of trade. The aim is to increase the production of oilseeds by expanding the cultivated area. The oilcrops included are soybeans, cottonseed, coconut, and oil palm. In Chiapas, a new body is in charge of carrying out the oil palm project; it is called PAPA (Programa Alianza Palma Africana). It cooperates with the National Institute for Forestry, Agricultural and Livestock Research, which produces

the palm seedlings in local nurseries. The oil palm project will be described in greater detail in the next chapter.

Even before the passage of NAFTA, Mexico had unilaterally begun to liberalize trade. In 1986, Mexico became a part of the GATT to increase overall trade flows and shift production to areas with a comparative advantage. Mexico went beyond its GATT commitments, reducing the use of import permits and quotas. Tariffs on most agricultural products were lowered, and in 1991 the average tariff was only 4 percent. Again, maize was an exception, as it is considered crucial for many rural families, and Mexican farmers could not compete with large-scale US producers. Export policies were much less restrictive than import policies, and since the mid 1980s export taxes were reduced and virtually eliminated.

Until 1994, Mexican tariffs on vegetable oil imports were between 10 and 20 percent. Duties on peanut, virgin olive, tung, sesame, jojoba, and castor oil were eliminated immediately with the passage of NAFTA. Most other duties on vegetable oil will be phased out until 2004. For US soybeans, Mexico's seasonal tariff[4] was reduced from 15 to 10 percent in 1994, and the season affected by the tariff was shortened from 6 to 3 months. The remaining 10 percent tariff is being phased out over ten years. For 1998 it will be 5 percent (Oct. 1 until Dec. 31). There was a 10 percent tariff on crude US soybean oil, which will be eliminated over a ten-year period. For refined soybean oil, Mexico is reducing its 20-percent tariff over the same period. For 1998, the tariffs on crude and refined soybean oil are 4 percent and 10 percent, respectively. For meal imports, Mexico is eliminating its 10 percent import duty over 10 years; in 1998 it was 7.5 percent (FAS Online, 1998).

Overall, low-productivity landowners in Mexico are expected to lose from NAFTA because oilseed and grain imports from the US are expected to increase (de Janvry and Sadoulet, 1997). Since the low-productivity category includes most small farmers in Mexico, they will be negatively affected by free trade. Some may be fortunate enough to find a profitable alternative to maize and bean production, such as vegetables for the US market or oil palm. PROCAMPO is an instrument to make it easier for farmers to make the transition to NAFTA, easing the adaptation period until they can start to produce crops for which Mexico has a comparative advantage. For many small farmers, however, NAFTA will imply that they have to find income sources besides agriculture, in which case PROCAMPO may only delay the date when these farmers sell their land and join the millions of underemployed "paracaidistas"[5] in Mexico's cities.

The changes in agricultural and trade policy are having an effect on Soconusco farmers. Although virtually all farmers in the area produce some maize, few depend on maize as a main source of income. As one farmer put it: "Growing maize is just like buying it; our costs are as high as the purchase price". These farmers do not engage in traditional subsistence production like most highland farmers. They are accustomed to cash crop production, which makes them less vulnerable to the new policy environment. They are also used to receiving support and many services from the state and central governments, and regard it as the government's obligation to keep helping them out. On the other hand, many promises were never kept, and some programs were interrupted, so that there is much suspicion and mistrust of government programs.

While some highly capitalized larger-scale producers in the region are benefiting from access to the US market, for example for bananas and papaya, access to capital-intensive crops and to distant markets is more difficult for campesinos. Their remoteness from the main consumption areas makes efficient marketing channels crucial for their competitiveness. The state no longer provides transport and mar-

[4] A tariff which applies only during a few months of the year.

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keting services at subsidized prices, and efficient regional markets have not formed immediately. Producer associations for marketing, transport, and processing will be the only way for Soconusco farmers to compete in distant markets. Both ejidatarios and larger landowners can form Rural Production Societies (SPR) and farm their land on a more commercial, larger scale, taking advantage of economies of scale. Some ejidatarios are starting to form these societies; for some larger landowners an SPR has become a way to disguise a latifundio, pretending there are several owners when in fact there is only one.

Reduced government intervention will translate into less public investment in agriculture. Instead, the government has set up programs to encourage private investment, for example in palm oil processing. This investment in turn is affected decisively by the structure of land tenure in Chiapas; since investors cannot buy large amount of land, they have to enter into agreements with small farmers, including ejidatarios. Oil palm farming can be an opportunity for smaller farmers to make a living in this changing policy environment. Through SPRs and with the help of a local processing industry, they can overcome the limitations posed by distance, high transportation costs and difficult direct access to markets. A profitable crop and a local processing industry give rural people income sources which can help to prevent increasing migration and land sales, which could lead to growing land concentration, and increased social conflict.

Section B. Land Tenure and Reform

Land Tenure in Chiapas

While in some parts of Mexico the Mexican Revolution resulted in extensive land redistribution, Chiapas' powerful landowning elites were able to make pacts with Mexico's post-revolutionary governments, which delayed the beginning of serious attempts at land reform until the Cárdenas administration (1934-40). During the Cárdenas presidency, the government distributed significant amounts of land in Chiapas (Collier and Lowery Quaratiello, 1994). However, apart from those years, "agrarian reform in Chiapas was never based on the actual redistribution of private holdings but on colonization of unused forested areas in the Selva region" (Harvey, 1994:20). Some of the tropical land was only distributed on paper, while actually it was used by large cattle ranches; these were the so-called "phantom ejidos". During the 1970s and 1980s population pressure had mounted, and campesino organizations began fighting for land, for example through land invasions. The government was forced to buy land from large landowners that was occupied by campesinos. With this land, the government then formed new ejidos. This practice led to conflicts not only between government, campesinos and private landowners; it also led to disputes between different campesino organizations claiming the same land (Harvey, 1994).

In theory all land redistribution ended with the ejido reform law in 1992, but the government is reportedly still buying up land that has been invaded by campesinos in the Soconusco. The Emiliano Zapata Proletarian Organization is very active in the region, and has been successful in forcing the government to grant campesinos access to land bought from large landowners. The new communities on these lands are called New Population Centers (Nuevos Centros de Población); and although they do not officially have ejido status, people perceive them as such. In the Soconusco, new land for colonization is extremely scarce, and the last settlements have encroached on the mangrove swamps along the coast. While once each ejidatario received 20 hectares of land, the area was later reduced to 10, and even 5 hectares. Since new land is scarce, most farmers' children leave the area to find work in the cities or even in the US, which makes it even more important to find sustainable income sources both in and beyond farming.

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The 1992 Ejido Reform and its Expected Effects

The Mexican Revolution had eventually brought about the Agrarian Law of 1915, which was later incorporated into the Constitution as Article 27. It limited private land ownership to 100 hectares under irrigation, or more for rainfed and pasture lands[6]. The Agrarian Law also officially established the ejido as a communal agrarian system for the peasantry (OECD, 1997). Ejido land was assigned to a community of peasants, with an ejido assembly to make decisions[7]. The land usually included both communal plots for grazing and firewood, and plots assigned to individual members. These individual plots could not legally be rented or sold. They could be inherited, but remained national property. These plots were supposed to be worked directly by the "owner", without hired labor. The rules were often broken, and illegal land markets were operating before the reforms. The Salinas government felt that in an economy increasingly governed by market mechanisms, the ejido system prevented the development of flexible land markets. Unclear property rights lead to sub-optimal investment, and thus lower production levels (de Janvry *et al.*, 1997).

The 1992 ejido reform formally ended land redistribution in Mexico, and set a time limit to end the land distributions that were in progress. Latifundios are still forbidden under the new law, but many landless rural people lost their hopes of owning their own plot. Ejido land is divided into three categories: land for human settlement, parceled land, and communally used land. While individual families can sell their house plots, other land designated for human settlement consists mostly of public service facilities and is inalienable. Communal land cannot be sold, but it can be part of a society formed by ejidatarios and other investors for productive projects. This land can also be rented out for up to thirty years, after which time the contract can be renewed. All decisions about communal land are made by the ejido assembly. Individual parcels are also still ejido property, but the individual ejidatario has permanent use rights. Ejidatarios can rent their individual plots to outsiders for up to thirty years as described for the common land; in addition they can sell to other ejido members or villagers (de Janvry *et al.*, 1997; SARH 1994).

One of the most significant components of the reform is that the ejido assembly can decide to end ejido rule over the land, in which case the ejidatarios can convert their land to private property and acquire legal titles. Once it is private property, the land can be sold to outsiders, mortgaged, and used as collateral. Several small private owners can form a production society, in which case the maximum land holding is expanded to 25 times the individual limit (for a society with at least 25 members). Since the reform, commercial firms can own land, and ejidatarios can form associations and joint ventures with investors. The government hopes that with these new rules, land tenure will have a transparent and secure legal framework which will stimulate production, foment investment and stimulate a flow of resources to rural areas (SARH, 1994).

In Chiapas, the reforms initially created much anxiety and confusion, as precise information about the new law was scarce. While many ejidatarios welcomed the right to buy and sell land freely, there were fears that land sales by poor farmers suffering from falling prices and lack of credit would lead to land concentration, and exacerbate rural poverty (Harvey, 1994). So far, in the Soconusco land sales have not increased dramatically, probably in part because unofficial land sales were already happening before the reform. Several small proprietors have formed rural production societies, pooling land and investment to

[6] According to the Agrarian Law, one hectare of irrigated land is equivalent to two hectares of rainfed arable land, four hectares of pasture, or eight hectares of brush.

[7] Ejidatarios were represented by an executive committee (comisariado ejidal), which was integrated into a network of state institutions related to the PRI. At the same time, peasants were represented in various ejido and peasant organizations, and could influence government decisions, for example regarding further land distribution. The ejido thus served as a mechanism both for peasant integration and for political control (de Janvry *et al.*, 1997).

operate on a larger scale, with more capital and inputs. Ejidatarios are also beginning to form SPRs, although not on the large scale desired by the government. Most small farmers however still think of themselves as ejidatarios, and communal plots, for example for schools and women's associations, remain common on ejidos.

Although this is only occasionally happening in 1997, the reform of ejido legislation gives successful oil palm farmers the possibility to expand their farms, while less successful farmers may be forced to sell their land. This will probably lead to some land concentration in the future, although it is difficult to guess how strong this trend will become. Since in Chiapas land tenure is so politicized, and land is relatively scarce, oil palm production in the Soconusco will probably remain mostly a small-farm enterprise, although several ejidatarios and/ or farmers can form an SPR and produce on a larger scale. The oil palm project plans to promote SPR formation to achieve economies of scale in input purchases, consolidate oil palm area and so on. Some larger land owners have demonstrated their skills in overcoming land tenure legislation by registering different plots under the names of different family members; this is common both in banana and other export fruit production, and in cattle ranching. In oil palm, there are only isolated instances of very large farms. To insure that oil palm production remains viable for small farmers, they have to receive adequate support until palms reach maturity. Furthermore, production and processing need to be linked in a way that distributes benefits between farmers and investors, allowing profits for both. The institutional links between farmers and processing industry will be explored in the next chapter.

Chapter IV
INSTITUTIONAL ARRANGEMENTS IN PALM OIL PRODUCTION

Apart from vegetable oil markets and agricultural policy, there is a third factor that can critically affect the profitability of oil palms for smallholders: the institutional setup. Since oil palm fruit are a non-edible commodity which requires processing before it can be sold on the market, farmers depend on processing plants as buyers for their production. The market structure and/or the institutional link between growers and farmers can have a large influence on price setting, and thus on farmers' profits. This chapter examines different institutional setups for oil palm, and analyzes the proposed models for Chiapas.

In tropical agriculture, the most common forms of production are plantations and peasants or independent smallholders. Depending on land reforms, population density, and the history of settlement in an area, these two agricultural systems vary in importance over time and in different locations. Both have advantages and disadvantages that make them more or less suitable for certain crops and certain locations.

Smallholders have the advantage of relatively cheap family labor, which allows for very intensive land use. Supervision costs are much lower on family farms than on large plantations. Small farmers tend to know their land very well, and can adapt crop selection and input use for example to variations in soil quality. But while small farmers' labor costs tend to be relatively low, they often face very high capital costs because of difficult access to credit markets (Hayami, 1994). Furthermore, smallholders usually face high transaction costs in processing and marketing.

Small farmers' difficulties in access to credit, markets, and market information, and services such as infrastructure and technical assistance can be overcome through vertical integration (Delgado, 1998). If the smallholder system is at the low extreme of the vertical integration continuum, plantations are at the other extreme, where different stages of the production process, for example growing, processing and/or marketing are different activities carried out by the same enterprise. These larger farms tend to have better access to credit, markets, and services. Plantations can organize such that timing and quality of input supply are optimal. Furthermore, they are able to take advantage of economies of scale in production, processing and/or marketing. Because of difficulties related to labor supervision, plantations tend to substitute capital for labor. They also tend to achieve lower yields than small farms at comparable levels of input use (Hayami, 1994).

A couple of systems with intermediate degrees of vertical integration are able to combine some of the advantages of smallholder and plantation agriculture. Both cooperative and contract farming systems have the advantages of small farmers' low labor costs, high work incentives, and extensive information about the land. At the same time, they can organize production to optimize raw material supply, take advantage of economies of scale where they exist, and have access to cheaper credit. Like plantation systems, contract farming schemes can (to varying degrees) internalize the external effects associated with the provision of public infrastructure, pest and disease management, and technical assistance. Thus, some of these services, which usually are supplied by the government or not at all, can be supplied by the private sector.

In the palm oil sector a close connection between growers and the processing industry is very important for several reasons. Palm fruit are not edible, and farmers need a secure market for their product. Similarly, the processing industry needs a steady supply of fresh fruit bunches to avoid wasting part of its capacity. Furthermore, palm fruit need to be processed quickly, otherwise the oil they contain becomes rancid, which lowers the quality of the final product. Thus farmers and extraction plants need an efficient institutional arrangement that ensures profitability for both sides. The Mexican Ministry of

industry in Chiapas. It has considered three institutional models, one based on large private plantations with processing plants, one where independent growers have long terms contracts with the private industry, and a mixed model, where farmers are shareholders in the mostly private plants.

After an introduction to the history of the oil palm sector in Chiapas, this chapter analyzes the three proposed solutions. To this end, a few international examples of different institutional arrangements are included. Colombia and Honduras are included because they are recent examples, and they are from the Latin American region. The first example consists in large plantations that include their own processing plants; this model is frequently found in Colombia. But large estates are not the only viable setup for oil palm; small farmers can be successful producers. If peasants are organized in cooperatives as in Honduras, they can arrange harvesting and delivery to ensure smooth operation of the extraction plant. This model has the added benefit that farmers receive the profits from processing; but the organization of cooperatives is often problematic. Malaysia, the world's most important palm oil producer and exporter, relies primarily on new settlements of smallholders to grow oil palm. They are organized through the FELDA schemes, which have experimented with different institutional setups over time, including individual and cooperative land ownership. Finally, the emerging literature on contract farming is surveyed briefly. Côte d'Ivoire and Ghana have very different experiences with contract farming in oil palms. A final section discusses the implication of the different models and case studies for Chiapas.

Section A. The History of Oil Palm in Chiapas

1948 - 1979: Isolated Plantations

The Mexican oil palm industry dates back to 1948, when a German immigrant, Mr. Bernsthoff, established the first oil palm plantation in the Soconusco region, and built a small extraction plant. His plantation of about 800 hectares still existed in 1997, although due to inheritance disputes it had recently been divided in two. La Lima was the original plantation and extraction plant. The other, newer plant is called El Desengaño. Their approximate location is shown on the map of the project area (Figure IV.1).

1979 - 1991: Initial Government Involvement

The two Bernsthoff plantations remained alone until two projects promoted oil palm in the Soconusco, first on a small scale in 1979-81, and then more extensively in 1989-91. Although their objective was to plant 23,000 hectares, only 5,000 hectares were planted, of which 3,119 hectares are still productive. Two thirds of the producers are ejidatarios The projects had difficulties convincing farmers to adopt oil palm as a cash crop because at that time the possibilities to sell oil palm fruit were very limited. The only extraction plant belonged to the plantation, and plans for new plants were not very concrete. Farmers received government credit to help them with the initial investments in oil palm, and to sustain them during the gestation period until palms became productive. Many farmers defaulted on these credits since even when palms started to produce, there was no market for the fruit except at La Lima. Later on, two cooperatives built their own extraction plants with credit from the state of Chiapas (El Arenal and BEPASSA). Another private one, El Desengaño, was added on the divided Bernsthoff estate. By 1997 prices were up, and oil palms had become profitable for producers. The two projects had a series of shortcomings, which prevented them from reaching their objectives[1]:

- Inadequate planning: Planting started before investments in extraction plants were secured. When palms reached maturity, extraction plants had not been built, and farmers received extremely low prices for fresh fruit bunches at La Lima, if they could sell at all. Many farmers stopped taking care of the palms before the processing plants were finally built.

[1] From Israel Nuñez at SAGAR, personal communication.

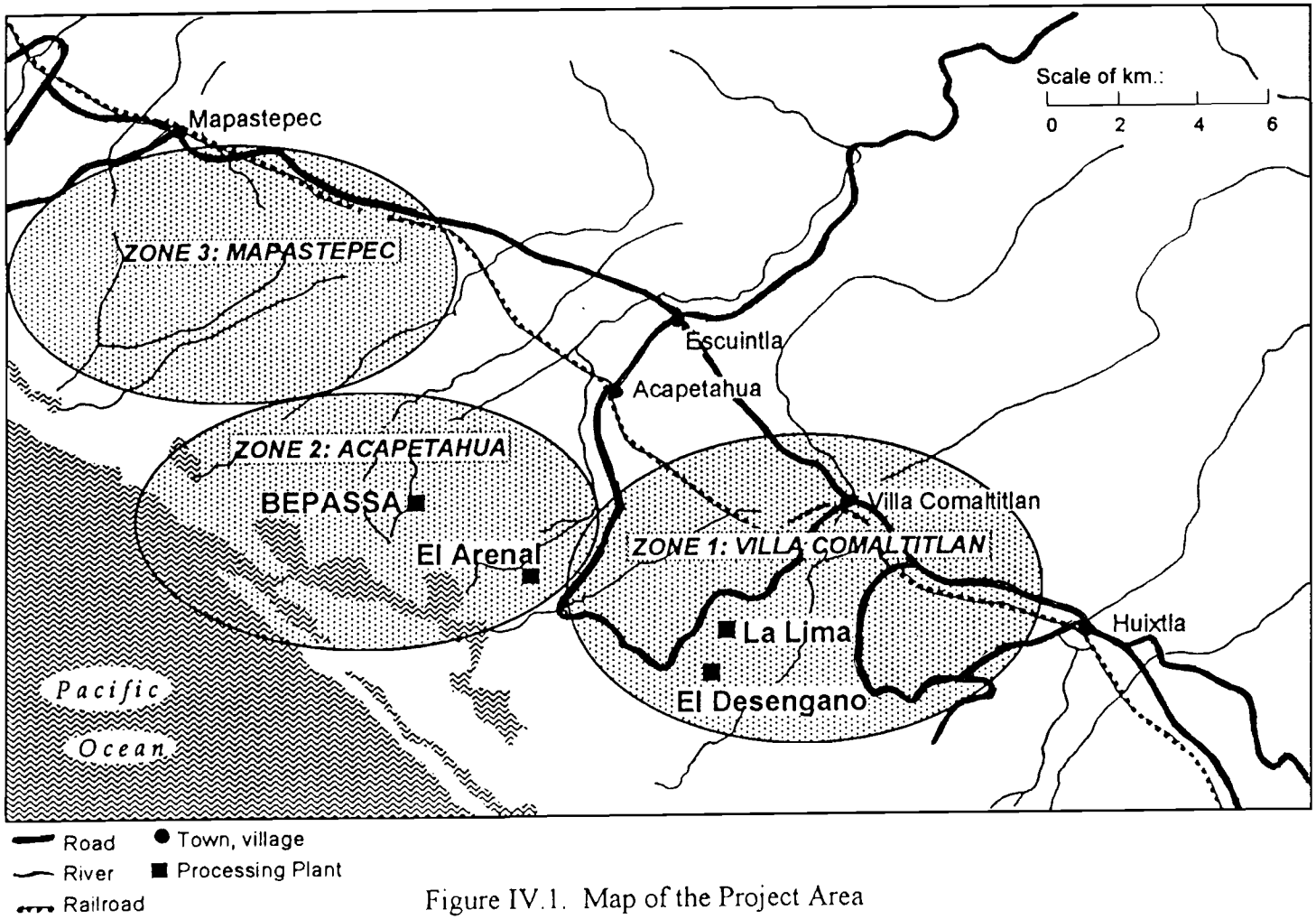

Figure IV.1. Map of the Project Area

- Credit problems: The project was financed by BANRURAL, and farmers often did not receive the credit in time for planting. Since many farmers stopped taking care of the palms, BANRURAL suspended the credit program before the end of their contract with farmers.
- Lack of extension services and organization: The project did not include technical assistance for farmers. No efforts were made to form producers' groups to achieve economies of scale in input purchases and transport.
- Fragmentation: The area planted was very fragmented and spread out. This led to prohibitive transportation costs of almost 50 percent of fresh fruit bunch prices.
- Lack of information: No registration and statistics services were established; there are no records on yields, productivity, input use, etc.

The SAGAR project of the late 1990s hopes to learn from the problems of the first two projects, and incorporate the lessons into its project design.

The Mid-1990s: The Status Quo Before the SAGAR Project

During my visit in the summer of 1997, oil palm growers in the Soconusco belonged to one of two types: ejidatarios, with an average of 10 hectares total land area, and pequeños propietarios[2], with widely varying farm sizes from 15 to over 400 hectares. Ejidatarios usually plant only a part of their land with oil palm, many between one and five hectares. On the rest of the land they grow other crops, including maize, mango, sesame, rice, cocoa, and plantain. Many farmers also own cattle, and use at least part of their land for pasture. In contrast to highland farmers, most ejidatarios in the Soconusco are engaged in cash crop production. The majority still retains some of their maize for domestic consumption, and the importance of subsistence production in household budgets varies. Backyard production of poultry, pigs and fruit for home consumption is very common. It is usually the responsibility of the women of the household; if there are no women in the household, these activities are usually not present. Most farmers are first generation ejidatarios, many of them are over 60 years of age. Many of their children have left the area and migrated to Tapachula or Mexico. Since not much more land is available in the area and alternative employment is scarce, many young people decide to pursue economic opportunities in the cities.

The SAGAR Project Area

In 1997, SAGAR was starting to implement a revised oil palm project, incorporating lessons learned from past failures. The project area, shown in Figure IV.1, is divided in three zones: Villa Comaltitlán, Acapetahua, and Mapastepec, named after the municipios where they are located. Each municipio also contains a town with the same name. Villa Comaltitlán is the first zone, and since it is relatively large, it is divided in two parts. One part contains mainly pequeños propietarios, the other contains mostly ejidatarios interested in oil palm. Villa Comaltitlán already has a significant oil palm sector; the two largest plantations La Lima and El Desengaño are in this area. Here farmers also grow other valuable cash crops, including cocoa, mango, flowers, and sugar cane.

The second zone, Acapetahua, is where oil palm production is already most firmly established. The main center of production is the ejido Luis Espinoza, with approximately 850 hectares under production, some since 1979. Oil palm farmers in Luis Espinoza have done quite well. Many have replaced their traditional bamboo or wood houses with cement block houses, almost all have a TV, and some even own a

[2] Pequeña propiedad literally means small property, and refers to landowners who are not part of an ejido. (Pequeño propietario thus refers to the small size of the land, not of its owner. Usually pequeños propietarios actually own more land than ejidatarios, which makes the name confusing. Latifundios (large landowners) are forbidden in Mexico, but some pequeños propietarios manage to run quite large farms by registering the land in other family members' names and similar tricks. Ejidatarios who decide to convert their land to individual property also become pequeños propietarios.

pickup truck or a tractor. Since oil palm is so profitable for these farmers, many are taking advantage of the project's support to expand their oil palm area. There has also been a considerable demonstration effect, and most farmers in this area are interested in growing oil palm, especially near the established production centers. Acapetahua's municipal government has decided to encourage oil palm production by providing a subsidy of 100 pesos for each hectare of new oil palm.

Zone three, Mapastepec, is located to the Northwest of the other two zones, and it is a bit more remote from the project headquarters in Escuintla. Zone three is noticeably dryer than the other two zones, where flooding is a problem. During the summer of 1997, some newly planted oil palms were suffering from drought stress in this area. Here cattle ranching is the most important economic activity. Since this area is more remote, farmers have less information about oil palm and are more hesitant to commit significant proportions of their land to the crop. Some newer ejidos in the area are quite poor, and each farmer has about 5 hectares of land. These ejidos also tend to be closer to the mangrove swamps along the coast. Soil salinity is a problem, and affected areas cannot become part of the oil palm project since the palms do not grow well under those conditions.

Processing Plants in 1997

The two largest plantations in Zone One, successors to Mr. Bernsthoff's initial estate, each run a processing plant. They process their own harvest and buy from producers in the area. In addition, there are two cooperatively owned processing plants. One is owned by 29 ejidatarios from the ejido Luis Espinoza; it is called El Arenal, after the ejido village where it is located. Initially built with support from the state government, the cooperative was able to buy the plant from the government in 1994. It has the capacity to process 2 tons of fresh fruit bunches per hour, and employs 15 workers, most of whom are members' sons. In 1997, the plant was being expanded to double its capacity; the larger plant will require three more workers. El Arenal buys both from cooperative members and from nonmembers, although members have priority and get a 25 percent higher price per ton. Usually, members also receive dividends from the plant's profits, but in recent years these profits have been invested in the plant's expansion. There are serious conflicts in the ejido between cooperative members and independent producers who resent receiving a lower price. Cooperative members tend to be wealthier than other oil palm producers.

The other cooperative is called BEPASSA[3], and it was also established with state funds. It is located in Zone Two as well. It started working in 1996, and so far the cooperative does not have a repayment plan; the government has not even informed it how much it has to repay. This plant has the capacity to process 3 tons of fresh fruit bunches per hour, and in 1997 it was being expanded to 6 tons per hour. The expansion is financed from the plant's profits. This cooperative has 166 members, but it buys fresh fruit bunches from about 400 producers; members and nonmembers receive the same price. The members currently have 660 hectares of oil palm, and the cooperative is considering the admission of more members to have a larger area from which to buy raw material regularly. Two of the members are pequeños propietarios; one with 76 ha, the other with 17 ha; the rest are ejidatarios with an average of 10 hectares of total land owned. This plant has 26 permanent employees, who work in two shifts. During the busiest months, the plant runs a third shift with temporary workers. From December to February, the slowest months, the plant only works three days per week. Like El Arenal, it employs mostly members' sons.

In Mapastepec and Villa Comaltitlán, which are relatively far from the existing cooperatives, farmers have formed associations to request additional plants from the state government. Profits from oil palm are much lower in these areas since transport costs are considerable. Producers are anxious that the state will not cooperate with them, and will instead invite private investors to build the plants, as SAGAR has planned. Farmers say that they prefer to be "businessmen as well as farmers," meaning that they hope

[3] Beneficiadora de Palma Africana Soconusco S.A.

to own part of a plant and receive dividends in addition to farm income. In any case they expect a commitment to the construction of a new plant soon, since planting more area to oil palm is risky before demand for palm fruit is secure.

Starting in 1997: The SAGAR Project

Objectives

The SAGAR project has the objective of planting 50,000 hectares in Chiapas, Campeche, Veracruz and Tabasco with oil palm before the year 2000. It also aims to have private investors build ten extraction plants with a capacity of 20 tons of fresh fruit bunches per hour each. In Chiapas, 30,000 hectares are planned. In designing the project, government officials are trying to organize producers in rural production societies, or SPR. Several of these SPRs can form associations, for example for extraction plants. Individual ejidatarios become members in these SPRs; it is encouraged that as many members from each ejido participate as possible to plant relatively compact land areas with oil palm. SAGAR expects SPRs to cooperate in input purchases, transport, etc. to achieve economies of scale.

The Record of Accomplishments by Summer 1997

At the time of my visit in July 1997, a project administration had been created in Chiapas. It is called PAPA (Programa Alianza Palma Africana). The extensionists at PAPA have inspected and approved 8,500 hectares of ejido and pequeña propiedad land for participation in the oil palm project. To be approved, land has to be cleared, of good quality, and have the necessary infrastructure like access roads and drainage canals (if required); in addition, the owners' papers have to be in order. In 1996, project officials bought seeds for 5,200 hectares in Costa Rica, and established a pre-nursery and several nurseries, run by INIFAP (National Institute for Forestry, Agriculture and Livestock Research). For 1997, their goal was to plant 4,000 hectares in Chiapas and 1,200 hectares in Campeche. Seeds for another 5,200 hectares were purchased for planting in 1998. Cooperation between INIFAP and PAPA staff is mostly good, although during the summer of 1997 there was some friction when the beginning of the dry season neared and planting had not progressed far enough.

SAGAR has put together an assistance package for producers. It consists of the seedlings, which are distributed free of charge, and 900 pesos/ha for planting. In 1997, 10 month old seedlings were used; in 1998 the seedlings will be 12 months old when they are planted. Each producer's 900 pesos per hectare will be deposited in a trust fund called Fund for Agricultural Support of the State of Chiapas, or FOFAE; it is associated with PROCAMPO. These 900 pesos cover fertilizer, which will be distributed in kind; and the farmers' labor for planting and weeding, as well as transport. Prior to payment, the work has to be finished and inspected by one of the extensionists; then farmers receive a voucher that they can cash at a local bank. This way, farmers cannot use the funds for consumption purposes or for other crops, which was a problem in earlier projects.

If the producer installs irrigation equipment, SAGAR will pay 45 percent of the costs up to a cost of 5000 pesos/ha. Producers are responsible for all costs above 5000 pesos/ha. Ejidatarios generally cannot afford irrigation equipment; in most of the project area flooding is a more serious problem than drought in any case. Several larger landowners however are interested in receiving these subsidies for irrigation. In the summer of 1997, work on irrigation systems had not begun, although some pequeños propietarios were having systems designed.

The state and federal governments both allocate a portion of their budget to the palm project, which is combined and saved in the trust fund. A technical committee consisting of the state and national agricultural secretaries supervises the project's progress.

Unresolved Questions

As mentioned above, the project seeks private investment in the extraction industry. To ensure timely processing and coordination between growers and processors, SAGAR desires a substantial degree of vertical integration and has developed three possible models for the institutional setup:

1. **The private (or plantation) model**: Plantations and extraction plants are in the hand of private investors. They buy land, operate the plantation and the processing plant, and own the whole process from field to factory.
2. **The mixed (or shareholder) model**: Small independent producers are in charge of planting, and investors are responsible for processing, and possibly for transport and technical assistance. In this model, the producers would be shareholders in the extraction plants, and investors would try to acquire some land to ensure the availability of raw material for the plant. A certain amount would be discounted from farmers' fresh fruit bunches sales until they pay off their shares in the extraction plants; afterwards they receive a dividend from profits.
3. **The independent (or contract farming) model**: Independent producers cultivate the palms and sell fresh fruit bunches to the private processing industry. The two parties have a long term contract, which ensures continuity of the transaction for both farmers and plants. Prices are fixed at a certain discount from international prices, or through some other mechanism.

In all three models the investors could also be responsible for services such as technical assistance and transport. In the summer of 1997, three investment groups had shown interest in setting up one or more processing plants in Chiapas, and negotiations were in progress. They had not decided which model to employ; this would in part be decided by the investors themselves. In Chiapas, the private model will not be viable because all land is owned by small and medium-sized producers, and plantations of thousands of hectares could not be established, although in the other states this is still an option. Since the ejido reform, it is possible to buy land from ejidatarios, but the process is still very complicated and bureaucratic; it takes more than a year of paperwork. Land prices in the Soconusco were also reported to have risen substantially as soon as rumors about the expansion of the oil palm industry began to circulate. Even in Chiapas, the investors would like to buy some land to ensure a minimum supply of raw material for their plants. They fear collusion by the producers, which would drive up prices for fresh fruit bunches.

In the following I include alternative institutional arrangements and case studies which will aid in the evaluation of SAGAR's proposed institutional models for Chiapas. The case studies include a brief history of oil palm in the country, information about the institutional arrangement, and about the extent to which the government regulated and/or supported the sector. In each example below, the government initially played a role in encouraging the introduction of oil palm, and in supporting the sector until it became viable.

Section B. The Institutional Alternatives

The Plantations Model

A plantation is a large farm estate which produces one or several crops for commercial purposes, employing a relatively large number of wage laborers that are organized under a management hierarchy (Hayami, 1994). Plantations are especially common where new land is opened up for production, which often requires significant investments in infrastructure and machinery which are out of the reach of small independent farmers. They tend to produce export crops, often introducing new production and marketing technology. Their proponents argue that plantations transfer new technology and expertise to the rural sector, raise incomes, and generate foreign exchange earnings.

Critics on the other hand stress that the benefits of plantation agriculture tend to be very concentrated. Often linkages with the local economy are minimal, with little effect for development, especially in the case of multinationals. Furthermore, plantation agriculture tends to be more capital-intensive than peasant farming, therefore creating less employment. Production and labor input per hectare tend to be lower than in smallholder systems. Since plantations usually engage in monocropping, their impact on the environment tends to be more negative than the more varied peasant production systems. Furthermore, the hierarchical organization of labor often leads to social conflict between laborers and managers.

In Latin America, plantation systems tend to raise fears about a repetition of the United Fruit (later United Brands, then Chiquita) model. The extremely large transnational fruit companies where much more powerful than many Latin American governments, and they ended up practically running the whole country (the "Banana Republics). Plantation agriculture thus has a bad reputation and is associated with a very negative effect on equity. These companies held vast land areas, repatriated most profits, and did not contribute much to development in the host countries.

The Colombian Experience

Colombian farmers started growing oil palms during the first half of the century, but it was not until the government started an import substitution program for vegetable oils in 1957 that palm oil production really began to grow. Oil palms were an attractive oil crop because they grow on low-value land, and because of their high oil yield per hectare. The initial growth slowed down because of palm diseases and the availability of cheap Peruvian fish oil under the Andean Pact free trade agreement, but during the 1970s, there was a sudden drop in fish oil production, and the Colombian government started giving tax exemptions for up to ten years for oil palm plantations over 500 ha. In addition, the government provided funds for research and extension activities, and growth resumed. By the late 1980s, Colombia had become the largest Latin American palm oil producer.

In 1983, over 50,000 hectares had been planted to oil palm, 60 percent of which were on plantations over 500 hectares in size. These plantations were better able to overcome difficulties related to processing etc., and further expansions in area took place almost exclusively on larger plantations, which now account for over three fourths of Colombian oil palm area. The estates operate their own mills, which also buy palm fruit from smaller farmers nearby. A large domestic refining industry produces margarine and cooking oils for the national market, mixing palm oil with other domestic and imported oils. Palm oil accounted for almost two thirds of all edible fats and oils produced in the country in the 1980s. Colombia protects its cooking oil industry with import tariffs, and production costs in the country are above world market prices.

Although the palm oil industry developed in the hands of private entrepreneurs, the government provided a favorable environment through trade and tax policies, and also by supporting research and extension activities. The Colombian Farming Institute (ICA) is involved in palm oil research. In addition, the National Federation of Oil Palm Growers (Fedepalma) represents the producers' interests and disseminates technical knowledge. The bottleneck in oil palm cultivation is and has been capital. Some growers had to abandon their (usually smaller) farms due to lack of credit (Moll, 1987). As expected, large plantations, with tax breaks from the government, have been better able to overcome problems associated with credit availability, palm diseases and processing in Colombia than smallholders.

The Cooperative Model

Cooperatives are associations of producers for the purposes of input acquisition, production, marketing and/or processing. While some cooperatives consist of fairly independent producers linked in

pursuit of only one of those goals, others are centrally managed and organized as one enterprise. Since the cooperative members own all stages of the production process, they benefit from all profits, while sharing the risk with each other. Cooperatives thus can combine the benefits of horizontal integration, such as economies of scale in production and input purchases, with the benefits of vertical integration.

Often cooperatives face problems with the resolution of conflicts between members; a frequent shortcoming seems to be a lack of administrative and managerial capacity and experience (Healy, 1987). Often cooperative farms become very inefficient and thus unprofitable. There are however some examples of very successful cooperatives, for example the El Ceibo cocoa producers in Bolivia (Healy, 1987), horticultural marketing cooperatives in the Netherlands, and cooperative creameries in Denmark (Hayami, 1994). The Honduran experience with oil palm cooperatives is neither a pure success nor a pure failure. The demise of the cooperatives was largely a product not of internal problems, but of changes in the wider economy which ended the viability of the schemes.

The Honduran Experience

Two large multinational fruit companies, United Brands and Standard Fruit, introduced oil palms to Honduras. During the 1970s, the Honduran government started a settlement program on the North Coast which included oil palm cooperatives. The National Agrarian Institute (INA), which implements agrarian policy, initially had a central role in the planning, financing and implementation of the settlement projects. It was responsible for clearing the land, supplying inputs to farmers, establishing and managing the processing mills, and for formation and guidance of cooperatives. Additional financial resources came from the National Agricultural Development Bank (BANADESA), and from international assistance. By the mid-1980s, Honduras had become Central America's largest palm oil producer, although it accounted for only a tiny fraction of global production.

The oil palm projects included two organizational levels: the primary cooperatives, which produced fresh fruit bunches, and the secondary cooperatives, responsible for processing and marketing. A primary cooperative has between 20 and 100 members, about 50 on average. They grow their crops communally; depending on the region, there are an average of 5 to 12 hectares per member. Not the entire area is planted to oil palm. Other crops and wage labor, for example at the processing plants, are alternative sources of income for members. In the 1980s, around 70 percent of the area cultivated with oil palm in Honduras belonged to cooperatives, only 3 percent to independent smallholders; the rest was in the hands of multinationals who also had their own extraction plants (Moll, 1987).

The refining industry is mostly in the hands of the multinational fruit companies. Combining palm oil with imported soybean and cottonseed oil they produce cooking oil, margarine, and by-products such as soap. These products are mainly sold on the domestic market, which is regulated by the state. The Honduran government sets maximum prices for the final products and enforces quality standards. While initially, the government also played a large role in establishing and supporting the cooperatives, later on these operated fairly independently. International consulting firms provided technical services to the cooperatives. However, when Honduras reformed its land tenure laws to encourage individual land ownership and titling, the oil palm cooperatives ceased to exist. Nowadays, oil palms in Honduras are grown mainly on large private plantations.

Malaysia's FELDA Model

In Malaysia, palm oil production has grown extremely quickly since the 1960s; Malaysia has become the world's most important producer of palm oil and accounts for about two thirds of exports. This phenomenal growth was possible initially because oil palm replaced rubber as a cash crop and could rely on a plantation infrastructure that was already available and facilitated large scale oil palm production.

In the 1960s, regulation increased, and the government was able to shift benefits from palm oil to low-income producers, limiting dominance of large foreign-owned estates (Pletcher, 1991). The government played a crucial role, notably through the large FELDA[4] settlement schemes which promoted smallholder oil palm cultivation.

In 1960, FELDA began to implement oil palm settlement schemes, with the goals of reducing political unrest and poverty in the countryside, establishing a Malay middle class, and diverting rural-urban migration (Osman-Rani, 1987). Each scheme included about 1,700-2,000 hectares, with one family for every 4-8 hectares. The government first cleared the land, established palm plantations, and built roads and village infrastructure. The settlers were brought in when the fields were fully planted, their houses were built, and drinking water was available. During the first few years, the farmers worked on the plantations for a wage, until the revenues from palm oil began to cover the costs. At that point, settlers started to repay their debt to the government through deduction from their pay for palm fruit sales. The government recovered most of is investment in the schemes (about 70 percent), but they were still substantially subsidized.

The 1960s: Experiments with Individual vs. Cooperative Ownership

FELDA experimented with different institutional setups and land tenure arrangements. Initially, farmers received individual freehold titles to a portion of the scheme upon repayment of the debt; usually after about 15 years. The authorities then reformed this system into one of share ownership, where settlers as a group became owners of a cooperative when they repaid the debt. In this model, farmers did not work on a specific plot of own land; rather, the scheme's land was farmed collectively. This way, FELDA hoped to insure scheme coherence and avoid land fragmentation due to inheritance. The management assigned work to settlers and controlled financial operations and cash flow. This allowed the scheme administrators to maintain financial reserves, mix crops to reduce income variations resulting from price fluctuation, and even out settlers' monthly income over the year. Replanting could be staggered over several years, insuring continuity (Lamin, 1988; Pletcher, 1991).

The 1970s and 1980s: Experiments with Cooperative Size and the Return to Individual Ownership

Despite the advantages gained through scale economies, settlers began to protest against the cooperative model. They felt FELDA had too much control and treated them as estate workers rather than independent farmers. They wanted clear individual property rights and more responsibility in management. As a response, the administrators gave the settler committee a role in management and started to promote educational and developmental programs on the schemes. In the 1970s, FELDA tried the block system, where a group of 20 or fewer settlers are identified with a block of land. They do all the work without wages, and share the proceeds from palm fruit sales. This way farmers have more responsibility, but lose the benefits of large schemes; performance and income levels varied between blocks. In 1985, FELDA changed the management structure yet again, instituting another share system, where the scheme is managed as an entity, and settlers work as directed labor and receive a wage plus a dividend from the scheme's profits.

Settlers perceive FELDA as paternalistic and reluctant to devolve control. In 1987, some settlers refused to join a cooperative claiming they had been promised individual land ownership. The dispute attracted national attention, and in 1988 the government backed down, giving settlers individual titles to their land once they had repaid their debt (Pletcher, 1991). Although centralized scheme management and cooperative work offered more coordinated administration and planning, settlers valued direct land ownership more.

[4] FELDA (Federal Land Development Authority) was created in 1956 to develop settlement schemes for poor landless peasants, mostly concentrated on rubber and oil palm cultivation.

Success or Failure?

Despite these conflicts over land tenure, the FELDA schemes have been quite successful. Until 1983, almost 48,000 families had been resettled, and in 1987, over 712,000 hectares of plantations had been established. The drop out rates are very low, repayment rates are high, and there are long waiting lists for those who want to join a scheme. Settlers by and large have left poverty; there are some criticisms that participants are usually not the neediest, but rather people with a loyalty to Malaysia's ruling party (Pletcher, 1991). The over 400 FELDA schemes are now the most important producers of palm oil in Malaysia, before plantations; independent smallholders represent less than 10 percent of the oil palm area. The FELDA corporations process and market all products; settlers hold the majority share in these corporations and are represented on the board.

Apart from its role in the FELDA schemes, the Malaysian government has succeeded in providing a policy environment which allowed the oil palm industry to grow. Domestic processing was encouraged through tax incentives which favored domestic refining. Another reason for palm oil's success in Malaysia was the Malaysian palm oil research institute PORIM. Financed through an export tax, this institute has raised productivity in palm oil production, for example through the introduction of weevils to improve pollination. While the Malaysian experience proves that oil palms can successfully be grown on small farms, it also demonstrates how important institutional arrangements are. The Malaysian government and FELDA have been able to combine high productivity and competitiveness with a positive social impact. The FELDA authorities, although reluctant to give up control, were flexible enough to adapt to farmers' demands about land tenure to ensure the survival of the schemes.

Contract Farming

In contract farming schemes, "contract farmers sell their crops under contract to private or public enterprises for processing or export in return for various price guarantees, inputs and services" (Glover, 1990:303). The system was first implemented in the 1930s in the United States. It became especially widespread in the poultry industry, which changed from consisting of hundreds of competing mom-and-pop farms, feedmills and processors to become dominated by a few, vertically integrated businesses. At the end of the 1980s, more than 90 percent of all broilers were produced under contract (Watts, 1994). This contract specifies the number of cents per pound live weight that the farmer receives, plus incentives and penalties related to performance and quality standards. Competition is fierce, and poultry contractors often struggle to make a living. The hog industry is undergoing a similar transformation, and in the late 1980s, about 12 percent of all US pigs were being grown under contract (Watts, 1994).

In Africa, Asia and Latin America contract farming was introduced during or after World War II, often to replace plantation production systems post-independence. Often the processing firms were (and still are) foreign multinationals, which led many writers to view them as neo-colonial exploitation systems. Benefits were concentrated in the processing firm, which reinvested them elsewhere (de Treville, 1986). Even in the US, the power of processors was often such that farmers were barely able to earn their livelihood; debts in company stores worked as barriers to exit which kept farmers in a situation almost of debt peonage. There are certainly enough examples were contract farming was not very beneficial for farmers. The distribution of benefits, and specifically farmers' ability to demand a share of the profits depends on relative bargaining power, an issue which will be addressed below.

Contract farming can combine the advantages of small farms with the benefits of vertical integration. As on independent small farms, growers have high work incentives and low supervision costs for family labor. For the plant, contract farming lowers the transaction costs associated with the supply of farm-produced materials, and allows the internalization of external effects. Food processing firms often have high fixed costs, and therefore want to secure a steady supply of raw material inflows close to

capacity levels, which is difficult to achieve through open market purchases (Glover and Kusterer, 1990). Often, companies keep a nucleus estate for raw material production, and combine it with outgrower contracts and open market purchases (de Treville, 1986). Contract farming systems divide risk among the contracting parties: farmers usually bear most of the production risk (depending on whether the contract specifies an amount to be delivered, or the production of a certain area); processors bear the marketing risk. There is a high degree of interdependence, and in the long run fluctuations in production and in the price of final products get transmitted through the entire production chain.

Contract farming is not advantageous for all crops. It has advantages over independent smallholder or plantation production with wage labor when a crop has high and relatively skilled labor requirements. Crops with long gestation periods on the other hand can often lead to debt problems and barriers to exit. This problem can be minimized where farmers have other income sources apart from the contract crop. Crops with high economies of scale in production tend to be less suitable for contracts, although these problems can sometimes be overcome with innovative management techniques. Where machinery is important, such as for example in sugar cane production, contracts can work, but growers often resemble hired workers more than independent farmers (Glover, 1990).

There is a growing literature on contract farming and its role in development, especially regarding Africa. Comparative studies such as Glover (1990) and Watts (1988) identify lessons from observing existing contract schemes. They highlight several key factors that influence the viability of contract farming schemes. The first is related to prices and pricing policies. Large and lucrative markets for the product obviously increase the viability of a scheme by allowing for profits for both processors and growers. The distribution of profits depends on the contractual agreement. Farmers' participation in scheme profits depends on their bargaining power, which is related to several factors such as well-defined land tenure, horizontal organizations, and the plant's monopsony power. A second factor consists of macro-economic and macro-institutional policies, which includes both overall economic and political stability, and continuity and effective organization of services such as input supply, credit and payments.

Third, the design of payments systems is important; it needs to be transparent, and minimize intra-household conflict. This factor may be more important in Africa, where much farming is done by women, than in the Soconusco, where most farming activities are carried out by men. A fourth factor are monopoly and monopsony power. Monopoly power can enable the processing firm to make higher profits which may be shared with growers. Monopsony power on the other hand is often detrimental as the lack of alternative markets restricts the sellers' bargaining power. Being the only buyer on the other hand may enable firms to restrict free rider problems, which arise for example where other buyers benefit from a company's technical assistance programs. Fifth, barriers to entry and exit can threaten the success of a scheme. Barriers to entry such as high initial investment costs restrict participation in the scheme, sometimes excluding the poorest farmers, and thus limiting the scheme's effect on poverty. Barriers to exit lower a farmer's bargaining power, which tends to reduce growers' participation in profits. This can be the case with tree crops, where switching to a different crop is very costly.

Farmer participation in management is another factor which contributes to good performance. The existence of a farmer organization with some influence on decision making tends to improve communication with the company and lower conflict. The last factor is income and crop diversification. Schemes where farmers do not depend solely on income from contract farming, but have some alternative income sources, and/or grow some food on part of their land perform better. Risk for farmers is lower, and there are some indications that nutrition is also better in households which grow some of their own food (Glover, 1990; Porter and Phillips-Howard, 1997).

Since there tends to be a considerable power differential between farmers and often large companies, governments often provide regulations and guidelines for contract design. That way they can

ensure that prices are not set too low, especially where firms have monopsony power, and that farmers receive a share of the profits.

The oil palm scheme in Chiapas seems to be a good candidate for the contract farming system. Oil palms are a typical crop which requires relatively high initial investments, which can be overcome with the help of the processing firm and/or the government. They require relatively skilled labor, especially for harvesting. Substantial coordination is required to ensure timely processing. There is a large and growing market for vegetable oil and feed in Mexico. Since farmers maintain other income sources apart from oil palm, their dependence on oil palm is relatively low, which improves their bargaining position and reduces risk. If contracts ensure transparent payment schemes and an equitable distribution of benefits, there remain only two potential sources of problems as identified from the factors above. One is related to barriers to entry and exit, as oil palms have a gestation period that may be too long for poorer farmers, which could limit its benefits to already better off farmers. Once land is planted to oil palm, abandoning the crop is costly, which means that farmers cannot credibly threaten to exit the program, which lowers their bargaining power. The other potential problem lies in monopsony power: if the new large private extraction plant(s) outcompete the existing, small ones, farmers may be left with very few markets for their product, which would tend to shift prices to their disadvantage.

Côte d'Ivoire and Ghana: Two Experiences Compared[5]

The oil palm originates in West Africa, and people in the area have long grown it in a semi-wild manner for palm wine, building materials, and oil. The oil is extracted on a small scale by farmers themselves and consumed as crude palm oil. At the time of independence (1957 and 1960), both Ghana and Côte d'Ivoire had important palm oil deficits, because since colonial times their economies had focused on cocoa and coffee production. Both decided to invest in oil palm after independence, and received additional funds from international lending agencies. In both countries, part of the oil palms are grown by contracted smallholders who participated in resettlement schemes. The governments broker the relationship between (partly state-owned) processing companies and smallholders by setting minimum guaranteed prices. While the major characteristics were similar in Ghana and Côte d'Ivoire, the organization of the contract farming schemes differed in important ways; as did the outcomes.

Côte d'Ivoire: The Ehania Scheme. In Côte d'Ivoire the government began promoting oil palm production quite aggressively after independence. In the early 1960s under the Plan Palmier, the entire southern coastal zone began to be covered with oil palm plantations. The parastatal Sodepalm/Palmindustries came to oversee a total of 86,678 hectares oil palm fields, of which 60 percent were industrial plantations, and 40 percent contracted smallholders (village plantations), with 8,582 smallholder families, and 6,000 workers employed by them. In addition, there were almost 12,000 hectares of private plantations. Ehania is a scheme with about 12,000 hectares of industrial plantations, and 16,000 hectares of village plantations worked by 3,134 smallholder families.

The state provided forest reserves for clearing, and reformed property rights to make productive land use a condition for land ownership. Smallholders received subsidies and cash advances to cover the costs of clearing; and tending plantations. There was a six year grace period before repayment. By the end of that grace period, palms would be producing close to peak. Farmers above 40 years of age were required to have a codebtor to avoid defaults and to ensure scheme continuity. Farms must be within 20 km of the processing plant, close to a road, and ecologically suitable for oil palm. Each farmer agrees to plant an area compatible with his/her labor force and management ability. The average holding size per smallholder is about 4.4 ha.

[5] A more detailed comparative evaluation of the two cases can be found in Daddieh, 1994.

Sodepalm/Palmindustrie provides technical advice and inputs such as seedlings, fertilizer, and wire nets in exchange for legal title to the smallholder's entire output. The company assists contractors in securing financial aid and subsidies from the state, and loans for equipment and input acquisition. The collection of fresh fruit bunches from the road side is the firm's responsibility. Furthermore, the company has the responsibility for road provision and maintenance. Between 1963 and 1979, it opened up 5,000 km of feeder roads and villages received electricity, water, cultural centers and social facilities. This was not specified in the contract, but earned goodwill and support from peasants.

The smallholders in turn agree to execute tasks such as clearing land, burning, planting, weeding, and applying fertilizer according to the agricultural calendar. They are responsible for harvesting on designated dates and carrying fruit bunches to collection points by the roadside to ensure timely processing. In the case of death or neglect, the company may repossess the farm until all loans are paid off. Producers who have land besides their oil palm fields tend to devote it to other cash crops such as cocoa or coffee. Many farmers do not have enough land for food production, and no credit and inputs are provided for food production. Food production on oil palm land (intercropping) is forbidden, which has led to conflicts.

Smallholder oil palm schemes have injected significant income to rural economies in Côte d'Ivoire, but income distribution has not improved. Productivity on smallholder farms tends to be relatively low, which is probably a function of the low prices paid by Sodepalm. Increasingly, farmers divert fruit to sell on the open market. Although the improved oil palm varieties planted on Ehania schemes are less suitable for traditional home cooking, oil palm fruit receive double the Sodepalm price when sold on the market. Farmers have accepted that Sodepalm will pay whatever price it wants to pay; they have no negotiating channels. Many farmers are neglecting their trees and investing more time in other crops and activities as a form of covert resistance. There are allegations that collection agents demand bribes for collecting fruit, since farmers demand on timely pickup to ensure high quality. Furthermore, weighing tends to be a source of conflict since it is often done in the absence of farmers, who feel cheated.

Côte d'Ivoire has thus been successful at establishing oil palm plantations on large areas, and at raising production to 158 632 metric tons of palm oil by 1984. Inefficient organization of fruit collection, as well as corruption and low producer prices are threatening this success, and farmers are finding ways to bypass their contracts to find more profitable markets and income sources.

Ghana: The Ghana Oil Palm Development Corporation (GOPDC) Arrangement at Kade-Kwae. Although they faced a palm oil deficit similar to Côte d'Ivoire's at the time of indepen-dence, Ghana's governments did little to stimulate production until the early 1970s. At that time, the government began to attract investment in large scale agriculture by giving financial incentives. Investors in the oil palm industry received preferential treatment for the first five years, including annual monetary transfers to ensure returns on their investment during the gestation lag. Although policies generally favored large farms, there were attempts to involve smallholders through outgrower schemes. Similar to Côte d'Ivoire, the government tried to provide a favorable environment for palm oil production, but with more modest results. One difficulty was the availability of land: in Ghana, the government did not have access to large land areas, and thus tried to expropriate land from village communities and peasant families. Not surprisingly, this induced deteriorating relations with peasants, and to numerous court challenges.

By 1982, about 5,100 hectares had been planted with oil palm; this first phase included about 1,200 hectares of smallholders. By 1986, around 320 peasant households were participating in the schemes. A second phase, which was to be completed in 1990, had the goal of planting another 7,700 ha, 50 percent of which were reserved for another 800 smallholders. These smallholders are tenants, not landowners. At first, each household received 8 ha, of which 7 were planted to oil palm, and one was reserved for food production. After 1981, as the government was unable to expropriate sufficient land,

each household received only 4 ha, with 0.8 hectares reserved for food production. Households were selected to ensure adequate labor supply; the ideal scheme family had five children.

The division of responsibilities specified by the outgrower contracts is similar to the Ivoirien case. The company provides surveying and pegging, and employs chain saws to log trees. In addition, it provides seedling for cover crops, fertilizer, wire nets, and field boots (an item in high demand). These inputs are provided at cost and deducted from farmers' fruit sales. As in the Ehania scheme, the company is responsible for fruit collection, while farmers have to harvest at certain times. Although labor supply was such a central concern when selecting participating families, there have been shortages. About 14 percent of the growers employ wage labor, which the company sees as undesirable since it requires labor for its own plantations and wants to avoid rising wages.

One important difference from the Ehania example is the existence of a Smallholder Association called SHAK. GOPDC saw this organization as a means of communicating with outgrowers. It has become a powerful voice for members that is used to express farmers' needs. Through SHAK, smallholders have for example requested seedling after a drought had killed some palms. Other requests include motorcycles for easier access to fields etc. Only occasionally does SHAK deal with fresh fruit bunch prices, which indicates that farmers are satisfied with the prices that they receive. As in Ehania, food availability has been a problem. Food plots are too small to maintain the farmers' large families; and again inputs for food production are scarce. The local food market was not capable of supplying enough food, and SHAK intervened to request the use of company trucks to transport food to the scheme area.

Although in Ghana the government was not able to stimulate palm oil production on such a large scale as in Côte d'Ivoire, several features of the scheme have been more successful. Farmers are satisfied with prices, and thus maintain their plantations properly. Through SHAK, they have influence on management which ensures communication and voices farmers' needs and concerns.

Section C. Implications for Chiapas

Although the economic and political situation in the Soconusco is very unique, the experiences of Colombia, Honduras, Malaysia, and Western Africa can give some insight into the factors to consider when choosing an institutional setup for the oil palm industry. Colombia's plantation model, similar to SAGAR's private model, has the advantage that it minimizes transaction costs and inefficiencies in the link between plantation and industry. It has the disadvantage that benefits from the oil palm sector remain very concentrated in the hands of plantation owners, who hire laborers for plantation work. In the Soconusco, smallholders and relatively small independent farmers will grow the palms, so this model will not apply, as pointed out before.

Honduras' experience with cooperatives illustrated both that this model can work, and that there may be problems in its sustainability over time. The cooperatives successfully grew oil palm until the government changed land tenure legislation to require individual land titling. The land titling process is very complicated and costly, making it inaccessible for most small peasant farmers. It facilitates land purchases by large landowners and is leading to considerable land concentration, among others on large oil palm plantations. Some of these large landlords hold the land for speculative purposes more than as a productive investment. This process has led to the disappearance of the oil palm cooperatives, and now the oil palm sector is mostly characterized by large farms. In Mexico, similar problems may result form the reform of ejido laws, although the situation differs in important ways. Oil palm in Mexico is produced by individual farmers and ejidatarios, not on cooperative farms. Cooperatives exist in the processing stage, and are doing very well. Land titling in Mexico is more accessible than in Honduras, even where ejido land is privatized. In other areas of Mexico, land sales have led to some consolidation of landholdings, but in the Soconusco in 1997 that had not been the case. Although maximum land sizes are restricted, people

have found ways around these regulations, for example to establish large banana farms. It is difficult to predict if similar developments lie ahead for the oil palm industry. Some cooperation among independent smallholders, for example to purchase inputs or for transport could be beneficial, but there seems to be a lack of leadership and organization in this area.

Maybe the most important lesson from Malaysia is the importance of flexibility in adapting the institutional setup to local conditions and to farmers' preferences. Malaysian farmers expressed a clear preference for individual land ownership over communal property. In all cases FELDA owned the processing plants, sometimes with farmer representation on the board. Since the land is already individually owned by farmers, or they have permanent use rights, land tenure is not an issue in Chiapas. The Malaysian farmers' aversion to cooperative land ownership thus does not reflect on the viability of cooperative plant ownership in Mexico.

The contract farming schemes in Côte d'Ivoire and Ghana contain valuable lessons for investors in Chiapas. Many of their problems are related to the fact that both examples are settlement schemes, where new land was cleared, and peasants were relocated to become oil palm farmers. Thus farmers were highly indebted to the companies, and exiting the schemes was difficult, even when prices paid were not satisfactory. Food availability problems can also partly be attributed to the fact that these farmers were newly settled in areas were food markets were incomplete or non existent. These problems should not be central in Mexico. Land does not have to be cleared, and the much lower establishment costs are at least partly covered by a grant from the government. Food markets are relatively well established, and shortages are not likely.

Other determinants of success and failure in Western African schemes have direct relevance for Mexico. The central importance of price setting in an oil palm scheme's viability demonstrated by Ehania farmers who neglect their farms and divert fruit to local markets is a problem that could apply in the Soconusco. Furthermore, farmers need an opportunity to negotiate with management, to express their needs and concerns, and to influence price setting. Since smallholders face a considerable power differential when dealing with large companies, a grower's association can be an important contribution to good communication. It can act not only as a way for farmers to have an influence on managers, but can also facilitate the dissemination of information from the company to farmers.

Since some degree of vertical integration is desirable for palm oil production, and since plantations have been ruled out as an option for Mexico, the question remains how to decide between contract farming and share ownership. If prices are set at a reasonable level, i.e. if farmers have sufficient bargaining power and there is some competition between processing plants, contract and shareholder systems can lead to an identical distribution of benefits. It is difficult to predict the fate of the small cooperative processing plants, but once larger plants start to operate, they may not be able to compete. In that case, the large plants could gain considerable monopsony power, and some mechanism to avoid conflict over price setting would be needed. Farmer participation in management and share ownership could lead to better communication between the two parties, and to a more equitable distribution of benefits.

In interviews, farmers stressed their wish to "become businessmen" and own part of a plant. If this is what farmers prefer, the shareholder model may be more likely to succeed in Chiapas than the other SAGAR setups. Oil palm producers are familiar with the prosperity of the members of the existing cooperatives and aspire to belong to a similar enterprise. Two associations are currently requesting processing plants from the state, which the state government is not planning to give them, since they are trying to interest investors in building large scale plants. A shareholder arrangement may be a substitute for cooperative plant ownership and help to avoid resentment about this issue.

One farmer expressed concerns that too many owners would make efficient plant management impossible. He considered the existing private plants to be better organized and more efficient. He therefore supported the independent (contract) model, as long as contracts made sure that plant owners paid decent prices for fresh fruit bunches. As was mentioned above, this model could lead to the same distribution of benefits as the shareholder model. In practice, however, the independent model could easily lead to conflicts over price setting and over fruit quality. The mixed model, where farmers are shareholders, will give them a voice in management, while also giving them a stake in the plant's profitability. The symbolic value of ownership may be great enough to overcome antagonism and reduce conflict. The mixed, or shareholder arrangement therefore seems more likely to be sustainable in the long run.

In the first three palm oil producing countries mentioned before, the government played an important role in the regulation and support of the palm oil industry. From quality standards for final products, to tax incentives for domestic refining and processing, it can insure that a prosperous domestic oil industry develops. Research to improve oil palm production, and technical assistance and extension are further important government contributions. While so far, planting material and technical information has been imported from Costa Rica, a growing palm oil sector may require domestic investigation, either by INIFAP or by private agencies. Initial technical assistance and extension are part of the PAPA project. Eventually, the Ministry of Agriculture hopes to hand those responsibilities over to the private sector. Since good fruit quality and high yields are in the interest of the processing plants, its owners could be made responsible for the dissemination of technical information. Another important component which may determine the success of the project, the existence of adequate infrastructure, especially roads, will remain the responsibility of the government due to the fragmentation of oil palm land.

Chapter V
EVALUATING OIL PALM PRODUCTION IN CHIAPAS

This chapter evaluates the profitability of oil palm in Chiapas. The background has been laid out in previous chapters: Chapter II shows that there is a market for palm oil in Mexico, and Chapter III demonstrates that the policy environment is favorable to a switch to oil crop production, away from formerly subsidized crops such as maize. Chapter IV shows institutional setups, and how the choice of institutional arrangement can affect profitability by determining producer prices and the distribution of benefits.

After a brief review of data sources and methodology, this chapter identifies farmers' income sources in a section devoted to farm budget analysis. This section includes an evaluation of farmers' financial vulnerability during the initial gestation period. The next section analyzes profitability both statically, using gross margins per hectare, and over time through net present values and internal rates of return.

Section A. Data Sources and Methodology

Data on Mexican and world vegetable oil and oilcrop production are from the FAO's internet database called FAOSTAT. Information on prices is from publications such as *Oilcrops Situation and Outlook Yearbook* by ERS, and the World Bank's *Price Prospects for Major Primary Commodities*, as indicated in the sources. Farm level information from ejidatarios and pequeños propietarios comes from farmer interviews which I conducted during my visit in July of 1997.

Interviews

Farm level data were collected in interviews during the summer of 1997. Since available time and resources did not allow for extensive random sampling of the Soconusco population, a different approach was chosen. Instead of interviewing farmers at random, great care was taken in their selection for inclusion in the study. At first I familiarized myself with the project area by accompanying PAPA extensionists on their daily tours of oil palm farmers. Through informal conversations with both extensionists and farmers, I was able to get a sense of the range of farm types represented in the area.

I decided to choose four farmers from each of the three project zones for interviews to cover the whole geographical area and maximize farmer diversity. After spending one or two days in the respective zone and talking extensively with extensionists and farmers, I chose the four farmers based on a few criteria described below, and on the work plan of the extensionists. Since I relied on them for transport and introductions to farmers, I usually interviewed in the ejidos where extensionists were busy on those days. In each case, two of the interviewed farmers were already engaged in oil palm production, while the other two were planting oil palm for the first time in 1997. Furthermore, farmers were chosen to represent all socio-economic levels. Thus some are relatively wealthy, while others are struggling to supplement farm income with wage labor and other activities such as fishing or sewing.

Interviews were usually conducted in the presence of extensionists, sometimes within hearing range. I found most farmers either by their houses, or on the fields where they were working. Interviews were usually conducted in a shady spot either by the field or next to the house, often over some coconut water or another refreshment offered by the farmer or his wife. Most were quite willing to chat for a while, and curious to talk to the "gringa". Most farmers participating in the oil palm scheme are men[1], although there are a few women, and this is reflected in the interviews: only one woman was interviewed. Most

[1] I often refer to a farmer as "he". This is only for purposes of simplicity and not meant to imply that there are no female farmers.

interviews included only the farmer himself, but sometimes his wife and/or children were present. Oil palm cultivation is almost exclusively men's work; women and small children only help collecting the loose fruit which are lost during the harvest.

Instead of a fixed set of questions, the small number of interviews allowed a less rigid, more personalized approach. After being introduced, I told farmers about my reasons for seeking information on the subject, and explained my aim of evaluating the economic of oil palm cultivation on small farmers. During a conversation about farmers' different crops, I filled in a table on areas planted to each crop, yield, amount sold, price, input use and so forth. An example of such a form is included in Appendix A (translated into English). Apart from information on income sources and production, there were also open-ended questions on farmers' opinions on matters such as ejido reform, the peso crisis, and much room for comments and suggestions.

Because of time constraints and difficulties in obtaining accurate information through interviews based on recollection, I did not attempt to evaluate expenditures in a detailed fashion. Questions included where farmers shopped, and how much maize they purchased to assess their reliance on the market. A question on which price increases had had the greatest effect since the 1994/95 peso crisis indicated which items played an important role in expenditures.

Interviews with pequeños propietarios were somewhat different. I was able to converse with several owners of these larger farms, or their administrators, and I interviewed five in some detail. Three were administrators, the absentee landowners could not be reached for comment. Two pequeños propietarios were interviewed personally; they both manage their own farms. Where possible, I followed the same form from Appendix A. Since these farms are not necessarily family farms, information on household composition, expenditures and so forth was only collected where relevant. Often even detailed production information could not be obtained since administrators did not make these decisions, and accounting was in many cases not carried out on the farm itself. The most important insight in those cases were the reasons for switching to oil palm production from some other crop, and other general comments.

Two additional interviews with the administrators of the two cooperative extraction plants, El Arenal and BEPASSA, were extremely useful for production, marketing and price information. They furthermore complemented general information on the history of oil palm in Chiapas received from extensionists and other project staff.

Sources of Bias

The reliability of farm level data is often difficult to assess. Several sources of bias coexist and can distort results significantly. When asked about their income, most people tend to round up or down--they do not like revealing that information. To reduce this bias, I did not ask directly about farmers' income, but rather attempted to infer it from amounts sold, prices, and so forth.

This method does not account for two main sources of bias, which may fortunately partly cancel each other out. One is the desire of showing off one's skills as a farmer, and thus to exaggerate yield and production information. The presence of extensionists in many interviews may have increased farmers' desire to appear competent, but also reduced their exaggerations to the realm of the believable.

On the other hand, farmers perceived me, as an outsider accompanying the project's extensionists, as someone who may be able to lobby for increased support and subsidies for participants in the oil palm project. Several farmers took the opportunity to ask for more support payments. Thus, some farmers also had the desire to show that it was hard for them to make ends meet, and if not directly consulted about an income source, most would not have brought it up themselves. While the "good farmer' bias thus tended to

lead to inflated incomes, the "support worthy" bias counteracted this first bias, hopefully leaving the final figures somewhere closer to the actual amounts.

Although asked about their last harvest, farmers tended to give average yield and production data. If the past year had been particularly bad due to a pest, for example in maize production, or if the field had been flooded, farmers automatically gave information from a "normal" year. Thus the data do not reflect crop failures, which happen quite often, especially in maize. Production risk in thus not reflected by yield figures, or by gross margins per hectare calculated later in the chapter.

Section B. Farm Budget Analysis

This section deals with farm budgets based on data from farmer interviews conducted in July 1997. These farm budgets reveal the profitability of oil palm per hectare as compared to the other crops farmers are growing. Yields, costs and prices vary, and thus gross margins per hectare are not uniform across farmers. In addition to relative profitabilities, the budgets show farmers' income sources, and their dependence on income from oil palm as compared to other crops. The overall level of household income, combined with the dependence on farm income determines farmers' vulnerability during the oil palms' gestation period. Both relative profitabilities and farmers' economic vulnerability critically determine the viability of the oil palm scheme.

Since the farm budget information is based on only twelve complete interviews with ejidatarios, and two interviews with pequeños propietarios, none of the results are statistically significant. Rather, they are case studies of typical cases that represent a wide range of farm households. Calculating average income figures and such is thus meaningless, but the range of incomes represents a range to be found in the project area. Approximately half of the interviewed ejidatarios already produce oil palm (7), while the other half (5) were beginning to plant oil palms in 1997. The two groups, established oil palm farmers and new oil palm farmers, will be analyzed in some detail, as well as a couple of pequeños propietarios.

Established Oil Palm Farmers

The members of this group of farmers, who planted their oil palms in the early 1980s and 1990s, had considerably higher incomes than those who were only starting to plant oil palms in my sample. Figure V.1 shows farmers' incomes and income sources. The seven farmers on the top are those already producing oil palm. It can be seen that the first three farmers are relatively more specialized in oil palm production; they derive more than half of their income from oil palm. The other four farmers in the established oil palm farmers' group derive most of their income from other sources. Those with other income sources can be further divided into two better-off and two lower-income cases.

Farmers Specializing in Oil Palm

Three of the interviewed farmers belong in the group that derives more than half of their income from oil palm: José García, Mario González, and Pablo Méndez. Apart from oil palm, all three farmers also produce maize. However, subsistence production plays only a very minor role in their budgets; most of their production is for the market. Farmers García and González are both further expanding their oil palm area through the SAGAR project. In the following, each farmer's budget for 1997 will be discussed in more detail.

José García[2]. This farmer lives in a cinder-block house in Zone 1, on his plot of land in the ejido Luís Espinoza, where the El Arenal processing plant is located. This ejido has the strongest history of oil

[2] The names of all farmers have been changed in the interest of privacy.

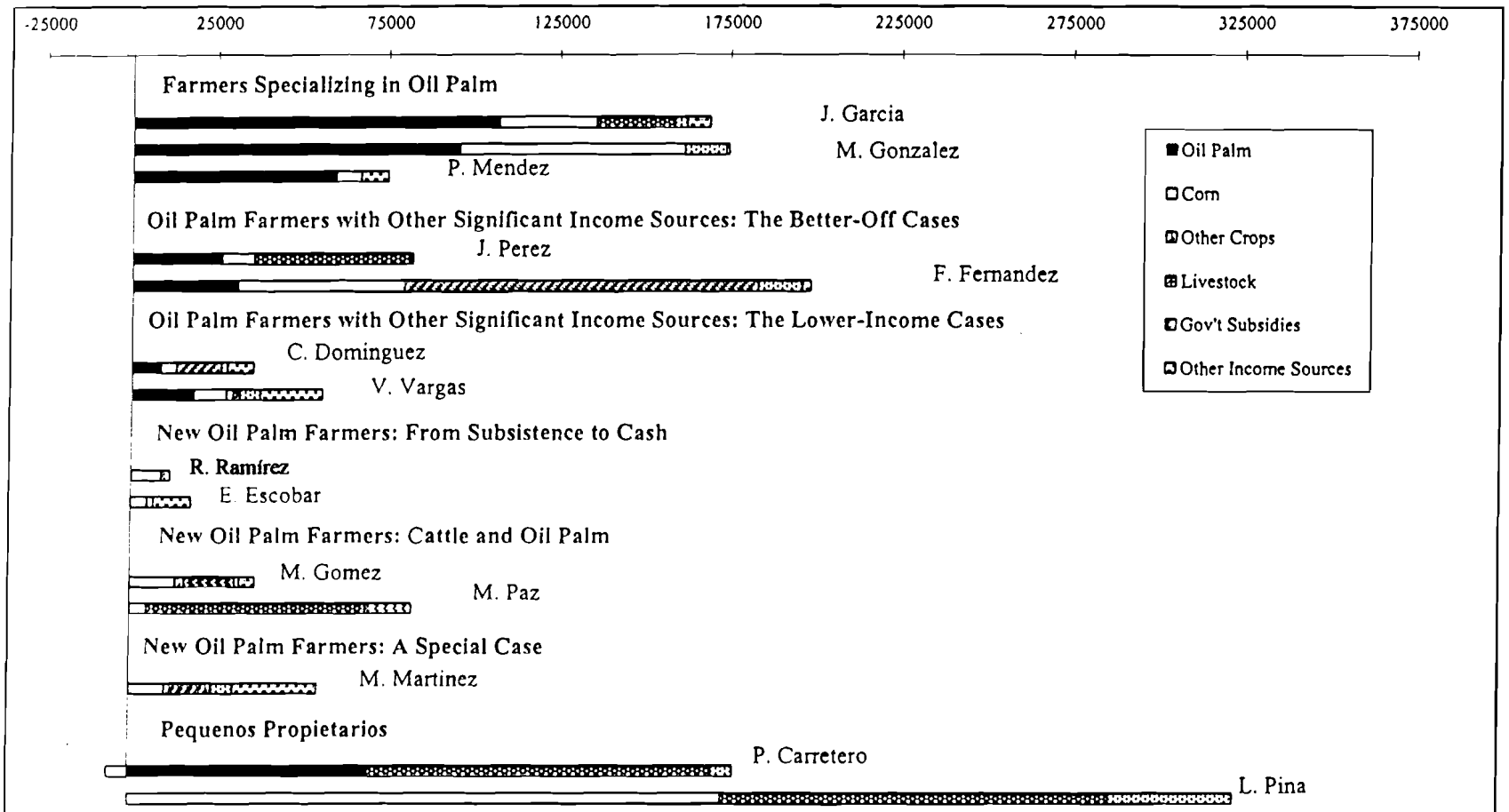

Figure V.1. Oil Palm Farmer Survey: Income Sources
(in 1997 Pesos)

palm production, with a high percentage of established producers. It is also where one of the oil palm nurseries and one of the cooperative processing plants are located. The Garcías have seven grown children, all of them married. Their two sons work on the farm with their father. The processing plant offered them jobs, but the farm is doing well and there is enough to do, so they do not engage in wage labor. Mrs. García takes care of the house and raises 40 chickens, in addition to ducks, geese and turkeys for home consumption. The family raises pigs in the back yard, and sells about 15 young pigs every year. They also own about 15 cows, which give steady income from milk and cheese sales, and can be sold in emergencies to raise cash for example to pay medical fees.

José García is a member of the plant cooperative. His original parcela had about 20 ha, of which half a hectare is taken up by the road and the river. He planted 7 hectares to oil palm in 1982, and another 5 in 1990. Some of the oldest plantations are not in very good shape anymore, and about 3 hectares were to be replanted in 1998. José furthermore bought about 4.5 ha of land which he is planting with oil palm in 1997. He is intercropping the new palms with maize, which he sells to traders (called "coyotes" in Mexico). On the rest of his land, he grows star grass (zacate estrella) as feed for his cattle.

Table V.1 shows the family's income sources. In the top part, the table details production and price data, and the gross value of the output. Where some of the output is consumed at home, it is valued at the market price. The next items show the costs associated with the production of each crop. The gross margin is the difference between the value of the output and total cost, first shown without, then with palm subsidy. Below, there is a list of other income sources. All amounts printed in bold add up to total household income. In the Garcías' case, almost two thirds of household income are from oil palm, which is grown on half of the land. José García regularly applies fertilizer to his palm fields, and thus achieves the relatively high average yield of 24 tons per hectare per year although the profitability of his oldest palms is declining. The other main income sources are maize, either grown alone or intercropped with freshly planted oil palms, and livestock.

The costs associated with oil palm production are substantially higher than those of maize production. In the Garcías' case, the costs of their twelve hectares of oil palm are more than nine times those of producing six hectares of maize. On a per hectare basis, oil palm costs are about five times those of maize production. Oil palm is still the Garcías' most profitable crop; per hectare its profitability is more than 50 percent above that of maize, even after costs are taken into account. Maize intercropped with palm has higher costs than maize alone because of the palm planting costs. These extra costs are covered by the subsidy. While oil palm thus generates more income, it also requires the farmer to maintain a high degree of liquidity to pay for labor[3], transport and fertilizer, the main costs associated with oil palm production. Since their income level is relatively comfortable, the Garcías are able to meet the liquidity requirements posed by oil palm. They consider oil palm to be a good and reliable source of income, which is confirmed by the fact that they are expanding their oil palm area by another four hectares.

As all farmers participating in the SAGAR oil palm project, they received a subsidy of 900 pesos for each newly planted hectare of oil palm. This subsidy is only intended to cover initial planting and maintenance costs, and will only be paid during the first two years. For the Garcías, the impact of the subsidy is relatively small; it constitutes a mere two percent of their income, which will most probably not be essential to their survival as oil palm farmers.

Mario González. Mario González was recommended by the extensionists as a sort of role model for all oil palm farmers. He takes excellent care of his fields, and achieves the highest yields of all farmers

[3] Labor includes cleaning, but most of the labor costs are associated with harvesting. The harvesters transport the fresh fruit bunches to the road by cart; these transport costs are included under labor costs. Transport costs do not include transport from the palm to the road, only from the road to the processing plant.

Table V.1. Farm Budget: José García[1]

	Item*	Oil Palm	Maize	New Palm and Maize	Total
Crop Income	Area Cropped (ha)	12	2	4	24
	Yield (t/ha)	24	5 ▲	5 ▲	
	Production (t)	282	8	20	
	Price per ton	500	1,300	1,300	
	Gross Value of Output	141,000	9,750	26,000	176,750
	Costs				
	Fertilizer	5,640	660	1,760	
	Pesticides		105	280	
	Herbicides		390	1,040	
	Labor	11,280	300	800	
	Transport	16,920			
	Field Preparation		1,800	4,800	
	Maize sheller rental		450	1,200	
	Palm planting costs[2]			3,600	
	Total Costs	33,840	1,010	6,290	41,140
	Gross Margin (value - cost)	107,160	8,740	19,710	135,610
	Gross margin per ha	8,930	5,827	4,928	
	Subsidy for new oil palm (900 pesos/hectare)			3,600	
	Gross Margin (value + subsidy - cost)	107,160	8,740	23,310	139,210
	Gross margin per ha	8,930	5,827	5,828	
Other Income	Cow sales				9,500
	Milk				14,235
	Cost				700
	Total income from livestock				23,035
	Backyard activities: Pig sales				6,750
	Total Household Income				168,995

Source: Wolff, C. 1997. *Fieldnotes.*

* In 1997 pesos unless otherwise specified

▲ Includes two crops per year

[1] In July of 1997, when farmers were interviewed, US $ 1 = 7.7 pesos.

[2] SAGAR estimates palm planting costs to be about 900 pesos per hectare (which is equal to the subsidy for new oil palm). Since the planting process was not completed, and individual information could therefore not be collected, I assume that for all farmers, costs for planting oil palm amount to 900 pesos on top of the costs associated with planting the maize on the same land. This is less than the 1075 pesos estimated by SAGAR (see Table V 15); but SAGAR does not take into account that tasks such as weeding benefit both palms and maize. Furthermore, I subtract the value of the labor carried out by the family itself.

Table V.2. Farm Budget: Mario González

	Item*	Oil Palm	New Palm and Rice▲	Total
Crop Income	Area Cropped (ha)	8	6	14
	Yield (t/ha)	33	3	
	Production (t)	264	18	
	Price per t	470	4,500	
	Gross Value of Output	124,080	81,000	205,080
	Costs			
	Seed		3,000	
	Fertilizer	4,560		
	Pesticides			
	Herbicides		840	
	Labor	7,920		
	Transport (rental truck)	15,840		
	Field Preparation		6,000	
	Maize sheller			
	Palm Planting Costs		5,400	
	Total Costs	28,320	15,240	43,560
	Gross Margin (value - cost)	95,760	65,760	161,520
	Gross margin per ha	11,970	10,960	
	Subsidy for new oil palm (900 pesos/ha)		5,400	
	Gross Margin (value + subsidy - cost)	95,760	71,160	166,920
	Gross margin per ha	11,970	11,860	
Other Income	**Backyard activities:** plantain			1,000
	PROCAMPO			6,720
	Total Household Income			174,640

Source: Wolff, C.. 1997. *Fieldnotes.*

* In 1997 pesos unless otherwise specified.

▲ Farmer's first time growing rice, so production data are estimates.

interviewed: 33 tons per hectare. As most farmers in this area, he planted his oil palm in 1990, so that it was close to maximum productivity in 1997. His family lives in a traditional house made from palm fronds; it is located on their parcela in Zone 2. They own a total of 14 hectares, half of which belongs to each spouse. They own another house in Tapachula, a relatively large city close to the Guatemalan border. For transport they have several bicycles, a horse cart, and a tractor[4]. The Gonzálezes are a very large family; they have twelve children. Of the eight daughters, four are married and have left the household. Four sons and four daughters live with their parents and work on the farm. They were attending school, but according to their father, they decided not to go anymore. According to the extensionists, Mario took them out of school one day to make them work full time on the farm. He is a member in the BEPASSA processing plant.

As Table V.2 shows, the Gonzálezes derive almost all their income from oil palm and rice. According to Mario, maize is not worth growing anymore, so he will not intercrop his 6 hectares of new palms with maize. Instead, he will sow rice in the next season. Rice has the added advantage that it produces less shade for the palm seedlings, and thus does not slow down their growth as much as maize. He gave some estimates of expected rice production, which were confirmed with extensionists but seem rather optimistic. Overall, as high oil palms yields suggest, Mario González seems to have been generous in estimating his production, which would bias his overall income upward. Apart from the customary 900 peso/ha subsidy for oil palm, the González's receive PROCAMPO, a subsidy for basic food crop production paid on a per hectare basis that was described in more detail in Chapter 3. Originally, they were receiving it for ten hectares of maize they were growing in 1993. Since then, however, they planted other crops on the land without properly notifying the PROCAMPO authorities, and their support was reduced to six hectares. In addition to his family's labor, Mario relies heavily on wage labor for the oil palm harvest.

According to his projected yields and 1997 prices, Mario will receive a gross margin from rice production very similar to that of oil palm; it is only about one percent lower. Including new oil palm subsidies, even this small difference all but disappears. Revenues from oil palm are very high, but again costs associated with oil palm production are much higher than those of rice production, which lowers the profit margin considerably. The main costs are transport, labor and fertilizer, as in the first case study. Transport makes up almost two thirds of the total cost of growing oil palm. The González family sells oil palm fruit to BEPASSA, of which Mario is a member. Again, the family is relatively well off, as their second house in the city and tractor ownership confirm. The oil palm subsidy is not essential for them either, making up just three percent of total income, or almost seven percent when combined with PROCAMPO payments.

Pablo Méndez. The Méndezes also have a large family with nine children. Five of them attend school, the other four work on the family farm. At the time of the interview, the family was gathered in the back yard of their cinder-block house in Zone 3. Pablo Méndez owns 10.5 hectares in his ejido, which he received in 1979.

For transport he relies on a horse cart, or on rental trucks to take his oil palm harvest to the extraction plant. Since he does not belong to any cooperative, he sells to the two privately owned plants El Desengaño and La Lima. These two plants are relatively far from his fields, in Zone 1. Transport comes to 400 pesos for each trip with the rented truck, which equals 114 pesos per ton, or about one fourth of the sale price. Since he supplies all his own labor, Pablo only has transport and fertilizer costs in his oil palm business. More than two thirds of his total oil palm costs are transport costs. Pablo belongs to ACEPALMA, an association of oil palm growers who want to request another processing plant from the

[4] It is very likely that Mario González derives income from tractor rentals. Like most truck and tractor owners, he did not report this income. Therefore all income as well as all costs associated with trucks and tractors will be excluded from the family budgets, although I will note in the text which families own such a vehicle.

state, to be constructed in Zone 3, in or around Mapastepec. He hopes to be able to reduce his transport costs if a new processing plant is built in his zone.

For his cash income, Pablo Méndez relies almost exclusively on oil palm, cultivated on close to 90 percent of his land. One and a half hectares are reserved for maize production, which is used almost exclusively in the household; none is sold. Apart from human consumption, maize is also used to feed the family's chickens, ducks and pigs. The Méndezes hardly buy any maize; they are practically self-sufficient in maize. Their only source of cash income apart from oil palm is mango, which they grow around the house. The gross margin from oil palm is almost 40 percent above that of maize. Pablo has decided that maize production is not worthwhile anymore, and is planning to plant another 1.5 hectares with oil palm in 1998.

Initially, when only one of the private processing plants existed, Pablo could not sell his fresh fruit bunch production and lost a couple of years' harvest, until more plants were built and demand increased. He says that he was confident that the plants would be built eventually, and thus decided to hang on. His economic situation permitted him to wait for a few years until the plants were built. Now palms are his most profitable crop, and he derives most of his income from them (Table V.3). Thanks to oil palm, the family lives quite comfortably.

Oil Palm Farmers with Other Significant Income Sources

This group includes four farmers; all of them have oil palm fields and derive part of their income from this crop. As opposed to the first group, these four have significant sources of income besides oil palm farming. Income from oil palm makes up less than half the total in this group. When looking at Figure V.1, it is striking that two of these farmers, Juan Pérez and Francisco Fernández, have much higher incomes than do the other two, Claudio Domínguez and Víctor Vargas. I will therefore compare the two wealthier and the two poorer farmers in this group.

The Two Better-off Cases: Pérez and Fernández

These two wealthier members of the group both derive a significant portion of their income from another farming activity; livestock in the Pérez case, and plantain in the Fernández case.

Juan Pérez. Juan Pérez lives in Zone 2, in the village El Arenal which belongs to the ejido Luís Espinoza. His house is centrally located at the main intersection of the village; it is made of wood. A new brick house is on the same plot; it was begun four years ago and is almost finished. The prices of cement and other construction materials have risen quickly, which has delayed the construction. The new house is only used for an altar honoring Juan Pérez's son, who died of an illness earlier in 1997. Since they have no other children, Juan and his wife have adopted two boys. They are teenagers and go to school; in the afternoons and on weekends they help on the farm. His wife takes care of the house and raises 25 chickens, 6 ducks, and 2 turkeys for eggs and own consumption. In the garden, they grow mangos and coconut for the household. Juan Pérez is a member of the El Arenal cooperative processing plant and sells his oil palm fruit there. He owns a total of 10 hectares, of which 6 are planted to mature oil palms. He planted another hectare of oil palm in 1997, which is not intercropped with maize; the remaining three hectares are used for growing maize. His income sources are detailed in Table V.4. Juan Pérez derives most of his income from cattle (55 percent), which he does not keep on his own land, and oil palm (32 percent).

Although Juan Pérez achieves a relatively low oil palm yield of 12 tons per hectare, oil palms are still his most profitable crop. He does not apply any fertilizer, which may be an explanation for the low yields. His palms are from the beginning of the 1980s, so they are in a phase where their yield should be declining. As the discussion on yields later on in the chapter will show, even for 17-year-old palms 12 tons

Table V.3. Farm Budget: Pablo Méndez

	Item*	Oil Palm	Maize	Total
Crop Income	Area Cropped (ha)	9	1.5	10.5
	Yield (t/ha)	23	5[a]	
	Production (t)	207	7.5	
	Price per t	450	1300	
	Gross Value of Output	93,150	9,750	102,900
	Costs			
	Fertilizer	9,810	1,050	
	Pesticides		132	
	Herbicides		324	
	Labor			
	Transport (rental truck)	23,660		
	Field Preparation		1,050	
	Maize sheller			
	Total Costs	33,470	2,556	36,026
	Gross Margin (value - cost)	59,680	7,194	66,874
	Gross margin per ha	6,631	4,796	
Other Income	**Backyard activities: Mango**			8,000
	Net Farm Income			74,874

Source: Wolff, C. 1997. *Fieldnotes.*

* In 1997 pesos unless otherwise specified.

[a] Includes two crops per year.

Table V.4. Farm Budget: Juan Pérez

	Item*	Oil Palm	New Palm Maize and Maize*		Total
Crop Income	Area Cropped (ha)	6	3	1	11
	Yield (t/ha)	12	4[b]	2	
	Production (t)	72	12	2	
	Price per t	500	1,300	1,300	
	Gross Value of Output	36,000	15,600	2,600	54,200
	Costs				
	Seed		100[c]		
	Fertilizer		1,980	330	
	Pesticides		420	70	
	Herbicides				
	Labor	3,840	600	100	
	Transport	5,760			
	Field preparation		1080[d]	180[d]	
	Maize sheller		2,880	240	
	Palm planting costs			900	
	Total Costs	9,600	7,060	1,820	18,480
	Gross margin (value - cost)	26,400	8,540	780	35,720
	Gross margin per ha	4,400	1,423	780	
	Subsidy for new oil palms (900 pesos/ha)			900	
	Gross margin (value + subsidy - cost)	26,400	8,540	1,680	36,620
	Gross margin per ha	4,400	1,423	1,680	
Other Income	Animal sales				28,000
	Milk sales				17,630
	Total income from livestock				45,630
	Total household income				82,250

Source: Wolff, C. 1997. *Fieldnotes.*

* In 1997 pesos unless otherwise specified.

[a] Used for maize during one half year only, not intercropped the other half year.

[b] Includes two crops per year.

[c] Spring/summer season only.

[d] Own tractor, cost arbitrarily assumed to be market price minus 10 percent.

per hectare are very low. The gross margin per hectare from oil palm fields is still more than three times that of maize. Including the subsidy for new oil palms, maize intercropped with palm compares a little more favorably to oil palm, but still its gross margin per hectare is below 40 percent that of oil palm. Since the Pérez family's fields are in the same ejido as one of the processing plants, their transport costs are not as high as some other farmers'. Still transport remains their most important cost in oil palm production, followed by labor for harvesting and other tasks.

The Pérez family owns a tractor, which they normally rent out for additional income[5]. In 1997, however, the tractor broke down and required expensive repairs--a net drain on family resources. In addition to the tractor, the fact that they were able to build a new house from cinder blocks demonstrates that the family is not very vulnerable economically. The subsidy for their new hectare of oil palm contributes only very marginally to family income, and is probably not indispensable. Were they able to improve their oil palm yields--for example through fertilizer application, or by replanting some of their fields--the family could significantly improve their income, since more than half their land is planted to this crop. Improved extension services might be able to play a role.

Francisco Fernández. Francisco Fernández lives in Zone 3, in his ejido's village, with his wife and a grandson who goes to school. The children have left the house. The Fernández family keeps only ten chickens and ducks for family consumption. It supplements its income with the sale of mangos and pigs raised in the back yard (Table V.5). Francisco owns a total of 20 hectares, four of which are planted to oil palm. Four hectares are intercropped with plantain and cocoa; but so far only the plantain is productive. Another two hectares are covered with brush and trees, which are used for posts and fuel wood. The remaining ten hectares were being planted with new oil palm in 1997, intercropped with maize.

Since he cannot rely on family labor, Francisco hires wage laborers to do most of the weeding, harvesting and other field work that he does not do himself. Labor is thus his most important cost in maize production, and is also an important cost in oil palm and plantain production. Francisco is a member of ACEPALMA, the association of producers in Zone 3 who want to build a cooperative processing plant. In the meantime, he sells his oil palm fruit to BEPASSA, one of the cooperative plants located in Zone 2. He owns a truck, which allows him to cut down on transport costs for the oil palm and other products. Transport costs are still very high in both oil palm and plantain production.

Although the yields given for oil palm and maize appear quite realistic, the value of Francisco's plantain crop is extremely high. It seems likely that he committed a mistake in indicating the value of production, and the relative importance of plantain income should be viewed with some caution: The gross margin associated with plantain production is more than three times that of oil palm. Oil palm in turn is more than one third more profitable than maize on a per hectare basis.

Apart from backyard activities and PROCAMPO subsidies, Francisco Fernández is one of the few farmers who relies almost entirely on crop income. The fact that he owns a truck shows that his financial situation is relatively good. Although oil palm subsidies make up only about 5 percent of the household's income, they have helped the Fernándezes' cash flow during field preparation. Tractor owners charge considerable fees for activities such as plowing, and since Francisco is planting ten hectares of oil palm at once, the cash outlays are quite high. Since the subsidy is paid shortly after each task is finished, it allows farmers to pay for hired labor and machine rentals.

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[5] Juan Pérez was the only farmer who mentioned income from his tractor, although he insisted that in 1997 it was negative. For consistency, it was excluded from the farm budget.

Table V.5. Farm Budget: Francisco Fernández

	Item	Oil Palm	New Palm and Maize	Plantain[a]	Total
Crop Income	Area Cropped (ha)	4	10	4	
	Yield (t/ha)	21	6[b]	23	
	Production (t)	84	60	92	
	Price per t	450	1,400	1000-1500[c]	
	Gross Value of Output	37,800	84,000	108,000	229,800
	Costs				
	Fertilizer	2,104			
	Pesticides				
	Herbicides		2,320	640	
	Labor	1,800	7,500	1,600	
	Transport[d]	2,800	1,000	2,400	
	Field Preparation		9,500		
	Maize sheller		6,000		
	Palm planting cost		9,000		
	Total Costs	6,704	35,320	4,640	46,664
	Gross Margin (value - cost)	31,096	48,680	103,360	183,136
	Gross margin per ha	7,774	4,868	25,840	
	Subsidy for new oil palm (900 pesos/ha)		9,000		
	Gross Margin (value + subsidy - cost)	31,096	57,680	103,360	192,136
	Gross margin per ha	7,774	5,768	25,840	
Other Income	**Backyard activities:**				2,550
	Mango				900
	Pig sales				1,650
	PROCAMPO				3,920
	Total Household Income				198,606

Source: Wolff, C. 1997. *Fieldnotes.*

[a] In 1997 pesos unless otherwise specified.

[a] Intercropped with cocoa, which is not producing yet.

[b] Includes two crops per year.

[c] Depending on the season.

[d] Gasoline cost for own truck, estimated by the farmer.

The Lower Income Cases: Domínguez and Vargas

These two farmers each have two hectares of oil palm, a relatively small area compared to the other oil palm producers. Apart from other crops, both their families rely on wage labor as a significant source of income. They are the only two oil palm farmers whose families regularly engage in wage labor at all.

Víctor Vargas. The Vargas household lives relatively far from the main road in Zone 3; it consists of 7 children and Víctor and his wife. Two of the sons work at the oil palm nursery, three help on the farm, and the remaining two are in school. In the backyard, the family raises 15 chickens, and around six pigs per year which they sell. They also have some fruit trees for their own consumption. The Vargas family is building a new house from cinder blocks, and owns a horse cart. The family also owns four horses, 20 sheep, eight cows and six calves. They used to own more cows, but these had recently been

stolen at the time of the interview. Víctor Vargas is trying to increase his herds, and is therefore not selling any cows or sheep in 1997.

Victor initially owned ten hectares in his ejido, but sold three and bought another six; so now his total land area amounts to 13 hectares. Four hectares are used for pasture, the rest are cropped as can be seen in Table V.6. Víctor is not a member in the cooperative plants, but sells to BEPASSA, one of the cooperatives. The Vargases' income is very diversified. Oil palms are the single most important source of income. They account for one fifth of the total, but are grown on only 15 percent of the land. Gross margins per hectare from oil palm are around twice those of maize, even when subsidies for new palms are considered. Off farm work is second in importance, around one fourth of total income. Other sources include maize intercropped with new palm, mango, milk and pig sales, PROCAMPO subsidies for maize, and subsidies for new oil palms. Since the Vargas family relies exclusively on family labor, their production costs in cash are relatively low. In oil palm, their main cost is transport, while in maize it is field preparation (machinery rental) and fertilizer.

Table V.6. Farm Budget: Víctor Vargas

	Item*	Oil Palm	New Palm and Maize	Mango	Total
Crop Income	Area Cropped (ha)	2	3	4 [b]	13
	Yield (t/ha)	25	5 [a]		
	Production (t)	50	15		
	Price per t	450	1,300		
	Gross Value of Output	22,500	19,500	2,000	44,000
	Costs				
	Fertilizer	500	2,160		
	Pesticides				
	Herbicides		696		
	Labor				
	Transport	3,750			
	Field Preparation		3,000		
	Maize sheller		1,500		
	Palm planting cost		2,700		
	Total Costs	4,250	10,056		14,306
	Gross Margin (value - cost)	18,250	9,444	2,000	29,694
	Gross margin per ha	9,125	3,148	500	
	Subsidy for new oil palm (900 pesos/ha)		2,700		
	Gross Margin (value + subsidy - cost)	18,250	12,144	2,000	32,394
	Gross margin per ha	9,125	4,048	500	
Other Income	Cow sales				0
	Milk sales				3,300
	Cost				1,295
	Total income from livestock				2,005
	Backyard activities: Pig sales				2,700
	Off farm work				15,600
	PROCAMPO				3,360
	Total household income				56,059

Source: Wolff, C. 1997. *Fieldnotes.*

* In 1997 pesos unless otherwise specified

[a] Includes two crops per year.

[b] Mango trees planted on pasture.

In 1990, Victor had initially planted seven hectares of oil palm. As there was nowhere to sell the fruit, he felled the palms on more than four hectares in 1994, although this is very costly and requires hard work. He could not have some of his land not produce any income. Some additional palms died for lack of care, and in 1997 only two hectares remained of the initial seven. Since at that time oil palm had become very profitable, he decided to plant another three hectares. His example demonstrates that while some farmers were so well off that they could afford to have unproductive fields for a few years, others could not afford this. Apart from highlighting the importance of a steady demand for their production, Victor Vargas's story shows the possibility that some of the poorer farmers may not be able to survive the first few years, when maize yields start to decrease on oil palm fields, but palms are not yielding much yet. According to SAGAR's and my own more optimistic yield projections, this period should be short, as the second half of this chapter will show.

Claudio Domínguez. (Table V.7) Claudio is an older ejidatario in Zone 2, with two sons, four daughters, and two grandchildren. His wife died, and all the children moved away except for the two sons. One of them lives close by with his family. He helps his father on the farm, and they split the income from it. The other son recently returned from the city to live with his father; his wage income accounts for more than one fifth of total family income. He works as a day laborer at a nearby papaya plantation. Claudio Domínguez's house is old and made of wood; there are no chickens or other animals in the backyard, only some coconut and other fruit trees. He explained that since his wife died, no one could take care of the animals. While most families prepare their own tortillas from own or purchased maize, Claudio buys tortillas. Neither he nor his son cook; housework seems to be strictly women's work that Claudio and his son will not take up even when it seems costly not to do so. Overall, his household made a poor and neglected impression, although Claudio seemed to be a very friendly and warm person who shared fresh grilled maize with the extensionists and me. The lack of backyard activities and household production of tortillas and other food items seems to have a significant effect on household welfare.

The Domínguez family owns only four hectares of land that can be cultivated, and part of a hillside that is not arable land. Some cedro trees grow on that hillside, but because of deforestation legislation, they cannot be harvested. There are also about 60 mango trees on that land; they are grown under a type of contract which stipulates that the middleman pays for all inputs and has the right to purchase the entire harvest.

The arable land is very diversified in its use, with small areas of oil palm, maize, and cocoa. The gross margin from cocoa appears very high at more than three times oil palm margins, which may be partly due to an underestimation of the land area devoted to the crop. Oil palm in turn is almost 50 percent more profitable than maize. The Domínguez family produces with very low cost; their only expenses are for fertilizer, and transport in the case of oil palm. Their oil palm and maize yields are both very low, especially when considering that their palms are from the early 1990s, and should have been reaching their most productive phase by 1997. This may partly be due to low soil fertility on their rather marginal land.

Claudio Domínguez is a member of the cooperative processing plant BEPASSA, where he sells his oil palm harvest. Before 1996, he lost three years' oil palm harvest because the private plant La Lima was saturated with raw materials and was not buying. Now profits from oil palm are good, and he is planning to expand his oil palm area in 1998. He plans to replace the maize, which is not very profitable. He will however have to work on the access road to the additional land, it was not passable in 1997. Claudio is an example of a farmer who in 1997 believes in oil palm, although he had bad experiences with it in the past.

New Oil Palm Farmers

The five farmers in this group participate in the 1997 SAGAR project to plant part of their land with oil palm; they do not have any mature oil palm fields. Apart from this similarity, they are a very

Table V.7. Farm Budget: Claudio Domínguez

	Item*	Oil Palm	Maize	Mango	Cocoa	Total
Crop Income	Area Cropped (ha)	2	1.5	60 trees	0.5	4+hillside
	Yield (t/ha)	13.5	3 [a]		2	
	Production (t)	27	5		1	
	Price per t	450	1,300		8,000	
	Gross Value of Output	12,150	5,850		8,000	26,000
	Costs					
	Fertilizer	1,104	1,410		184	
	Pesticides				80	
	Herbicides					
	Labor					
	Transport	2,430				
	Field Preparation					
	Maize sheller					
	Total Costs	3,534	1,410	0 [b]	264	5,208
	Gross Margin (value - cost)	8,616	4,440	5500	7,736	26,292
	Gross margin per ha	4,308	2,960		15,472	
Other Income	**Off farm work**					7,800
	PROCAMPO					1,680
	Net Farm Income					35,772

Source: Wolff, C. 1997. *Fieldnotes.*

* In 1997 pesos unless otherwise specified.

[a] Includes two crops per year.

[b] Buyer pays for all inputs.

Table V.8. Farm Budget: Eduardo Escobar

	Item*	Maize	New Palm and Maize	Total
Crop Income	Area Cropped (ha)	3	3	6
	Yield (t/ha)	3 [a]	3 [a]	
	Production (t)	9	9	
	Price per t	1,300	1,300	
	Gross Value of Output	11,700	11,700	23,400
	Costs			
	Fertilizer			
	Pesticides	420	420	
	Herbicides	1,080	1,080	
	Labor	1,370	1,370	
	Transport			
	Field Preparation	1,800	1,800	
	Maize sheller	1,220	1,220	
	Palm planting cost		2,700	
	Total Costs	5,890	8,590	14,480
	Gross Margin (value - cost)	5,810	3,110	8,920
	Gross margin per ha	1,936	1,037	
	Subsidy for new oil palm (900 pesos/ha)		2,700	
	Gross Margin (value + subsidy - cost)	5,810	5,810	11,620
	Gross margin per ha	1,936	1,937	
	Total household income			11,620

Source: Wolff, C. 1997. *Fieldnotes.*

* In 1997 pesos unless otherwise specified.

[a] Includes two crops per year.

diverse group of farmers. Two of them are among the poorest farmers interviewed; for them oil palms represent the chance to grow a profitable cash crop that will become a secure income source. The next two farmers are relatively wealthy; they are replacing cattle or other cash crops with oil palm. The last example, Manuel Martínez, is a special case. He had planted part of his land with oil palm, destroyed the palms when they were not profitable, and is replanting oil palm in 1997. In the following, I analyze each farmer's budget and compare their reasons for switching to oil palm.

From Subsistence to Cash Crop Production

These are the only two farmers for whom production for subsistence makes up a significant part of total production in 1997. They had the lowest incomes of all farmers interviewed, derived mainly from maize. Both are very hardworking, and hope to achieve a higher and more secure income through oil palm. Their income is so low that they may face trouble making ends meet until palms start to generate income.

Eduardo Escobar. In 1997, Eduardo Escobar was 77 years old; he had received his parcela five years earlier in Zone 2. Apart from himself, his household consists only of his young wife and an adopted four year old son. From a previous marriage, he has 13 children, all of whom have moved away to other areas or to the cities. He lives in his ejido's village, in a house he claims is made out of "straw", which probably means bamboo and wood. For transport he has a little horse cart; his horse's foal follows it around everywhere. The family also produces fruit for their own consumption, as well as 30 chickens and two pigs.

On his six hectares he grows maize; three hectares are intercropped with oil palms. Because of his age, and since he cannot use family labor, Eduardo Escobar relies heavily on hired labor. Therefore, apart from field preparation, labor is his highest cost. He also has to spend a lot on herbicides since he cannot weed manually. His margins per hectare are very low, which is a result of a combination of low maize yields and high costs. In the past, he has grown rice, so oil palm is not his first cash crop. His fields are exceptionally well taken care of, with clean, weed-free circles around each palm. He plans to intercrop the palms with sesame in the dry season of 1998 because it is more profitable than maize.

Eduardo sells about half of the maize harvest (Table V.8) to traders, or "coyotes", the rest is consumed at home. His cash income is thus very limited, but he only has to buy maize when his harvest fails. Otherwise the family is self-sufficient in maize. They initially did not want to plant oil palm; but according to Eduardo he decided to participate in the project because he works too hard, and needs some secure income source that will allow him to hire wage labor. If all goes well, he plans to buy another six hectares of land. He had begun to apply for credit in 1997, which proved extremely difficult. He may rent land in the future to generate some additional income during the palms' gestation period. Although he refused to give information on the subject, it seems likely that at least some of his numerous children help Eduardo Escobar out economically in times of need.

He is one of the few ejidatarios I spoke with for whom the project subsidy for new oil palm is a great help: it constitutes almost 20 percent of his income. If he relies solely on his farm income to support his family, this subsidy is very necessary for Eduardo, and he may face some difficult times in the period after the subsidy is discontinued, and before oil palm income makes up for the difference. The subsidy is only planned for two years, but in the third year maize yields are likely to decline while oil palm yields may not be very high yet.

Rosa Ramírez. The Ramírezes' family economy is very complex and interwoven. Rosa's father Daniel Ramírez is an ejidatario in the Luís Espinoza ejido in Zone 1, where the El Arenal processing plant is located. There are two villages on the ejido, one called El Arenal, like the plant, the other Luís Espinoza, like the ejido. There are conflicts over membership in the plant cooperative; the inhabitants of Luís

Espinoza feel people from El Arenal discriminate unfairly against them by not admitting them as cooperative members. Since Daniel Ramírez is getting older, he has divided his 20 hectares among four of his children. He lives with one of his sons; and there is a lot of cooperation and exchange between family members. The family land includes 14 hectares of oil palm, the production of which they sell to El Arenal, or to La Lima. El Arenal gives priority to members' production, and often refuses to buy fruit when its capacity is fulfilled by members' production. Daniel furthermore feels it is unfair that El Arenal pays a 25 percent higher price for members' fresh fruit bunches, and accuses El Arenal of weighing incorrectly and therefore underpaying. Apart from oil palm, he owns 26 cows.

Rosa has only two hectares; she is 40 years old and has three daughters who are in school, and a 20-year-old son who works on the land. He also engages in wage work on Rosa's brother's farm. Rosa's husband has left the household, so she has to raise her children with only her father's help. The family raises a large number of birds in the yard: about 20 chickens and 40 chicks, two geese, and four local birds, which they sell only infrequently. They also have coconuts, and receive mangos from Daniel.

On her land Rosa has planted oil palm intercropped with maize. She also rents 0.9 hectares from a pequeño propietario on which she grows only maize. All her production is for home consumption. Rosa's income sources are described in Table V.9. Apart from maize production, her main income sources are the son's wage work and pig sales. On average, they sell about seven pigs during a year. Rosa sometimes earns extra money by making dresses for women in the village; she also makes a lot of the family's own clothing to save money. Her maize yields are very low; according to Rosa the land was exhausted by the tobacco she grew before. Since the family does all the work itself, and does not use a lot of inputs, their production costs are relatively low as well. Still, the oil palm subsidy has a significant impact on gross margins per hectare of maize production. The subsidy accounts for more than 10 percent of household income.

Rosa hopes to improve her income in the future. She has invested in a cow and a calf, and soon a second calf will be born. She wants to start a herd. Her maize field is not very productive anymore, as was mentioned above. The soil is exhausted and there are a lot of pests. Before, they grew tobacco on contract for the La Moderna tobacco company, which exhausted the soil. La Moderna stopped contracting with smallholders and rented land to produce its own tobacco. In the future, Rosa will have to rent land to survive until palms start to produce; maybe she will be able to buy some. Rosa's father also helps out economically; for example he helped her build a new cinder-block house where she lives with her children. She, like Eduardo Escobar, is relatively dependent on continued support from the project in the form of subsidies, or on support from her family.

Cattle and Oil Palm

Although their income levels are fairly different, these two farmers have one thing in common: one of their main income sources is cattle. While Mauricio Gómez is reluctant to give up the more prestigious role of cattle farmer to switch to oil palm, Martín Paz is eager to do so.

Mauricio Gómez. Mauricio Gómez is another example of the complex economic intra-family connections in the area. He is an ejidatario in Zone 3, with seven hectares, in addition to which he rents four hectares. Mauricio lives in a cinder-block house, and owns four bicycles and an ox cart. He has six children, three of which are still in school. They all help on the farm, and one works with his father full time. Another son has left to the United States. This son received a plot of land of 1.5 hectares in the new ejido La Esperanza, located in Zone 2. Mauricio takes care of his son's land in his absence. The ejidatarios at La Esperanza have received a big plot of land, which is subdivided into individual parcelas. They have however decided to plant oil palm on the entire land, without limit between individual fields.

Table V.9. Farm Budget: Rosa Ramírez

	Item*	Maize	New Palm and Maize	Total
Crop Income	Area Cropped (ha)	0.9	2	2.9
	Yield (t/ha)	2.7 *	2.7 *	
	Production (t)	2	5	
	Price per t	1,300	1,300	
	Gross Value of Output	3,159	7,020	10,179
	Costs			
	Fertilizer			
	Pesticides	36	80	
	Herbicides	157	348	
	Labor			
	Transport			
	Field Preparation	900	2,000	
	Maize sheller			
	Palm planting cost		1,800	
	Total Costs	1,093	4,228	5,321
	Gross Margin (value - cost)	2,066	2,792	4,858
	Gross Margin per ha	2,296	1,396	
	Subsidy for new oil palm (900 pesos/ha)		1,800	
	Gross Margin (value + subsidy - cost)	2,066	4,592	6,658
	Gross Margin per ha	2,296	2,296	
Other Income	**Backyard activities: pig sales**			3,150
	Off farm work			7,800
	Sewing			240
	Total household income			17,848

Source: Wolff, C. 1997. *Fieldnotes.*

* In 1997 pesos unless otherwise specified.

* Includes two crops per year.

The Gómez family's income sources are detailed in Table V.10. The single most important source of income is cattle, although all crops together account for more than cattle income. At the time of the interview, the milk price was low, and according to Mauricio it was not worth milking the cows. At other times it is likely that the family derives considerable income from milk sales. The cattle are kept on seven hectares of pasture, which is also planted with mango and marañón[6] trees. Four hectares are dedicated to maize, all of which Mauricio sells to the tortilla store. Although on his own land Mauricio is not planning on replacing pasture or maize with oil palm, he recognizes the practicality of oil palms for his son's land, which is relatively far from his own farm. The palms take care of themselves, he says. Owning cattle has a special value for him beyond its profitability; in the region it is a source of status.

Looking at gross margins per hectare, first of all it is striking that Mauricio is still losing money on his marañón trees. Since there is only a single buyer for the product, which was still very new in 1997, the

[6] Marañón is a tree similar to mango. Its fruit has a pit which contains oil that can be extracted for industrial uses. A marañón program promoted the crop, but failed to provide a processing facility. The crop was thus only starting to produce revenue in 1997, as an extraction plant had been built in Tapachula.

Table V.10. Farm Budget: Mauricio Gómez

	Item*	Maize	New Palm and Maize	Marañón	Mango	Total
Crop Income	Area Cropped (ha)	4	1.5	2 [b]	60 trees [b]	12.5
	Yield (t/ha)	6 [a]	3 [c]	125 kg		
	Production (t)	24	6	250 kg	11	
	Price per t	1,300	1,300	3.50/kg	varies	
	Gross Value of Output	31,200	7,800	875	14,000	53,875
	Costs					
	Fertilizer	2,640	660	650	390	
	Pesticides	2,000	500	1,500		
	Herbicides	5,280	1,320			
	Labor				9,600	
	Transport	2,400	600	80		
	Field Preparation	5,200	1,300			
	Maize sheller	1,920	480			
	Palm planting cost		1,350			
	Total Costs	19,440	6,210	2,230	9,990	37,870
	Gross Margin (value - cost)	11,760	1,590	-1,355	4,010	16,005
	Gross margin per ha	2,940	1,060	-678		
	Subsidy for new oil palms (900 pesos/ha)		1,350			
	Gross Margin (value + subsidy - cost)	11,760	2,940	-1,355	4,010	17,355
	Gross margin per ha	2,940	1,960	-678		
Other Income	Cow sales					15,000
	Milk sales					0
	Cost					136
	Total income from livestock					14,864
	Backyard activities: Pig sales					4,500
	Total household income					36,719

Source: Wolff, C. 1997. *Fieldnotes.*

* In 1997 pesos unless otherwise specified.

[a] Includes two crops per year.

[b] On pasture.

[c] Only one crop during 1997/98; the farmers in La Esperanza missed the planting season for maize

The Gómez family's income sources are detailed in Table V.10. The single most important source of income is cattle, although all crops together account for more than cattle income. At the time of the interview, the milk price was low, and according to Mauricio it was not worth milking the cows. At other times it is likely that the family derives considerable income from milk sales. The cattle are kept on seven hectares of pasture, which is also planted with mango and marañón[6] trees. Four hectares are dedicated to maize, all of which Mauricio sells to the tortilla store. Although on his own land Mauricio is not planning on replacing pasture or maize with oil palm, he recognizes the practicality of oil palms for his son's land, which is relatively far from his own farm. The palms take care of themselves, he says. Owning cattle has a special value for him beyond its profitability; in the region it is a source of status.

[6] Marañón is a tree similar to mango. Its fruit has a pit which contains oil that can be extracted for industrial uses. A marañón program promoted the crop, but failed to provide a processing facility. The crop was thus only starting to produce revenue in 1997, as an extraction plant had been built in Tapachula.

Looking at gross margins per hectare, first of all it is striking that Mauricio is still losing money on his marañón trees. Since there is only a single buyer for the product, which was still very new in 1997, the information on prices and costs may not be very accurate. Because they had to prepare the land for oil palm by removing trunks, plowing and so forth, the farmers at La Esperanza missed the planting season for maize, and will only harvest one maize crop during 1997/98. This leads to a significant income loss. Since they only have 1.5 hectares, all these farmers have other income sources, such as wage labor in the US in the case of Mauricio's son. For these farmers as well the subsidy can be a very important support to help them bear oil palm planting costs.

Martín Paz. This farmer has a large cinder-block house in Zone 3 with relatively new living room furniture. Furniture is a rarity in the area; as are separate living and bedrooms in the houses. Both are signs of wealth, as is the pickup truck Martín owns. The family includes four sons and three daughters. Only one son remains in the household and works the farm with his father. The Pazes' farm includes 30 hectares of land; Martín, his wife and his son each own ten hectares. The family also owns a pickup truck. Until 1997 all of the Pazes' land was in pasture. They own 40 cows and sell both milk and cows. The family also raises 30 to 40 chickens for their own use, and two pigs. They grow some mangos, which they occasionally sell.

In 1997 Martín Paz decided to plant half of his land with oil palms; he will probably have to sell some cows since his pasture area will be reduced. The oil palm land is intercropped with maize. Martín insists that maize is not a profitable crop for him, which is confirmed by the low margin per hectare he achieves. He explains that he expects higher returns from oil palm than he gets from cattle. A comparison between returns from cattle and oil palm is difficult and will be discussed in more detail in the following summary. Table V.11 shows the Pazes' farm budget. Since most of his income is from cattle, Martín will most probably be able to support himself during the oil palm's gestation period, even if he did not receive the subsidy.

A Special Case: Manuel Martínez

This farmer lives in Zone 2, where he has ten hectares in the ejido Luís Espinoza. He has two daughters and four sons. One is still in elementary school, three have moved to Mexico City, one to Tuxtla Gutierrez, and one works with Manuel on the farm. His wife has left him, and is currently staying with one of her children in Mexico City. He is thus one of the few farmers who buys tortillas instead of preparing them at home. His children take care of the family's 12 chickens. They also have a few coconut and avocado trees in the garden, and sell some mangos.

Manuel has several different income sources (shown in Table V.12), including farm and non-farm income. His farm income amounts to only about 60 percent of the total. The rest consists of income from fishing, and some mango sales. Manuel and his adult son go fishing in the estuary by the coast about three times per week to supplement the household's income. Several farmers mentioned that before cultivating oil palm, they had to engage in fishing as well, but that they stopped when their farm income rose high enough. Fishing thus does not seem to be a popular way to earn one's living. In addition, Manuel and his son occasionally engage in wage labor when there is an opportunity, although he could not indicate how often. Pressed to give an estimate, he gave the figure of 6 to 12 days per year per person, which would only come to an additional 300 to 600 pesos.

On his ten hectares, Manuel grows maize and plantain, and has planted seven hectares of oil palm. His plantain achieve a very high margin per hectare, although he does not have any costs (he harvests himself). The figures on plantain production may not be too reliable. His maize yields are about average, but he missed the planting season for maize on his oil palm fields.

Table V.11. Farm Budget: Martín Paz

	Item*	New Palm and Maize	Total
Crop Income	Area Cropped (ha)	15	30
	Yield (t/ha)	3.5 [a]	
	Production (t)	53	
	Price per t	1,300	
	Gross Value of Output	68,250	68,250
	Costs		
	Fertilizer	3,300	
	Pesticides	420	
	Herbicides	4,200	
	Labor	12,600	
	Transport		
	Field Preparation	24,000	
	Maize sheller	5,250	
	Palm planting cost	13,500	
	Total Costs	63,270	63,270
	Gross Margin (value - cost)	4,980	4,980
	Gross margin per ha	332	
	Subsidy for new oil palm (900 pesos/ha)	13,500	
	Gross Margin (value + subsidy - cost)	18,480	**18,480**
	Gross margin per ha	1,232	
Other Income	Cow sales		40,800
	Milk sales		23,500
	Cost		190
	Total income from livestock		**64,110**
	Total household income		**82,590**

Source: Wolff, C. 1997. *Fieldnotes.*
* In 1997 pesos unless otherwise specified.
a Includes two crops per year.

Table V.12. Farm Budget: Manuel Martínez

	Item*	Maize	New Palm and Maize	Plantain	Total
Crop Income	Area Cropped (ha)	2	7	1	10
	Yield (t/ha)	4 [a]	2 [b]	36	
	Production (t)	8	14	36	
	Price per t H73	1,500	1,500	200-750 [c]	
	Gross Value of Output	12,000	21,000	13,800	46,800
	Costs				
	Fertilizer				
	Pesticides	420	735		
	Herbicides				
	Labor	2,500	4,375	0	
	Transport	160	280		
	Field Preparation	2,200	3,850		
	Maize sheller	600	1,050		
	Palm planting cost		6,300		
	Total Costs	5,880	16,590	0	22,470
	Gross Margin (value - cost)	6,120	4,410	13,800	24,330
	Gross margin per ha	3,060	630	13,800	
	Subsidy for new oil palms (900 pesos/ha)		6,300		
	Gross Margin (value + subsidy - cost)	6,120	10,710	13,800	**30,630**
	Gross margin per ha	3,060	1,530	13,800	
Other Income	**Backyard activities**: mango				**625**
	Income from fishing				**24,000**
	Total Household Income				**55,255**

Source: Wolff, C. 1997. *Fieldnotes.*
* In 1997 pesos unless otherwise specified.
[a] Includes two crops per year.
[b] Only one crop during 1997/98 because the farmer missed the planting season for maize.
[c] Depending on the season.

Manuel had already planted four hectares of oil palm in 1992/93. He did not officially participate in the early 1990's oil palm project, but rather planted the seedlings that were left over when the project ended. Therefore he received no support, in credit, technical assistance, or inputs. A year later he had to destroy his oil palms because he needed income, and he planted tobacco. Costs associated with tobacco production were prohibitive and prices were low, so he abandoned tobacco as well, and is now returning to oil palm. He explains that the members of his ejido's extraction plant (El Arenal) seem very happy with the crop. He is not intercropping his new palms with maize because that way they grow faster, and because he missed the planting season for maize. His other two hectares of maize were not doing well; he was having trouble with insects, but very optimistically still expected to harvest two tons per hectare.

While his story seems like a string of bad luck, the extensionists offered another explanation. As many farmers in the area, Manuel has been struggling with alcohol problems, and related debts. His relatively high income level, as shown in his budget in Table V.12 does not agree with his relatively poor appearance and need to engage in wage labor and fishing, which usually only the poorest farmers do. Alcoholism and the need to pay back debts are a possible explanation for these inconsistencies, and for other contradictions in his interview. Most farmers in the area drink quite heavily as I witnessed on the days when they went into town to cash their support checks from the palm oil program. There is also definitely social pressure involved; drinking and buying drinks for one's friends seems to be an important component of social interaction and a source of status.

Pequeños Propietarios

Only two of the pequeños propietarios I spoke to managed their own farms, as opposed to the absentee landowners who put administrators in charge of most of the larger farms. Luís Piña and Pepe Carretero have very little in common, except that they are participating in the oil palm project in 1997. The most obvious difference between them is the size of their land: whereas Luís Piña owns more than 100 hectares, Pepe Carretero owns 24 hectares, less than some ejidatario families. The distinction between ejidatarios and pequeños propietarios is thus somewhat artificial.

Pepe Carretero. (Table V.13). This farmer owns a very nice large house in Acapetahua, and his 24 hectares are close by in Zone 2. He has two children; the son drives a truck; the daughter has studied computer science and works at the PAPA headquarters in Escuintla. She is married, has a young son, and is thinking about moving to Mexico City of the US, where she would have better career chances. Both children are fairly
independent and will not be included in the family's budget. Pepe Carretero's main income source is cattle; he owns 40 cows and 17 calves.

He also has 13 hectares planted with oil palm since 1991. Initially he had planted 16 hectares, but rodents destroyed three hectares. During about two years he lost his oil palm harvest because there was nowhere to sell, but now he is a member of BEPASSA, and appreciates the value of oil palm. During the bad years he mistreated his plantations, for example letting cattle graze between the palms, which is one of the reasons for his low yields. He also does not apply any fertilizer, probably because he is not aware of the potential yield increase due to fertilizer use. His low yields are partly compensated by low production costs, and margins per hectare are not extremely low. The main cost in oil palm production is labor for harvesting and cleaning[7]. Transport cost with his own truck are relatively low. Pepe Carretero is planting another seven hectares of oil palm in 1997, which he does not intercrop so the palms can grow quickly.

[7] Cleaning is a literal translation of "limpiar". Farmers cut the weeds that grow around oil palms, usually with a machete.

These palms he plans to treat better, to achieve higher yields. His relatively high standard of living shows that he could survive without the subsidy.

Pepe Carretero is convinced that oil palms are more profitable than cattle. The price of milk falls considerably in the rainy season, and cattle theft is a great risk. Some farmers are thinking about asking for credit to build a pasteurization plant; others favor a plan to bring a Nestle plant to the area. With his 24 hectares, Pepe feels he cannot have a profitable cattle farm. He would have to "industrialize", investing in infrastructure, feed and other inputs. That is a considerable investment, and he may not be able to compete with people who have much larger cattle farms. Oil palm has the advantage that it produces a secure and steady income stream. The disadvantage is the great dependence of oil palm farmers on the processing industry. Pepe sees potential problems with palm diseases, especially if many people begin to grow the crop. Research and extension services are thus essential.

Luís Piña. Luís' farm is on a much larger scale than any of the other farms included in this survey. The Piña family owns one house on the farm and another one in Escuintla. Luís owns a total of 109.5 ha in Zone 2, and is planting 40 hectares of oil palm in 1997, which he does not intercrop[8]. In 1998 he is planning to plant another 55 hectares. His other income sources are about 21 hectares of maize, produced with high input use and thus higher yields and profitability than on the smaller farms, and about 115 heads of cattle. Table V.14 shows their relative importance in the family's budget. Luís Pérez also mentioned cattle theft as a reason for wanting to switch to oil palm. To avoid having to sell his cattle because of reduced pasture area, he will try to build stables and convert his ranch to more intensive cattle production.

Luís Piña achieves the highest maize yields of any farmer in this study. He also has access to his own tractor, fertilizer, sufficient labor, and does not suffer from pest problems. His margins per hectare from maize production are thus extremely high. Since his income is very high, Luís does not depend heavily on the oil palm subsidy, although it amounts to more than 10 percent of his total income. For him, farming is a very commercial, large-scale activity; and he would be able to bear the costs for an investment. Because he can use his land as collateral, for him access to credit is also not such a problem as for ejidatarios.

Conclusions from the Case Studies

The case studies show that overall, oil palm is a profitable crop for the farmers who grow it. There are several factors affecting profitability at a given point in time, including yields and costs. These factors will be discussed in some detail below. The farm budgets also allow a comparison of the gross margins per hectare of different crops with that of oil palm. Finally, although they may be biased and not reflect farmers' income with a high degree of accuracy, the case studies give an idea of farmers' overall economic situation, and therefore allow an evaluation of how necessary the project's subsidies for new oil palms are. Figure V.2 shows the oil palm farmers' yields, costs and gross margins per hectare, it allows easy comparisons.

Oil Palm Yields

Oil palm yields depend on several things, some of which are not directly under the farmer's control: soil fertility, drainage, and weather. The age of the palms also plays a significant role, as yield projections in section C of this chapter will show. The palms planted at the beginning of the 1990s were beginning to reach mature yields in 1997, although the timing and level of maximum yields depends on the early care given to the palms. Those farmers who had the time, resources and foresight to fertilize their palms, keep

[8] Although farmers such as Luís are still called "pequeño propietario", their farms are anything but small.

Table V.13. Farm Budget: Pepe Carretero

	Item*	Oil Palm	New Oil Palm	Total
Crop Income	Area Cropped (ha)	13	7	24
	Yield (t/ha)	15.6	0	
	Production (t)	203	0	
	Price per t	450		
	Gross Value of Output	91,260	0	91,260
	Costs			
	Fertilizer			
	Pesticides			
	Herbicides			
	Labor	14,300		
	Transport [a]	6,760		
	Field Preparation			
	Maize sheller			
	Palm planting cost		6,300	
	Total Costs	21,060	6,300	27,360
	Gross Margin (value - cost)	70,200	-6,300	63,900
	Gross margin per ha	5,400	-900	
	Subsidy for new oil palm		6,300	
	(900 pesos/ha)			
	Gross Margin (value - cost)	70,200	0	70,200
	Gross margin per ha	5,400	0	
Other Income	Cow sales			29,750
	Milk sales			70,740
	Cost			0
	Total income from livestock			**100,490**
	Total Household Income			**170,690**

Source: Wolff, C. 1997. *Fieldnotes.*

* In 1997 pesos unless otherwise specified.

Table V.14. Farm Budget: Luís Piña

	Item*	Maize	New Palm	Total
Crop Income	Area Cropped (ha)	21	40	109.5
	Yield (t/ha)	7 [a]	0	
	Production (t)	147	0	
	Price per t	1,700		
	Gross Value of Output	249,900	0	249,900
	Costs			
	Fertilizer	9,240		
	Pesticides			
	Herbicides			
	Labor	4,200		
	Transport [c]	2,450		
	Field Preparation [b]	22,500		
	Maize sheller	2,100		
	Palm planting cost		36,000	
	Total Costs	40,490	36,000	76,490
	Gross Margin (value - cost)	209,410	-36,000	173,410
	Gross margin per ha	9,972	-900	
	Subsidy for new oil palm		36,000	
	(900 pesos/ha)			
	Gross Margin (value + subsidy - cost)	209,410	0	**209,410**
	Gross margin per ha	9,972	0	
Other Income	Cow sales			75,625
	Milk sales			51,300
	Cost			13,760
	Total income from livestock			**113,165**
	Total Household Income			**332,575**

Source: Wolff, C. 1997. *Fieldnotes.*

* In 1997 pesos unless otherwise specified. [a] Includes two crops per year.

[b] Own tractor, cost arbitrarily assumed to be market price minus 10 percent.

the fields weed-free and protected from cattle are harvesting much more than those who did not take such good care of their palms initially.

The case studies include eight farmers who already produce oil palms. As Figure V.2a shows, their yields vary considerably, between a high of 33 tons per hectare, and a low of 12 tons per hectare. The farmers specializing in oil palm (García, Méndez, González) all achieve relatively high yields. This is in part because they had the confidence that oil palms would become profitable, even when demand and prices were very low; they trusted that processing plants would be built. These farmers also had the resources to sustain their families in those initial years; their relatively large and/or fertile parcelas had allowed them to accumulate enough resources to survive a few bad years. Therefore they took better care of their palms than did those who thought they would never be profitable, which in 1997 was paying off through higher yields.

The group of oil palm farmers with other income sources includes very different yield levels. When initially demand for oil palm fruit was very low, many neglected their oil palm fields and concentrated on other crops. This delays the growth of the palms, and reduces yield. Some, such as Pepe Carretero, let their cattle graze between the palms. When the palms are relatively short, cows eat the palm fronds, which slows their growth (and is nutritionally not very valuable for cows). These farmers were experiencing much lower yields in 1997. Most had improved their care since they realized palms were quite valuable after all, applying fertilizer and cleaning regularly, for example Claudio Domínguez.

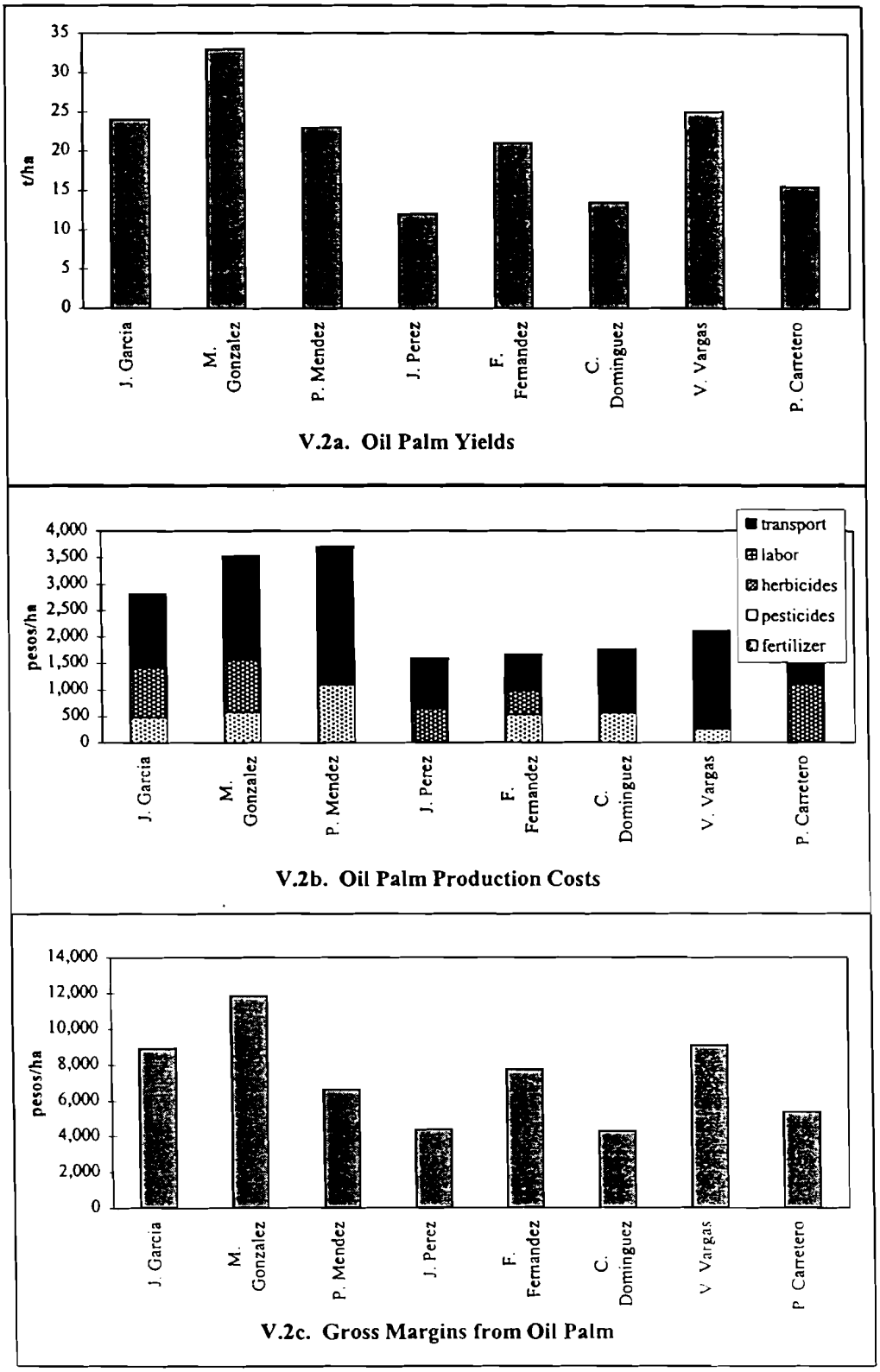
The new oil palm farmers' yields will thus depend critically not only on the technical assistance and information they receive from extensionists about growing oil palm, but also on the time and money they can afford to spend taking care of their oil palms. The project's subsidy is designed to cover planting costs during the first year, and maintenance costs during the second year. It could thus allow poorer farmers to invest more into the care of their palms, which would permit them to achieve higher yields later on.

Costs

When comparing farmers budgets, it becomes clear that the two major costs in oil palm production are labor and transport to the processing plant. Some farmers also spend on fertilizer, but those costs tend to be much lower. As Figure V.2b shows, transport costs tend to be extremely high, between almost half and 90 percent of total costs. They often amount to one fourth of the value of production. Since the processing plants are clustered in Zones 1 and 2, some farmers live relatively far from the plants. Often the access roads to the farmers' parcelas are barely passable, which further raises transport costs.

In general, the laborers who harvest the palm fruit take them out to the road, either on wheelbarrows or on ox carts, and trucks come to pick them up from the field and take them to the processing plant, where they are weighed. Since the trucks are so expensive, farmers harvest only once every two weeks even in peak production months, although weekly harvesting would be optimal to ensure the right degree of ripeness. Farmers do not cooperate, for example to rent one truck for several farmers. It is surprising that even the cooperative plants do not own a truck or organize a lower-cost transport system. Fresh fruit bunches could be weighed on the truck instead of at the plant, and one truck could pick up several farmers' harvests. When asked about it, both plant managers and farmers explained the problem was a lack of trust; each wanted to take his production to the plant to insure correct weighing.

In the future, it may be possible to organize collection centers in the ejido villages or at some other point, where scales could be installed to weigh the fruit. Cooperatively owned or private trucks could then transport the fruit to the plants, and several farmers could share the fare. Thus they could harvest more frequently, even if their production is not sufficient to fill a truck. It does not seem likely that farmers will organize without some coordination by plant managers or project personnel.



Source: Wolff 1997. *Fieldnotes.*

Figure V.2. Conclusions from Farm Budgets

The second highest cost in oil palm production is labor. Most farmers hire wage labor, at least for the harvest. Using family labor is cheaper, and it is extensively used for cleaning. Harvesting is very hard physical work that requires substantial skill, it is thus usually not carried out by children, women, or older ejidatarios. The high value of oil palm production has increased the opportunity cost of on-farm family labor, and few established oil palm farmers engage in wage work, and almost all of them hire labor on a regular basis. The advantage of oil palm is that it requires relatively constant labor input around the year, so that farmers are not dependent on expensive labor during peak seasons, but can engage in long-term agreements. This also benefits wage laborers since it reduces insecurity. Since landless laborers are relatively abundant, labor costs are not expected to rise significantly.

Gross Margins per hectare

The returns from one hectare of oil palm compare favorably to the returns from most other crops. Naturally, gross margins vary with yields and costs, as can be seen in Figure V.2c. Claudio Domínguez has the lowest returns, around 4,250 pesos per hectare. The farmers who achieve the highest yields also receive the highest returns from their oil palm, up to almost 12,000 pesos per hectare in the case of Mario González. Many farmers receive about 8,000 pesos per hectare of oil palm. In most cases farmers grow maize as well as oil palm. Maize, especially when grown with low input use, is not very profitable in the area. Most farmers grow local varieties that are lower-yielding than improved varieties because the improved varieties are not well adapted to the climates and soils of the Soconusco. Since maize used to be heavily subsidized, many farmers are used to growing it. It has the additional advantage that as a food crop, marketing risk is relatively low because people could consume their own maize. Since the marketing risk for oil palm is relatively low since new processing plants have expanded demand, and since maize subsidies have been reduced, many farmers are giving up maize in favor of oil palm because it is more profitable.

Other farmers are making the transition from cattle to oil palm farming. It is difficult to calculate a return per hectare of cattle land since many farmers exchange favors such as grazing cattle on harvested fields without assigning monetary prices. Furthermore, cattle income is not steady; farmers sell animals in times of need but not regularly. Assuming that Martín's 40 head of cattle were sustained solely by his 30 hectares of pasture land, it would give a return of 1,400 pesos per hectare, which seems low. Mauricio's 26 cows live on seven hectares of pasture. Again, assuming that he uses no additional pasture land, that gives a return of approximately 2,100 pesos per hectare. Luis Piña, a pequeño propietario who will be discussed later, achieves only a margin of approximately 1,300 pesos per hectare of cattle land. Compared to returns from oil palm and other cash crops, those margins are low. Farmers were asked to recall how many animals on average they sold in one year, which may bias results depending on the memory of the farmer. If they did not sell many animals in the period preceding the interview, they might underestimate overall sales. Cattle land does not have to be cleared and prepared. Switching from cattle to a crop that requires field preparation is thus costly and requires a substantial investment, which is another reason apart from social status why some farmers prefer not to replace their cattle.

Apart from its profitability, oil palm has other advantages such as low production and price risk, less vulnerability to pests and diseases (so far in the Soconusco, not in general), and less risk from the effects of adverse weather and theft. Oil palms thus not only produce a relatively high return, they also constitute a steady and low-risk income stream. Since farmers are usually very risk averse, this adds to the attractiveness of oil palm.

Subsidies

The most important subsidy that oil palm farmers receive are the palms themselves, combined with free technical assistance. The substantial cost of about 3,000 pesos per hectare for palm seedlings allows

many poorer farmers to plant palms who would otherwise not be able to. The oil palm project's cash subsidy is designed to cover oil palm costs during the first year, including staking the fields, transporting seedlings from the nursery to the field, planting, and fertilizing. For the second year, an additional cash subsidy was intended to cover maintenance costs such as fertilizer and cleaning. After the second year, no more subsidies were planned. Figure V.3 shows what percentage of farmers' income the cash subsidy constitutes. In general, for the farmers who already produce oil palm, the cash subsidy makes up a trivial fraction of total income. For the poorest farmers the subsidy may have an important progressive effect, allowing them to take good care of the young palm, and thus increasing future yields and therefore income. The poorest farmer, Eduardo Escobar, is the one who depends the most on the cash subsidy; it makes up 23 percent of his income. The subsidy may play a more important role in more than just the poorest cases in increasing farmers' liquidity, allowing them to pay for services related to oil palm planting, such as seedling transport and wage labor for planting. The fertilizer component of the subsidy is handed out in kind to reduce fungibility.

Since farmers specializing in oil palm tend to be quite well off, they do not need a cash subsidy to expand their oil palm area. Likewise, cattle farmers tend to have sufficient income and assets to sell to support them through a few years until palms begin to pay off. This is especially true for pequeños propietarios. A cash subsidy better targeted only to the poorest farmers may allow the project to save money to spend on more technical assistance later on, or to solve transport problems. On the other hand, this would definitely create targeting costs, and conceivably resentment among better-off farmers whom the project may not wish to alienate. To avoid a further economic stratification of oil palm farmers, the poorest farmers should be monitored closely to make sure they are able to survive the first years without too much income loss, and without having to neglect their palms and therefore lower their income earning potential.

Section B has analyzed the profitability of oil palm through farm budgets. Comparing gross margins per hectare shows that in any given year, oil palm can compete with most other crops in terms of economic returns. If compared to maize, the most common crop grown in the Soconusco among farmers switching to oil palm, oil palm is much more profitable in almost all cases. Another way to assess the relative profitability of maize and oil palm in dynamic: investment analysis can show how the profitability of oil palm compares with that of maize over the entire life of the palm, including the gestation period. This dynamic analysis is carried out in section C.

Section C. How Profitable is Oil Palm?

Since oil palm yields vary over the productive life of the palm, evaluating its profitability at any one point in time cannot give a complete picture of how it compares to other crops, especially annual crops without an initial gestation lag. The methodology of cost-benefit analysis is ideal for comparing the value of income streams over time. In order to evaluate the profitability of oil palm over time, it is necessary to project revenues and costs over the productive life of the palms. This requires projecting prices, yields, and costs of production 25 years into the future. Since predicting the future is always rather challenging, predicting events such as palm oil prices and yields, which depend on a myriad of other factors including unpredictable ones such as the weather, is impossible. Rather than giving a "precise" estimate of future parameters, I therefore attempt to provide a reasonable range within which future developments are likely to fall. The following sections explain how I obtained my yield, cost and price scenarios, and what the underlying assumptions are, followed by the profitability analysis.

Yield Scenarios

Oil palm yields vary widely; they are influenced by various factors such as sunshine, temperature, rainfall, soil quality, fertilization, pests and diseases, pruning, and so forth. Since the palms distributed by

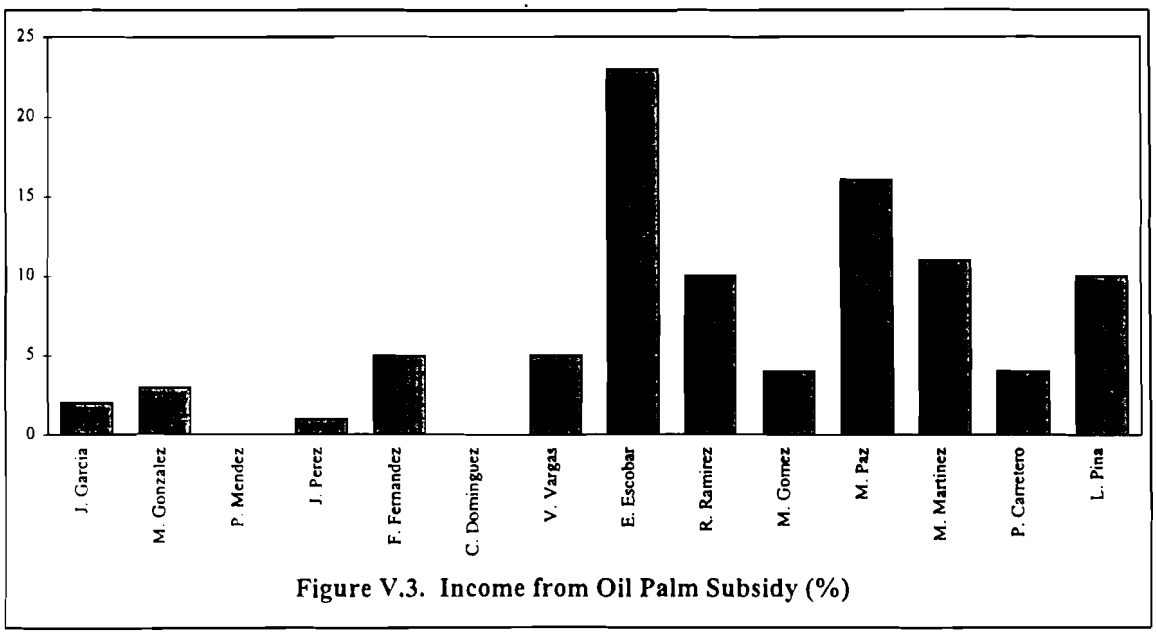


Figure V.3. Income from Oil Palm Subsidy (%)

Source: Wolff 1997. *Fieldnotes.*

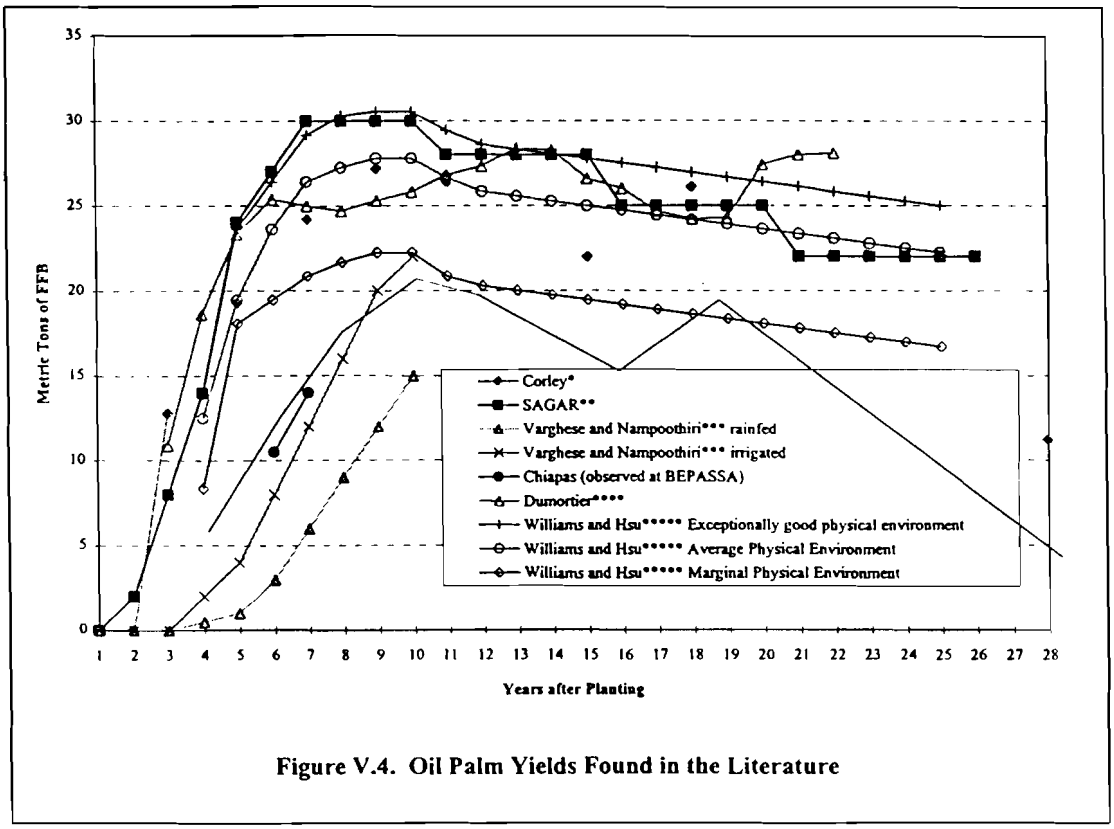


Figure V.4. Oil Palm Yields Found in the Literature

Sources:

Corley, R. H. V. 1983. "Potential Productivity of Tropical Perennial Crops". Experimental Agriculture, Vol. 19, No. 3

Corley, R. H. V., Gray, B. S. and K. Ng Siew 1971. "Productivity of the Oil Palm in Malaysia". Experimental Agriculture, Vol. 7, No 2

Dumortier, F. 1995. "Comportamiento y Variabilidad del Material de Palma de Aceite DxP en Papua Nueva Guinea" Palmas, Vol 16, No. 3.

SAGAR 1997b El Programa Nacional de Palma Africana de Aceite. Mexico City

Varghese, T. and K. U. K. Nampoothiri 1988. "Investments and Expected Returns from Oil Palm Cultivation in India". *Planter*, Vol. 64. Kuala Lumpur.

Williams, C N and Y. C. Hsu 1970. Oil Palm Cultivation in Malaya. University of Malaya Press, Kuala Lumpur

Wolff 1997 *Fieldnotes*

the current palm project are of a different variety than palms already grown in the area, and because care and input use are likely to be different, yields cannot simply be assumed to be equal to currently observed yields. Furthermore, nobody has kept yield records for Chiapas' oil palms during past years, and yield variations over the life cycle of the palms are crucial for net present value calculations. Since it is impossible to make an accurate prediction for yield in Chiapas, I attempt to construct an approximate range which is likely to contain the future yield. Figure V.4 shows a variety of yields from around the world found in the oil palm literature. The figure shows that yields tend to follow a certain pattern over their productive life, taken here to last 26 years. In the beginning, yields increase steeply, reach a maximum about seven to ten years after planting, and then slowly decrease. Palms are usually replaced after 20 to 30 years because decreasing yields, and, more importantly, the palms' growing height make replanting more profitable in the long run. Only two data points are available for current average yields in Chiapas. They are the observed average yields for the farmers delivering to the BEPASSA processing plant. These yields are relatively low because many farmers neglected their palms, which developed more slowly than usual.

Although this scenario is based on actual observations from Chiapas, it is pessimistic for several reasons. Until BEPASSA started operating in March 1996, farmers in that area did not have a market for their oil palm fruit, and therefore did not take very good care of their palms. They did not always apply fertilizer when recommended by extensionists, neglected cleaning and pruning, and many even let cattle graze between young palms. The results are delayed growth and low yields. Furthermore, the palms planted in 1990/91 are not of the current, high-yielding and quickly maturing variety. If the palms planted in 1997/98 receive better care, they should yield substantially more. While the BEPASSA average was at about 10.5 and 14 tons per hectare six and seven years after planting respectively, other farmers reach higher yields even with the old variety. In the Ejido Luís Espinoza, where farmers had access to an extraction plant earlier on, they invested more in palm care and now reach yields of up to about 30 tons per hectare for palms planted in 1990/91.

The first two scenarios are a high and a low estimate; actual yields will probably fall in between. As an example, I constructed an intermediate yield scenario (Figure V.5). Based on Williams and Hsu's average physical environment, it predicts yields close to those observed in Luís Espinoza. To avoid intersections with the best yield curve, some data points were altered slightly, and the downward-sloping portion of Williams and Hsu's average scenario was adjusted downward a bit. These adjustments make the two scenarios less confusing and hardly change present values at all. The medium estimate predicts a high yield of 27.8 tons per hectare reached in year nine after planting, so maximum yield falls between the two extreme scenarios. Initial increases in yields are also intermediate; harvesting starts later than in the optimistic scenario, and it increases at rate between the dramatic increase shown by the optimistic curve and the slow growth of the pessimistic scenario.

Assumptions Regarding Costs

To calculate a net present value for investments in oil palm, not only yields, but also costs have to be predicted. In July of 1997, only planting costs could be partly observed; maintenance cost estimates are based on maintenance costs on already established fields, and on SAGAR information about labor and other input requirements. Table V.15 shows the costs of establishing one hectare of oil palm on previously cleared land.

Almost all land in the project area is cleared pasture or crop land, although some farmers have to remove isolated trees and tree trunks from pastures to facilitate field preparation and/or reduce shade. Farmers receive a subsidy of 900 pesos for each hectare planted to oil palm, which covers most of the costs involved in planting. Palms are given out for free, their value is about 3,000 pesos per hectare. The 900 pesos include both cash payments and payments in kind. Fertilizer is distributed in kind, and payments for farmers' labor input are made in cash when the task is completed and has been inspected by project staff.

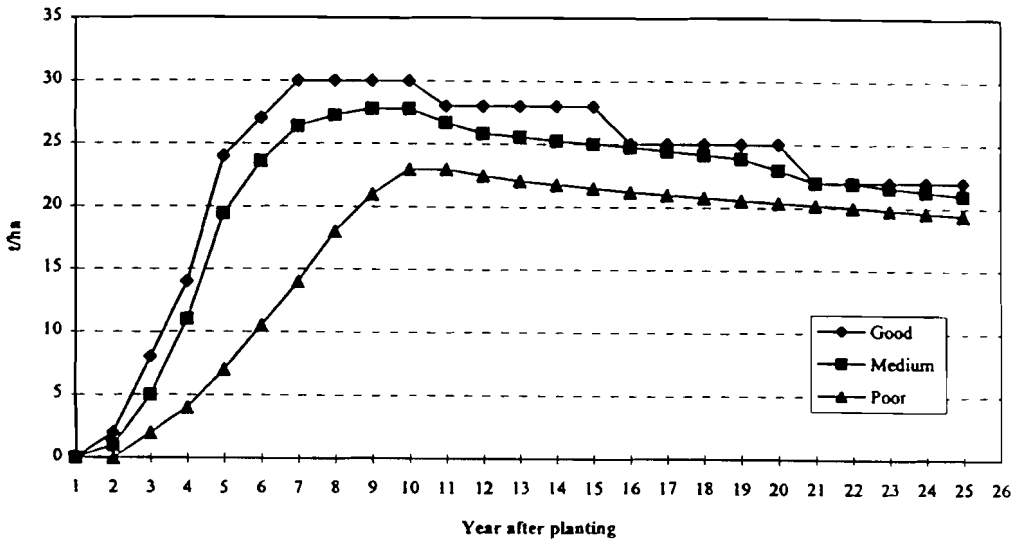


Figure V.5. Yield Scenarios

Source: Based on Figure V.4.

When third persons, such as machinery owners, truck drivers, or field hands have to be hired, the work has to be carried out first, and again the subsidy is paid after inspection of the completed task. Sometimes, for example in the case of transport, farmers have to pay less than they receive. They can use excess funds towards their own contribution of 175 pesos, or to cover travel costs to the bank in Acapetahua where subsidy payments have to be picked up. Because of the subsidies, the farmers' initial investment is very low.

Once the palms are planted, maintenance costs begin. During the first few years (depending on assumptions about yields, prices, and costs the time period varies), costs for cleaning, fertilizer, and so forth exceed revenues. These initial negative cash flows are offset by revenues from maize intercropping, but remain a significant factor lowering net present value, especially if discount rates are high. The cost scheme presented in Table V.16 lists expenses for individual items. These figures are approximate; they vary from farmer to farmer, in different ejidos, and over time. Harvesters in Chiapas usually do not only cut fresh fruit bunches, they also prune palms, pile palm leaves in the aisles between palm rows, and carry fresh fruit bunches to the road where they load them on carts or trucks. Collecting loose fruit is usually a job for children.

Although some farmers and their sons harvest by themselves, many hire professional harvesters for this task which requires some skill and strength. In the table, family labor is valued at market rates, which means 25 pesos per jornal, or 30-50 pesos per ton of fresh fruit bunches for harvesters. Depending on yield and palm size, one harvester can harvest between 100 and 250 bunches per day. Allowing time for pruning, carrying and piling leaves, an average of one hectare (with 143 palms, harvested twice a month) per harvester seems reasonable. On most farms, family members are responsible for cleaning and applying fertilizer and other inputs. Cleaning the cajetes around palms with a machete twice a year takes about 8 person-days, or 200 pesos. Initially, when palms are small and do not provide much shade, weed growth will be quicker, and palms are more susceptible to competition from weeds. Therefore, until about four years after planting, cleaning costs are about 300 pesos higher, which allows for two additional cleanings and more than three times the amount of herbicide used later on.

Table V.15. Costs of Establishing One Hectare of Oil Palm

Item	Amount (pesos)
Field Preparation (machinery rental)	500
Measuring + stakes	50
Digging holes	62.5
Palm Transport	286
Loading and unloading	50
Palm distribution on field	25
Planting and fertilizer application	62.5
Fertilizer (15 kg)	39
Subtotal	**1,075**
Value of palms (paid by SAGAR)	**3,003**
Total establishment cost	**4,078**
Subsidy (partly paid in kind)	**900**
Farmer's contribution (Total cost - value of palms - subsidy)	**175**

Sources: SAGAR 1997b. *El Programa Nacional de Palma Africana de Aceite.* Mexico City.
Wolff .C. 1997. *Fieldnotes.*

Table V.16. Oil Palm Maintenance Costs
(higher cost scenario; in *pesos*)

Cost	Amount
Labor Cost[a]	
Harvest	1,000
Cleaning[b]	200
Fertilizer application etc.	100
Input cost	
Fertilizer[c]	1,630
Herbicide	30
Pesticide	50
Total Maintenance Cost	**3,010**
Transport	about 40 pesos/ton

Sources: SAGAR 1997b. *El Programa Nacional de Palma Africana de Aceite.* Mexico City; and Wolff, C. 1997. *Fieldnotes.*

[a] Family labor is valued at market rates

[b] Initially about 500 (including herbicide), until palms provide enough shade about 4 years after planting

[c] As recommended by SAGAR

Table V.17. Oil Palm Maintenance Costs
(lower cost scenario; in *pesos*)

Cost	Amount
Labor Cost[a]	
Harvest	1,000
Cleaning[b]	200
Fertilizer application etc.	100
Input cost	
Fertilizer[c]	500
Herbicide	30
Total Maintenance Cost	**1,830**
Transport	about 40 pesos/ton

Sources: Sources: SAGAR 1997b. *El Programa Nacional de Palma Africana de Aceite.* Mexico City; and Wolff, C. 1997. *Fieldnotes*

[a] Family labor is valued at market rates

[b] Initially about 500 (including herbicide), until palms provide enough shade about 4 years after planting

[c] Approximate current expenditure on fertilizer

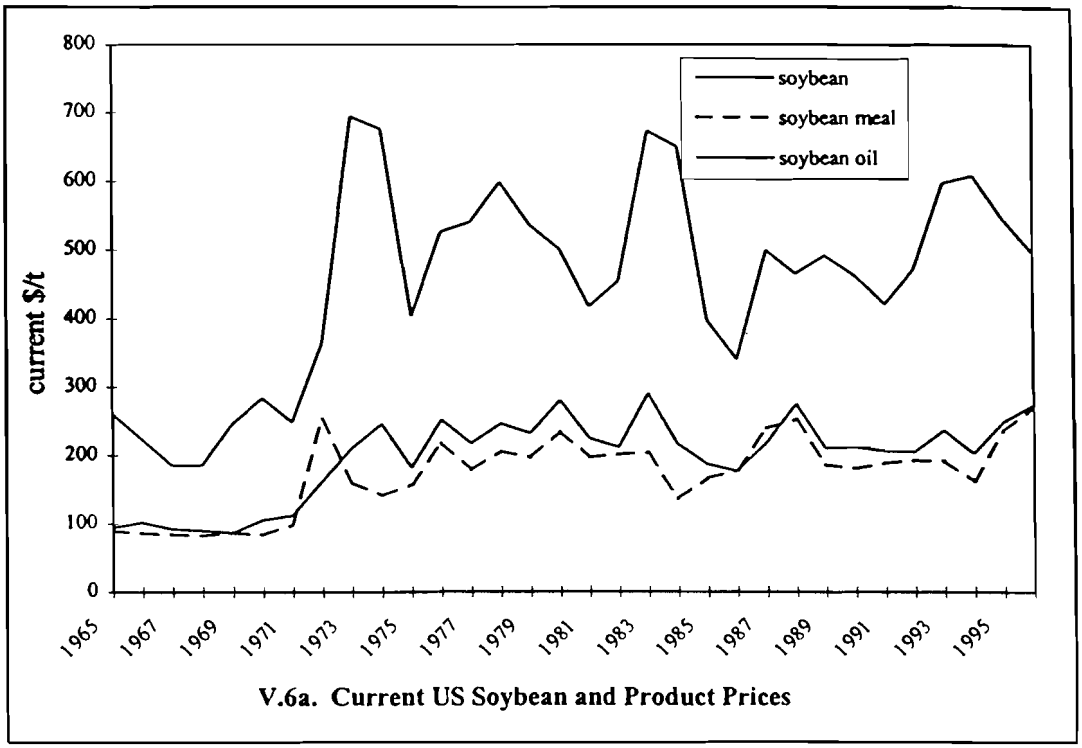
The only pesticides currently in use are rat poisons, because rats are the only pest which caused significant damage (to young palms only). Extensionists believe that pesticide use may have to increase in the near future as insects affecting palms become more common. A somewhat arbitrary figure of 50 pesos per hectare has been included in total costs in accordance with SAGAR estimates. About four jornales a year, or 100 pesos are budgeted for fertilizer and pesticide application. Including both labor and input costs, total maintenance costs amount to 3,010 pesos per hectare per year, or 3,310 pesos allowing for higher cleaning costs during the first four years. In addition, transport to the extraction plant costs an average 40 pesos per ton, which is not included in total maintenance cost in Table V.16, but is included in net present value calculations.

While good care is no guarantee for high yields, it is likely that frequent cleaning and fertilizer application will result in yields above the pessimist scenario described in the previous section. Farmers who have very low yields probably use less inputs, and therefore have lower costs than those in Table V.16. Thus, Table V.17 shows an alternative cost scheme for farmers with low costs. These farmers usually use mostly family labor for harvest and weeding, which reduces their cash needs, but does not lower cost in the economic sense. Therefore, the low cost scheme includes the same labor costs calculated previously. To reduce costs, these farmers economize on input purchases, using significantly smaller amounts of fertilizer or none at all. Many farmers currently spend about 500 pesos on fertilizer per year if they buy fertilizer at all. While herbicide use is very wide-spread to reduce the labor needed for cleaning, many farmers do not apply pesticides, and the low cost scenario does not include pesticide expenditures. Total maintenance cost under this cost scheme amounts to 1,830 pesos, roughly 40 percent below the initial scheme, or 2,130 pesos during the initial years.

Price Projections

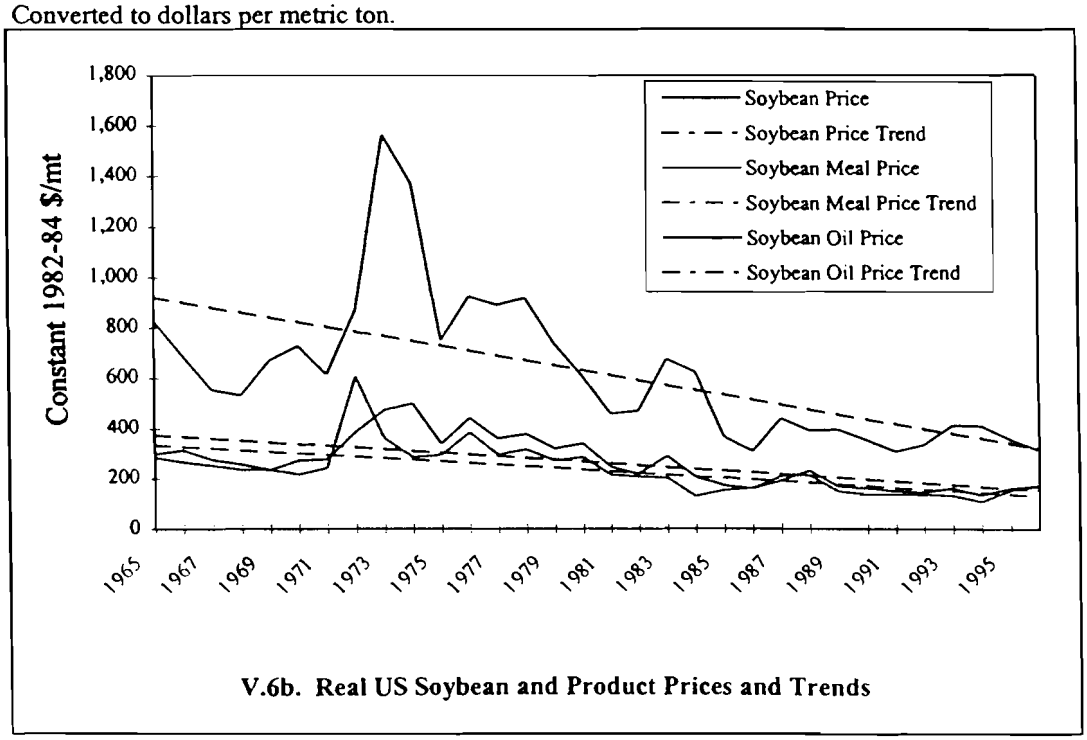
It is impossible to predict the prices of any agricultural commodity even for a few years into the future. However, for anyone investing in a long term project such as growing oil palm, future prices are an extremely important determinant of the net present value of the investment. Since the productive life of the oil palm is about 25 years, that is the relevant time frame for price projections in this case. The most reasonable estimates of future prices tend to start with a past long-term trend, and project it into the future, modifying for expected changes in demand and supply. In its *International Agricultural Baseline Projections to 2005*, the ERS (USDA) expects the prices of all major commodities to continue falling until 2005 in real terms, although at a slower rate than past long-term trends due to strong growth in world demand. These projections are based on assumptions of economic and political stability. They were elaborated before the Asian crisis of 1998, and may thus overestimate the growth of global demand, which would tend to bias prices upward.

The Mexican vegetable oil price will most probably continue to be determined by the price of US soybeans, the country's principal source of vegetable oil. Historic soybean and product prices are shown in Figure V.6. Current prices in V.6a vary considerable, but overall increase with inflation. Figure V.6b thus shows the same prices adjusted for inflation, with their respective trends. The Figure shows that prices have a definite downward trend, interrupted by the typical peak during the early 1970s which corresponds to the world food crisis. Since it is hard to compare the trends in the Figure, Table V.18 shows past price trends for soybeans and products. Soybean oil prices are falling faster than the prices of soybeans or meal. The reason for this faster decline in oil prices is that soybeans are usually crushed primarily for meal. Demand for animal feed is growing very fast, so that meal prices are falling more slowly than oil prices worldwide. Meal prices are decreasing at an even slower rate than soybean prices. Figure V.7 illustrates different projections for soybean prices until the year 2005 from the literature. Overall, the USDA estimates are much more optimistic than World Bank projections. Table V.19 shows the average annual price change between 1997 and 2005 associated with each projection, and thus gives an idea of trend expected for the future.



V.6a. Current US Soybean and Product Prices

Source: USDA (ERS): *Oil Crops Situation and Outlook Yearbook.*
Converted to dollars per metric ton.



V.6b. Real US Soybean and Product Prices and Trends

USDA (ERS): *Oil Crops Situation and Outlook Yearbook.*
Converted to constant 1982-84 dollars per metric ton

Figure V.6. US Soybean and Product Prices and Trends

Table V.18. Past Real Soybean and Product Price Trends

Item	Average Annual Price Change (%) 1965 - 1996	1975 - 1996
Soybean Oil	-2.0	-2.8
Soybeans	-1.4	-1.3
Soybean Meal	-2.3	-2.0

Source: Based on Figure V.6.

Table V.19. Expected Real Future Soybean Oil Price Trends

Projection	Average Annual Price Change (%)
World Bank: high estimate	-0.8
World Bank: middle estimate	-1.2
World Bank: low estimate	-3.7
USDA: US price	+0.2
USDA: international price	+0.8

Source: Based on Figure V.7.

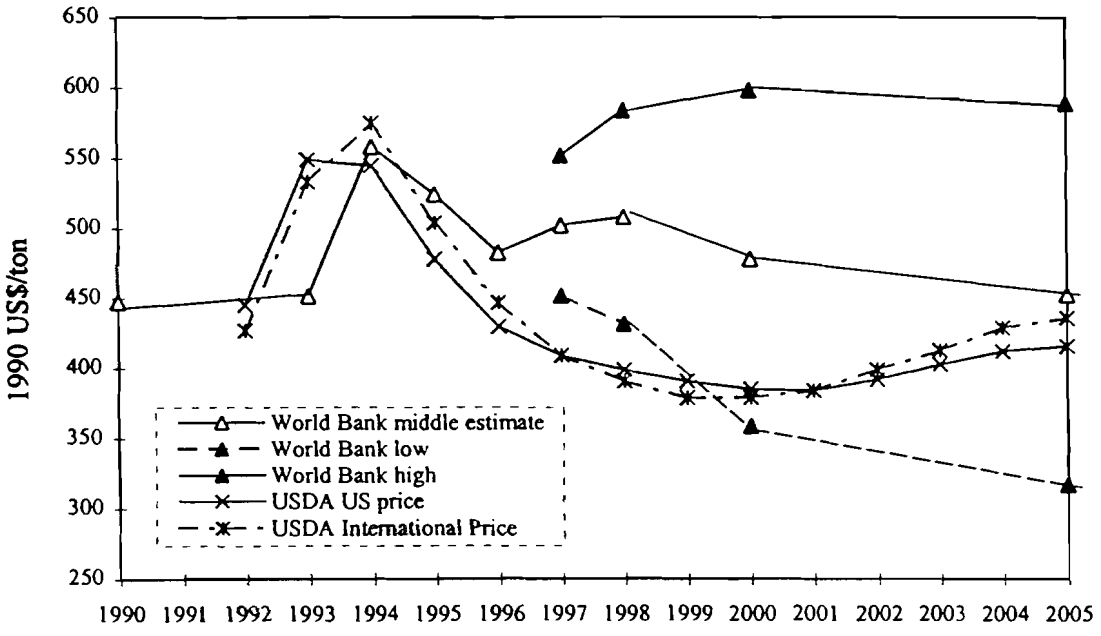


Figure V.7. Soybean Oil Price Projections

Sources: World Bank 1991. *Price Prospects for Major Primary Commodities,* 1990-2005, and *Commodity Markets and the Developing Countries.*
ERS/USDA 1997. *International Agricultural Baseline Projections to 2005.*
Converted to constant 1990 dollars per ton.

The large difference between these projections gives an idea of the difficulty in reaching a reliable projection. For my three price scenarios, I chose one cautiously optimistic case based on the USDA projection for the US, which projects prices to increase by 0.2 percent per year. The second scenario is based on the long term trend since 1965, where prices decline by two percent per year. Finally, the worst case scenario projects prices to fall by 3.2 percent annually. Figure V.8 shows these three scenarios, and historic US soybean oil prices since 1965. The last case is based on the World Bank's more cautious projections. My middle scenario is more pessimistic than the World Bank's. Since overestimating prices could lead to substantial losses for farmers and investors, it seemed more prudent to err on the pessimistic side, which would lead to higher profits than anticipated.

To translate these soybean oil prices into palm oil prices, I assume that in Mexico the margin between the two oils will stay constant over the period of analysis. In July of 1997, the price for crude palm oil in Mexico was about 545 dollars (4,200 pesos), which is very close to the US soybean price for 1997. It is difficult to predict the development of this relationship. On one hand, health concerns may depress the price for palm oil since it is mostly saturated. On the other hand, as more palm oil becomes available, demand for uses such as margarine, where solid oils have an advantage, may increase. Since it is hard to say which trend will predominate, I assume they will cancel each other out more or less. An additional source of insecurity is the relationship between palm oil and fresh fruit bunch prices. In July 1997, the fresh fruit bunch price (58 dollars, or 450 pesos) was about 11 percent of the crude palm oil price. This relationship depends on the processing technology and on the institutional arrangement between farmers and industry, which has not been determined. It is likely that processing efficiency will improve with larger scale plants. How much of this gain will be passed on through higher prices to farmers is uncertain, particularly if the new plants develop some market power. I therefore assume that the relationship between palm oil price and fresh fruit bunch price will stay constant as well. Thus, in the net present value analysis I apply the projected rates of soybean oil price decrease to fresh fruit bunch prices. If the relationship between the prices that my analysis is based on should not be representative of the true relationship in the future, my projections are easily adjusted up or down.

Before beginning oil palm net present value analysis, a brief section on maize will be useful for comparison. Since maize is the crop most widespread both among present and future oil palm growers, comparing the profitability of maize to that of oil palm gives a sense of the alternatives available to farmers.

Maize Profitability Over Time

As the farm budgets showed, the profitability of maize varied considerably from farmer to farmer. Therefore, I used a whole range of yields to calculate net present values (NPVs) for comparison with oil palm profitability. Table V.20 shows one example to illustrate how net present values are obtained. The profitability of maize is evaluated over the productive lifespan of oil palms, taken to be 26 years. By convention, the first year is defined to end after the initial investment expenditures. Therefore, in the first year there are only maize planting costs, no benefits. The costs of 1,200 pesos per planting season are defined based on information from farmer surveys. After year one, each year contains two planting seasons, and therefore twice the cost, or 2,400 pesos.

Compared to information presented in farm budgets in section B, these costs seem somewhat high. The difference stems from the treatment of family labor. In the farm budget analysis, only costs actually paid in cash were included. Here, family labor is valued at minimum wage to represent economic costs. In reality, costs vary considerably across farmers, but for simplicity only one cost scenario was taken into account for maize. Table V.20 shows yields, assumed to be constant over the years, and prices, which multiplied give revenue. Revenues minus costs give the net income from one hectare of maize each year.

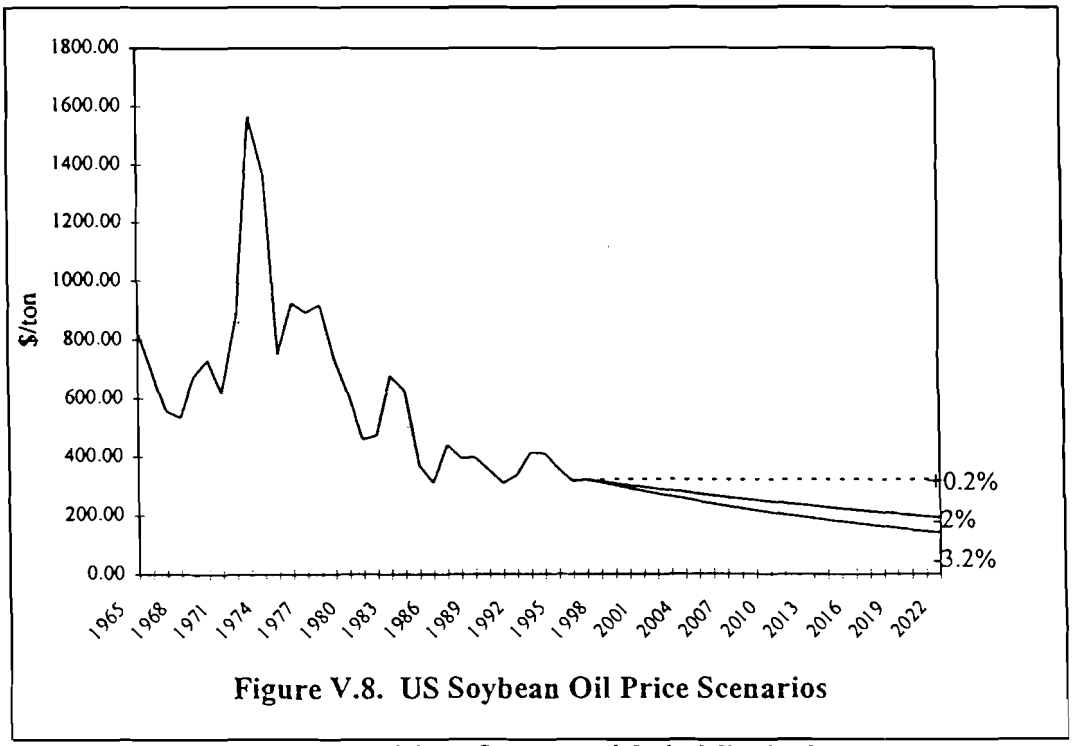


Figure V.8. US Soybean Oil Price Scenarios

Source: Based on USDA (ERS): *Oil Crops Situation and Outlook Yearbook.*

Table V.20. Maize Net Present Value
(in *1997 pesos*)

Year	Yield (tons)	Price	Revenue	Cost	Net Income	Present Value
1	0	1300	0	1200	0	-1200
2	4	1300	5200	2400	2800	2500
3	4	1300	5200	2400	2800	2232
4	4	1300	5200	2400	2800	1993
5	4	1300	5200	2400	2800	1779
6	4	1300	5200	2400	2800	1589
7	4	1300	5200	2400	2800	1419
8	4	1300	5200	2400	2800	1267
9	4	1300	5200	2400	2800	1131
10	4	1300	5200	2400	2800	1010
11	4	1300	5200	2400	2800	902
12	4	1300	5200	2400	2800	805
13	4	1300	5200	2400	2800	719
14	4	1300	5200	2400	2800	642
15	4	1300	5200	2400	2800	573
16	4	1300	5200	2400	2800	512
17	4	1300	5200	2400	2800	457
18	4	1300	5200	2400	2800	408
19	4	1300	5200	2400	2800	364
20	4	1300	5200	2400	2800	325
21	4	1300	5200	2400	2800	290
22	4	1300	5200	2400	2800	259
23	4	1300	5200	2400	2800	231
24	4	1300	5200	2400	2800	207
25	4	1300	5200	2400	2800	184
26	4	1300	5200	2400	2800	165
					Total Net Present Value = (Discount Rate = 12%)	**20,761**

Source: Based on Wolff, C., 1997. *Fieldnotes.*

This net income is discounted by a factor of 12 percent each year to yield the present value[9], and the present values add up to total net present value.

Maize prices were discussed in some detail in Chapter III. As Figure III.1 (p.35) showed, Mexican maize prices fell as a result of policy reforms. It is difficult to predict how these prices will continue to behave in the future. Therefore, I consider a range of possibilities in the net present value analysis, including annual decreases between one and four percent. Since in 1995, Mexican floor prices for white maize were slightly below international prices, I also include the possibility that prices remain constant. Using tables similar to V.20 for each combination of scenarios, I calculated a range of maize NPVs. They are represented graphically in Figure V.9. The maize production scenario with a yield of four tons per hectare that is represented in Table V.20 is marked by a cross in the figure; I use the net present value associated with this scenario for comparisons with oil palm. While the four-ton yield is about average for the Soconusco, the assumption that real prices will not fall in the future is fairly optimistic. If maize prices should fall in the future instead of remaining constant, maize would compare even *less* favorably to oil palm. Choosing an optimistic scenario for maize thus tends to underestimate the advantages of oil palm, which is more prudent than overestimating these advantages.

Oil Palm Profitability

Using the projections described above, I calculated the net present value associated with different price, cost and yield scenarios. The net present value resulting from each combination of price, cost and yield scenarios is calculated in a table very similar to the ones used for maize net present values. Table V.21 is an example which illustrates the methodology. It represents the most optimistic price and yield projections, combined with the higher cost scenario. The first column shows the age of the palm. The palms are planted in the field at the end of year one, which, again by convention, includes all the establishment costs but no revenues. In reality, farmers are growing maize (or another crop) on these fields every year even before the start of the project. However, since the maize income would be the same in both the maize and the oil palm cases, the omission does not cause distortions. The second and third column show yield and price developments under the current assumptions. Revenues are yields multiplied by prices; and adding revenues from oil palm and maize, and subtracting costs gives net income. Discounted net income is shown in the present value column, which adds up to total net present value, 41,691 pesos in this case.

Since comparing the net present values from all scenarios just using tables is extremely confusing, I have summarized them in four graphs in Figure V.10. On the left hand side, V.10a and V.10b represent the higher cost scenario, while V.10c and V.10d show the lower cost scenario. The two graphs on the top, V.10a and V.10c, show the net present values as bars which are grouped according to yield scenarios, while V.10c and V.10d group NPVs by price scenarios. The graphs on the right hand side show that costs have a major impact on profitability. Under low cost assumptions, all scenarios show oil palm as more profitable than maize, except for the most pessimistic yield scenario combined with medium or low prices.

Under the higher cost scenario, maize compares more favorably to oil palm. Only the combination of high or medium prices with high or medium yields ensures that oil palm is more profitable than maize; the combination of low prices and optimistic yields, or medium prices and medium yields leads to a NPV about equal to that of maize. While this may not look too encouraging at first glance, one should remember that higher costs are associated with higher input use, which for example includes more fertilizer than the lower cost scenario. More fertilizer use would, at least on average, produce higher yields, so that the most

[9] Ideally, the discount rate should represent the opportunity cost of capital. During the 1990s, Mexico's exchange rate, interest rates, and inflation rate were notoriously unstable; therefore the 12 percent is somewhat arbitrary. According to Gittinger (1982), 12 percent is a common choice for project analysis. Since the same discount rate is used for both maize and oil palm profitability analysis, relative profitabilities are not affected.

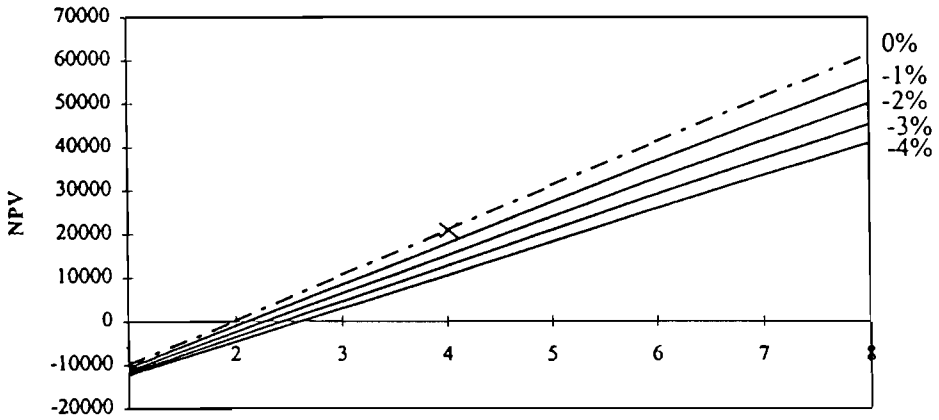


Figure V.9. Maize NPVs Under Different Price and Yield Scenarios
(in *constant 1997 pesos*)

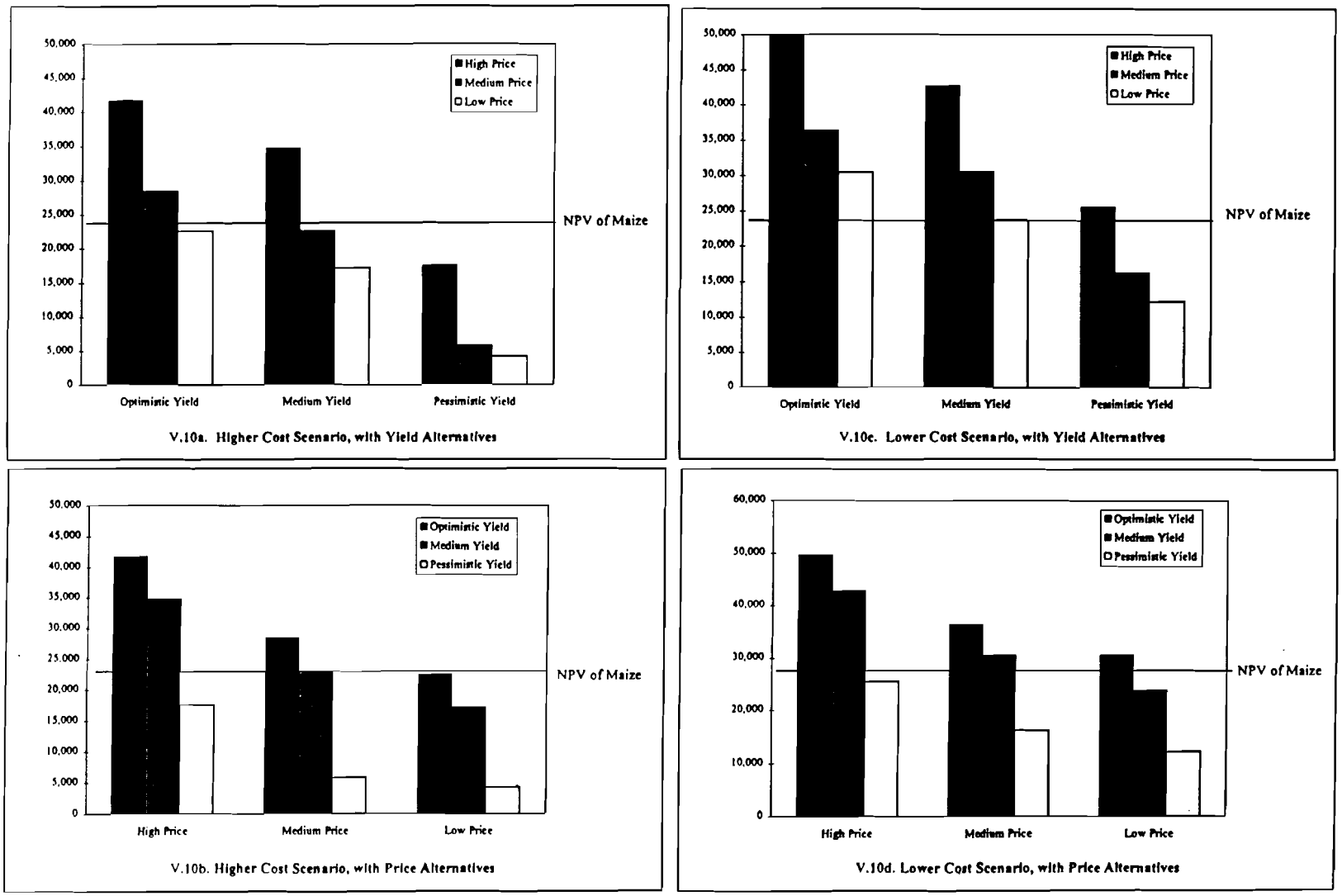
Source: Based on Wolff 1997. *Fieldnotes.*

Table V.21. Net Present Value of Oil Palm
(in *1997 pesos*)

Price Scenario 1: Annual Change = 0.2%
Yield Scenario 1: Optimistic Yield
Includes Subsidies

Year	Yield (*tons*)	Price	Revenue[a]	Corn Income[c]	Cost	Net Income	Present Value
1[b]	0	450	3903	-1200	4078	-1375	-1375
2[b]	0	451	900	2800	3310	390	348
3	2	452	904	2520	3390	34	27
4	8	453	3622	1008	3630	1000	712
5	14	454	6351	0	3870	2481	1576
6	24	455	10908	0	3970	6938	3937
7	27	455	12297	0	4090	8207	4158
8	30	456	13690	0	4210	9480	4288
9	30	457	13718	0	4210	9508	3840
10	30	458	13745	0	4210	9535	3438
11	30	459	13772	0	4210	9562	3079
12	28	460	12880	0	4130	8750	2515
13	28	461	12906	0	4130	8776	2253
14	28	462	12932	0	4130	8802	2017
15	28	463	12957	0	4130	8827	1806
16	28	464	12983	0	4130	8853	1617
17	25	465	11615	0	4010	7605	1241
18	25	466	11639	0	4010	7629	1111
19	25	466	11662	0	4010	7652	995
20	25	467	11685	0	4010	7675	891
21	25	468	11709	0	4010	7699	798
22	22	469	10324	0	3890	6434	596
23	22	470	10345	0	3890	6455	533
24	22	471	10366	0	3890	6476	478
25	22	472	10386	0	3890	6496	428
26	22	473	10407	0	3890	6517	383
						Total Net Present Value = (Discount Rate = 12%)	**41,691**

Source: Based on Wolff, C. 1997. *Fieldnotes.*
[a] In 1997, the price is 450 pesos ($58 44) per ton of fresh fruit bunches (FFB), increasing by 0.2% per year
[b] Revenues include a 900 peso ($116.90) subsidy during the first two years, plus the cost of the palms ($390), which are distributed free of charge.
[c] From intercropping (5 harvests during first 2.5 years), assuming a 10% loss in yield each year because of increased palm shade. As in the maize NPV table (V.18), the first year includes only costs. In any case, maize income would be the same in both the maize and the oil palm case, and can thus be excluded without leading to distortions in relative profitability.



Source: Based on Wolff 1997, *Fieldnotes*, and Figure V.5.

Figure V.10. Impact of Price and Yields Changes on Oil Palm NPV
(in constant 1997 pesos)

pessimistic yields scenario is unlikely to occur[10]. Likewise, while the optimistic yields scenario is not impossible combined with low costs, it is not as probable as under high costs. Since yields depend not only on input use, but also on soil fertility, climate, drainage, and other factors, adequate input use alone is no insurance for high yields.

Overall, yields and costs seem to have a bigger impact on NPVs than the price scenarios, although assumptions about price decreases of two or even three percent per year are quite drastic. This is encouraging insofar as it implies that even if the processing industry should have considerable market power and use it to depress producer prices, or if unpredictable developments in the palm oil markets should lead to price decreases, the viability of oil palm farming would only be affected in the most drastic scenarios, or if price decreases were combined with very low yields. On the other hand, the importance of yield developments highlights the need for effective technical assistance, including the availability of inputs, and treatment of diseases and/or plagues if they develop.

Costs are perhaps the most important factor affecting palm profitability. While my cost scenarios differ because of variations in input use, there are other factors which affect cost differences across farmers. The farm budget analysis showed that transportation constitutes a very important proportion of oil palm costs. Considering the impact of costs on profitability, there are great incentives to solving farmers' transport problems. If farmers themselves do not manage to organize for collective action and operate a transport cooperative, the new private processing plants could improve farmers' well-being and profit margins by picking up fresh fruit bunches from the fields, or from collection centers in the villages. Since timely processing has a big impact on oil quality, efficient organization of raw material delivery is also in the interest of processors.

What the difference in costs, yields, and prices means for profitability in any given year is illustrated in Figure V.11. Figure V.11a corresponds to the higher cost scenario, and Figure V.11b to the lower cost scenario. They both represent a static picture of profits from oil palm and maize in year 11. Maize profits of 2,800 pesos correspond to a yield of five tons and constant maize prices, the scenario presented in Table V.19 (p. 92). Each line represents the oil palm profits associated with one price scenario at varying yield levels. Recalling the yields in Figure V.5 (p. 88), in year 11 even the most pessimistic yield scenario was at 23 tons per hectare. At 23 tons per hectare, oil palm profits are above maize profits in all price scenarios, even in the (highly unlikely) worse than worst case scenario of a yearly price decrease of 4 percent and with high costs. With optimistic yields of 28 tons in year 11, farmers will be making a handsome profit in both the high and the low cost scenario. This static snapshot of oil palm profits thus shows what the net present values from Figure V.10 mean for annual profitability.

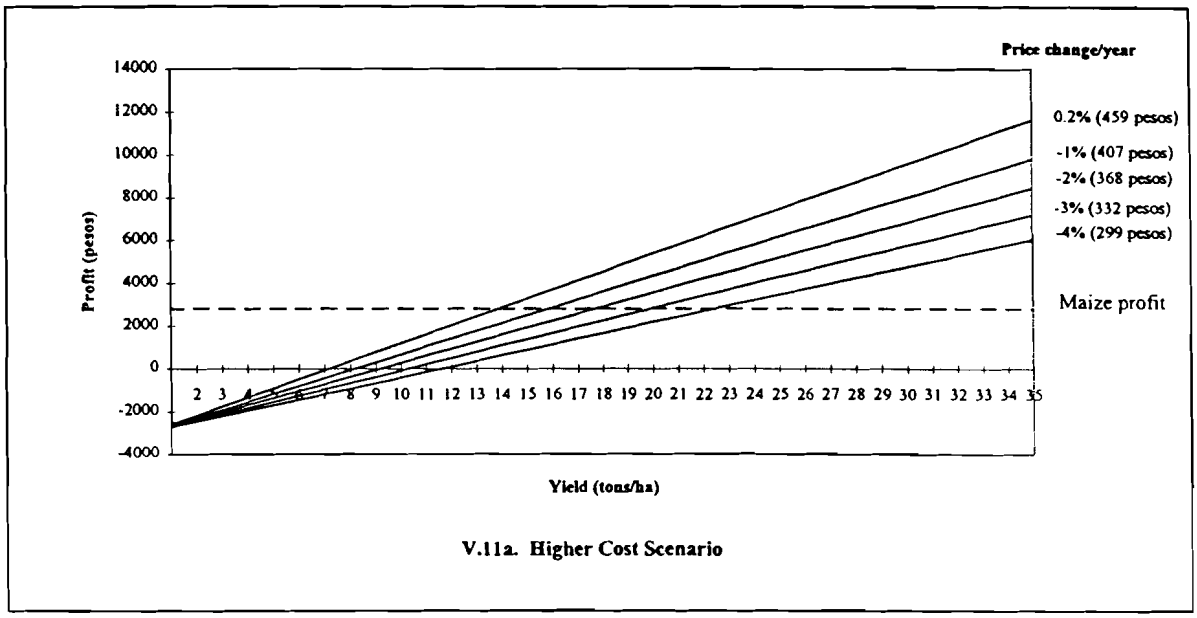
Section D. Conclusions on Profitability

Summarizing the results of this chapter, it is clear that oil palm has the potential to continue being a profitable crop for small farmers. The seven ejidatarios and one pequeño propietario surveyed who already grow oil palms all derive respectable gross margins from their oil palm fields, higher than those associated with corn, cattle, and most other cash crops represented in the sample. The oil palm farmers' standard of living has improved considerably in most cases, as shown by new cinder-block houses, trucks, and other vehicles. Almost all of these farmers were expanding their oil palm area in 1997. Their example

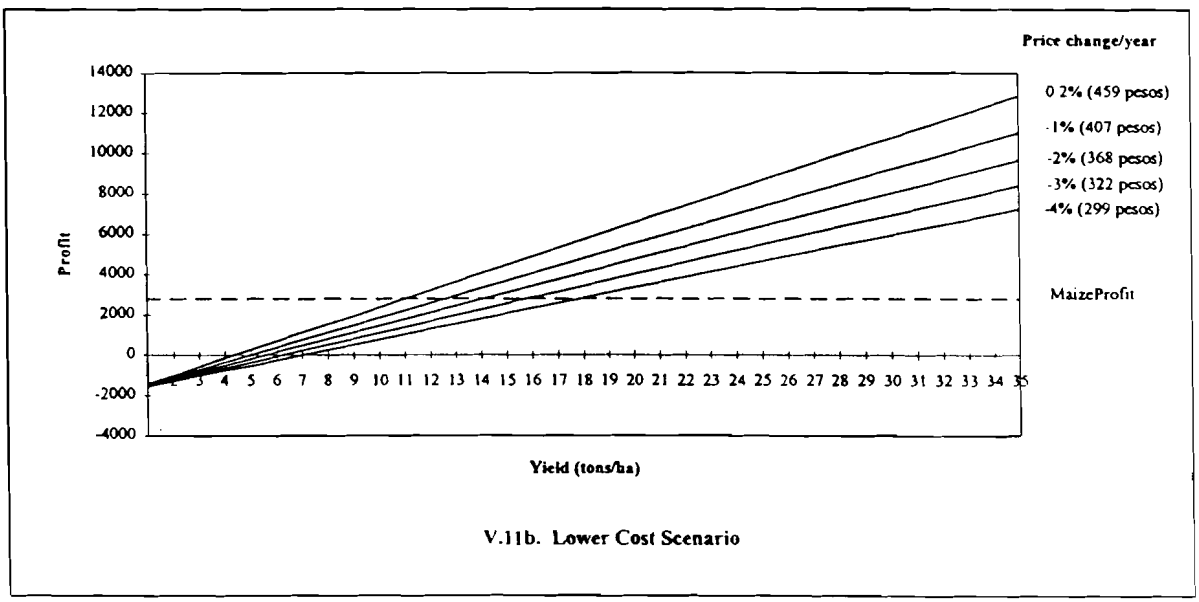
[10] There is an extensive literature on the fertilizer response of oil palms. The response to P (phosphate) depends on the soil. According to Zakaria *et al.* (1991) one kg of P fertilizer per palm leads to a yields increase of about one ton per hectare per year (more on inland soils, less on coastal soils). Another study of fertilizer responses in Sumatra finds that the optimum urea application rate (280 kg/ha) leads to a production increase of 3.9 tons per hectare per year, while the optimal phosphate rate (250 kg/ha) leads to a production increase of 5.3 tons per hectare per year (Tampubolon *et al.* 1990).

had a positive demonstration effect on other farmers in the area, and many hope to improve their economic situation by planting oil palm.

The forward-looking profitability analysis in Section C also produced positive results. It is hard to predict future profitability developments, which is why the projections in this chapter are explicitly based on a series of assumptions. Profitability per hectare of oil palm is generally high, except in extremely unfavorable price, yield, and cost scenarios. Compared to maize, returns from oil palm are high, even when ignoring risk and uncertainty, as was done in this study. Overall, the net present value of oil palm proved most sensitive to cost and yield variations. Only the most unfavorable price projections influence oil palm profits enough to jeopardize their viability for farmers.



V.11a. Higher Cost Scenario



V.11b. Lower Cost Scenario

Source: Wolff 1997. *Fieldnotes*, and Figure V.2.

Figure V.11. Impact of Price and Yields Changes on Oil Palm Profit
(in year 11, constant 1997 pesos)

Oil palms thus appear to be a profitable option for smallholders in the Soconusco that allows them to significantly improve their economic situation. The farmers' most vulnerable period is the gestation period, until palms become productive. In the sample scenario shown in Table V.21, palms do not start to produce a positive income until the fourth year, and profits are low until the fifth or sixth year. After the initial years, and especially once maize production declines and ends, the poorest farmers surveyed might encounter serious financial difficulties and cash flow constraints. They may be able to supplement their income through wage work, fishing, or by renting additional land to produce annual crops. If these supplemental income sources should not be sufficient, some kind of public assistance may be needed to avoid economic hardship for the families. Since lack of time and income can also have negative effects on future yields due to neglect of palm fields, the government may want to provide a continued cash subsidy, at least for the neediest. This could help to prevent a negative effect on income distribution in the area. Alternatively, the new private processing plants (as well as the old ones) could provide credit programs.

Government and/or processors could also have a big impact on farmer incomes by working on raising yields or lowering costs, especially for transportation. As was mentioned before, there is significant scope for benefits through better-organized transport, either in the form of a cooperative, or linked to extraction plants. Finally, extension services and facilitation of input supply may have a significant effect on yields, and thus raise profitability. Research and extension services will be especially important if the initial absence of serious disease and pest problems turns out to be transitional. In that case, continued viability may depend on the ability of these services to produce effective solutions and distribute them in a timely fashion.

Chapter VI
IMPLICATIONS AND RECOMMENDATIONS

The previous chapters have shown that oil palm can be a profitable crop for small farmers in the Soconusco. Chapters II through IV explored the market for vegetable oils, the Mexican policy environment, and institutional setups, and Chapter V evaluated returns to oil palm. But profitability alone is not a guarantee that oil palm will contribute significantly to regional economic development. Section A explores the impact of oil palm cultivation on regional development in the Soconusco. Finally, section B draws some recommendations from the lessons learned in the course of this study.

Section A. Implications for Rural Development in the Soconusco

As in many developing countries, structural adjustment in Mexico was more successful at reducing state intervention in the economy than at initiating a process of economic growth that would effectively reduce poverty. This is especially true in the agricultural sector; the dismantling of the complex system of parastatals, subsidies and support prices has not led to an immediate surge in private investment and growth. Both de Janvry *et al.* (1995) and Delgado (1998) would argue that structural adjustment is necessary, but not sufficient to promote growth in agriculture. Apart from a favorable policy environment, new, market-oriented institutions are needed. New marketing channels have to replace government marketing agencies. Furthermore institutions are needed to facilitate investment and information flows, and to provide services such as credit, insurance, extension, and input supply. These institutions can be public or private; most likely a combination of more effective public institutions and private-sector involvement will be required. In Mexico, the Ministry of Agriculture is thus for example actively promoting private investment in agricultural processing.

The oil palm project falls within this framework of increased private-sector involvement in agriculture. The combination of smallholder production with industrialized private processing promises to combine a positive impact on equity by raising smallholders' incomes with the advantages of large-scale processing and marketing. Furthermore, the private investors are expected to provide services such as extension, transport and possibly credit to the farmers. The processing company may thus be able to substitute for services formerly provided by the state. The project's impact on the regional economy will have two components: one is determined by the impact of oil palm cultivation on farmers and the other rural population, the other will depend on the institutional arrangement between farmers and the processing industry. The first component, the impact of oil palm, has already begun in the areas were farmers are growing oil palm, and could thus be partly observed. The second component depends on the institutional arrangement chosen, and is more subject to speculation.

So far, the major effect of oil palm has been to raise the income of farmers who cultivate them. Most of them spend their increased income on consumption goods such as televisions and radios Almost all oil palm farmers have a new house built with non-traditional materials, usually cinder-block. Some of them have also purchased vehicles such as trucks or tractors. Although farmers did not report this, they probably rent these vehicles out, increasing both their own income and the availability of transport and tractor services in the area.

Oil palm has also created a relatively steady demand for skilled labor for harvesting. Since this work is too heavy to be carried out by children, many farmers' children can stay in school longer than previously, usually through middle school and sometimes even high school. There was one case were the increased opportunity cost of family labor led the farmer to take his children out of school, which clearly is not desirable since it reduces the options available to the children later in life. Since this was only an isolated case, it may be more attributable to the father's personal philosophy than to a generalized trend. Overall, increased family income should lead to more time and resources to send children to school. In

addition to labor demand on farms, the processing plants employ a small number of permanent employees, in addition to temporary ones during peak production times.

Since the disposable income of many farmers' had increased, they also spent more in local businesses. One tendency seems to be to buy ground maize instead of grinding it at home; and buying some prepared foods or sodas. One pequeño propietario observed that since the ejido Luís Espinoza became involved in oil palm production, the number of "cantinas" (bars) in the area, including the nearby town Acapetahua had increased dramatically. Farmers seem to spend a considerable amount of money on beer in these cantinas. I could confirm this trend during my stay; after being paid the project subsidy at a bank in Acapetahua, for example, farmers tended to spend the rest of the day drinking in a cantina or at the market.

While farmers who grow oil palm experience income growth, this is not an equitable effect. Those farmers who have more land, an can afford to plant more of it to oil palm, tend to profit more from oil palm; thus economic stratification is maintained and even reinforced. The 1997/98 project made an attempt to be more progressive by subsidizing the initial costs of planting oil palm, and by distributing palms for free. While this certainly helped the more economically vulnerable participants, the area's poorest farmers were often unable to participate in the first place. The poorer farmers tend to live in the newer ejidos close to the coast, especially in Zone 3. They receive only five hectares of land on average. Since they are only beginning to farm, they are very dependent on the income from the land; often they grow mostly maize for own consumption. Planting a significant proportion of their land to a new, and in those areas relatively unknown crop is too great a risk. The soils in these new ejidos, which tend to be closer to the mangrove swamps on the coast, also tend to contain some salt, which makes them unsuitable for oil palm production. These ejidos are often relatively far removed, and transport costs to the existing processing plants would be prohibitive. Therefore these farmers would depend on the construction on a new plant in Zone 3. Since construction has not begun, farmers see this as an added risk. The oil palm project therefore excludes some of the poorest farmers. An attempt at including these poor farmers through an initial cash subsidy is made, but a subsidy better targeted at the poorest farmers could have a bigger impact, while not supporting the wealthier farmers' drinking habits.

The landless population in the area tends to be very poor as well, and they benefit only indirectly from the project, for example through employment on oil palm farms or at processing plants. The overall increase in farm income is likely to have an impact on the regional economy by raising effective demand, thus creating some additional employment. In the future, the oil palm scheme's economic impact will depend in large part on the processing industry, and its linkages to the regional economy. Since it is too early to observe these linkages in the Soconusco, examples from other parts of the world may be able to give some insight.

Since the institutional link between farmers and processors has not yet been defined, it is too early to evaluate their potential impact on regional development. Much will depend on relative bargaining powers, and specifically on the farmers' ability to demand participation in scheme profits. Vegetable oil processing typically does not have very important linkages to other industries, except possibly the production of oil containers. If investors decided to operate a refinery apart from oil extraction plants, a local industry for final oil products such as margarine or shortening could develop. Since the Soconusco is relatively far removed from the large consumption centers around Mexico City, this may economically not be viable.

Although oil palms do not promise an immediate end to poverty in the Soconusco, they can play a significant role in generating rural income. This will benefit primarily the oil palm producers themselves, but it will also spill over into the local and regional economy to some degree, and are thus a step in the right direction. Economically and ecologically sustainable rural income sources like oil palm allow smallholders to remain farmers, without pushing them off land and into migration as is happening in many areas of

Mexico. The full benefits of oil palm cultivation will only manifest themselves once more area has been planted, and local linkages have had a chance to develop.

Depending on its success at achieving its objectives, the oil palm project could make a significant contribution to the Mexican fats and oils market. Once the oil palms reach their highest yields in about 2005 - 2010, they will be producing about 30 tons of fresh fruit bunches or six tons of palm oil per hectare. If the oil palm project reaches its objective of planting about 50,000 hectares with oil palm by the year 2000, annual palm oil production will be around 300,000 tons by 2008, or around one fifth of total vegetable oil availability in Mexico in 1995. This would allow Mexico to reduce its vegetable oil imports by almost half their 1994 level, which implies significant foreign exchange savings. If only half of the projected area is planted, palm oil will still contribute one tenth of total availability, or replace one fourth of vegetable oil imports.

To get a sense of the opportunity cost of producing palm oil in Chiapas, I calculated the domestic resource cost of palm oil. The domestic resource cost compares the opportunity cost of domestic production to the value added it generates. Since assessing the opportunity costs of primary resources would be very time consuming, I compute the domestic resource cost for oil palm by comparing its gross value per hectare to the gross value per hectare of maize, both valued at world prices (Tsakok, 1990). Using 1994 prices in constant 1982-84 dollars for both commodities, the gross value per hectare of maize is 416 dollars (at a yield of four tons per hectare and a price of 104 dollars per ton); while the gross value per hectare of oil palm is 1,884 dollars (at a yield of 6 tons of oil per hectare, and a price of 314 dollars per ton of palm oil). The domestic resource cost in this case is 0.22, which means that the opportunity cost of one dollar used for palm oil production would have generated only 22 cents in maize production. Using the more cautious palm oil yield of 5 tons per hectare, the domestic resource cost increases to 0.26, which is still extremely favorable for palm oil. While this is only a rough approximation to the domestic cost of generating (or in this case saving) one dollar of foreign exchange, it shows that palm oil production in the Soconusco is a productive use of the area's resources, and that it is viable not only from a private, but also from a social point of view.

Section B. Recommendations

Much of the success of the oil palm project in Chiapas will depend on the institutional arrangement that will link growers and processors. Apart from profitability itself, the institutional link affects the distribution of benefits, and, as described in the previous section, the impact on the regional economy. As was mentioned in Chapter IV, other countries' experiences with smallholder oil palm production and with vertical integration in agricultural production can give helpful insights for the Soconusco.

If a contract farming arrangement is chosen, it is important to adapt the contract to local conditions as much as possible. For farmers it will be important to secure some bargaining power to avoid unfavorable price setting. The shareholder arrangement, where farmers own part of the processing plant, is more conducive to giving farmers some influence on management. This was discussed in more detail in Chapter IV. It is worth repeating here that ultimately, the farmers' bargaining power determines their benefits from the oil palm scheme, and thus the survival of the scheme. The Malaysian experience with the FELDA schemes shows how important it is to be flexible, and able to adapt institutional setups to local preferences. It is therefore in everyone's best interest to establish transparent channels for negotiation and communication. This is aided by the existence of farmers' organizations, the formation of which should be promoted. The processing companies should also hire locals for all possible positions because it facilitates communication with farmers (Porter and Phillips-Howard ,1997).

Since the share of benefits received by farmers can be the same under the shareholder and the contract farming arrangement, farmer wellbeing depends more on their bargaining power than on the setup chosen. However, since the shareholder arrangement necessarily gives farmers a voice in management, this

is the institutional setup I recommend. It is more likely to lead to flexibility, transparency and effective communication, and it fulfills farmers' wishes to own a share of the processing plant. If farmers are content with their institutional arrangement, the oil palm scheme has the greatest chances of being successful.

The Ministry of Agriculture has carried out the financial analysis of extraction plants under different institutional arrangements (SAGAR 1997b). The analysts reach the conclusion that oil palm processing is a very profitable enterprise. The internal rates of return vary between 24 percent and 35 percent, depending on whether the investors also run a nucleus estate to produce some of the raw material or not. Since these are quite comfortable rates of return, the processors can afford to provide incentives for farmers to increase the quality of their plantation, and to plant additional area to oil palm. In the long run, higher yields and volume of production will lead to greater cost effectiveness through economies of scale.

Chapter V mentioned that transportation accounted for a large fraction of farmers' oil palm production costs. The cost of transport lead farmers to harvest less frequently than desirable for quality reasons. Thus, a well-organized transport system, including fresh fruit bunch pickup by processing company trucks, for example from village collection centers could lower these costs, while simultaneously ensuring fruit freshness and timely delivery. Some part of the transport problem has its roots in poor infrastructure, namely bad roads and few bridges. Farmers themselves work on access roads to enable trucks and tractors to pass. The processing company may be better able to work on infrastructure improvement, or to lobby the government to invest in local infrastructure. This would increase farmers' margins from oil palms sales, and increase cost efficiency over all.

There will be a continued need for extension services, even when oil palms have all been planted. The Mexican government is planning to withdraw from extension and technical assistance once the new private processing plants start operating. In order to ensure high yields, the new private extensionists need not only to educate farmers about proper fertilization and so on to ensure high yields, but they should also prepare for the appearance of pests and diseases. While the Soconusco has so far been spared, in Colombia for example farmers lose significant revenue due to palm diseases. Some cooperation with government or private research stations will be required to find adequate treatments for these pests and diseases when they appear. Successful oil palm producers around the world all have a governmental research organization, notably Malaysia's PORIM (Palm Oil Research Institute of Malaysia). While there is no reason that private researchers cannot provide this service, the incentive to invest in such an organization may only arise when it is too late. Some foresight could prevent substantial losses later on.

During the next few years, the existing PAPA extension service should take care to follow up especially on the poorest oil palm farmers' welfare, to insure that they are able to survive the gestation period without additional assistance. Furthermore, it is important that all farmers be taught the proper care of oil palms, especially those who planted their first palms in 1997/98. If farmers fail to take appropriate care of the palms while they are growing, their growth will be delayed and they may never reach their full yield potential. In many areas, palms are intercropped with a leguminous cover crop. This practice not only reduces the need for fertilization because the cover crop fixes nitrogen in the soil, it also protects the soil from the direct impact of the weather, which can be damaging until the palm canopy is dense enough. Furthermore, cover crops reduce the need for weeding, which can further contribute to lowering production costs.

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APPENDIX A

Sample Interview Form (filled out during a conversation with the farmer)[1]

Name:_____

Zone:_____

Ejido:_____

House material: wood____palm_____bamboo____brick_____cinder-block___

Location of house: in ejido village_____by parcela_____

Total land area:_____

Number of family members in household:_____

Number of children: boys_____girls_____

- studying_____
- working off farm_____
- working on farm_____

Wife/husband's occupation_____

Does farmer engage in wage labor?_____When?____No. of days/month_____

Does the farmer own a vehicle?_____bicycle_____ox cart_____pickup truck

_____truck_____tractor

Member in extraction plant?_____Which?_____

Utilities/comments_____

[1] Translated from Spanish.

Crops

Which?				
Ha				
Yield				
Amount sold				
Sold where?				
Price				
Transport cost - how?				
Seed cost				
Fertilizer cost and amount used				
Pesticide cost and amount used				
Labor cost and days: - sowing - weeding - harvest - other				
Machine rental costs				
Other costs				
Differences: second season?				

Livestock

Type of animal:_____

How many?_____

Sales: how many? _____When?_____

Price:_____

Costs:_____

_____

Comments:

Backyard Activities

	For own consumption	For sale (amount and price)
Poultry: - chickens - ducks - turkeys		
Pigs:		
Fruit: - coconut - mango		
Vegetables and others		

Comments:

Oil Palms

Planting how much?_____

Will intercrop with corn?_____

(Are palm well taken care off? Weeding etc.: observed):_____

Does he plan on keeping up with weeding etc.?_____

Has the farmer ever had palms before?_____

Comments:

If he had palms and destroyed them: Area:_____

When planted/destroyed?_____

Prices and costs at the time:_____

Comments:

Expenses

Maize purchases: how much?_____when?_____

Where do they shop?_____

_____

_____

How has the devaluation affected them?_____

Which prices?_____

_____

General Opinions

How has the ejido reform affected them?_____

_____

- the area?_____

_____

_____

Has a lot of land been sold?_____

_____

_____

Is there anything else you think I should know/ include in my study?_____

_____

_____

Any general comments?

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