COMPETITIVENESS, EFFICIENCY AND POLICY IN MODERN IRRIGATED AGRICULTURE IN THE STATES OF SONORA AND SINALOA, MEXICO

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Competitiveness, efficiency and policy in modern irrigated agriculture in the states of Sonora and Sinaloa, Mexico

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THE UNIVERSITY OF ARIZONA, 1987

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COMPETITIVENESS, EFFICIENCY AND POLICY IN MODERN IRRIGATED AGRICULTURE IN THE STATES OF SONORA AND SINALOA, MEXICO

by

Beatriz Avalos Sartorio

A Thesis Submitted to the Faculty of the

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TABLE OF CONTENTS

TABLE OF CONTENTS--Continued

TABLE OF CONTENTS--Continued

LIST OF TABLES

LIST OF TABLES--Continued

LIST OF TABLES--Continued

LIST OF TABLES--Continued

LIST OF TABLES--Continued

LIST OF ILLUSTRATIONS

ABSTRACT

The states of Sonora and Sinaloa have been benefitted by massive public investments in agriculture, through the development of large-scale irrigation projects, complemented by research, input, and credit programs, since the 1940s. Today, they have the largest composition of modern versus traditional farms. The Policy analysis matrix was used to measure private profitability (competitiveness), social profitability (efficiency), and policy transfers for the major irrigated agricultural systems, under two main land tenure systems: ejidos and private farms. Basic staple and oilseed systems were socially profitable, although less than systems that produce for export (vegetables, cotton and chick-peas). The former were not always privately profitable; substantial subsidies for tradable inputs and capital were more than offset by output taxes. Pronounced inequities in income distribution between ejidos and private farms exist, in spite of specific policies intended to increase profitability of ejido agriculture. Differential access to credit and markets for the most profitable crops, and an average three-fold difference in farm sizes largely explain income differencials within the modern farm sector.

CHAPTER 1

INTRODUCTION

Economic Policy and the Evolution of the Mexican Ecomomy

Mexico's industrialization began in the 1940s under an import-substitution model. Initially, the model was successful in provoking economic growth. The period from 1959 to 1970 is commonly referred to as the "Mexican miracle", with an average annual growth rate of 6.5%, and an inflation rate between 4% and 5% per year. Prices of both private and public goods and services were largely constant, (Villarreal). In order to control inflation and stimulate private industry the accounts of public enterprises and institutions were sacrificed; mainly those of the Mexican Petroleum Company (PEMEX), the Federal Electric Commission (CFE), and The National Company of Popular Sustenances (CONASUPO), (Davila). The period marked the beginning of an explosive growth of all types of subsidies. Also, a system of protection against imports was developed to shield domestic production against competition from abroad; import licences constituted the main instrument of trade control, (Weintraub).

Because the exchange rate was fixed, a growing disequilibrium in foreign accounts required foreign

investment and loans from abroad. Foreign debt and the trade deficit continued growing until the late 1970s, reaching magnitudes of 4,500 and 20,000 million dollars, respectively, by 1976. In that year, the Mexican peso, which had remained at P12.50 per US dollar since 1954, devalued to P19.70 per US dollar. Also, Mexico required the support of the International Monetary Fund (IMF) so that the inflow of international capital would continue. In turn, the government agreed to implement a series of reductions in government deficit and trade liberalization policies, (Villarreal).

The discovery of large oil reserves in 1978[1] and the consequent boom in oil exports enabled Mexico to "escape" the IMF agreement, and recover its image in the international financial community.[2] The annual growth rate of the economy rose from 3.5% in 1977 to an average of 8% from 1978 to 1981. Yet, in spite of the Mexican government's intentions to use revenues from oil exports as a "lever" for economic development, the economy became increasingly

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1. Mexico's proven oil reserves grew by more than a 1000% from 1975 to 1981; from 6.3 billion barrels to 72 billion, which increased its ranking to fourth in the world, (Rizzo).

2. In spite of these favorable events, Mexico started to systematically replace import licences with import duties, with the intent of making tariffs the main instrument of protection. By the end of 1979 about 80% of Mexico's 7,946 tariff items had been freed from the prior import licence requirement, (Weintraub).

dependent on oil. The share of oil export revenues in the total value of exports went from 16.09% in 1975 to 71.35% in 1981, (Solis, 1984). Oil revenues became the main instrument to offset continued trade and government spending deficits, (Villarreal). The abundance of financial resources permitted the continuation of subsidies. The average nominal annual increment in subsidies was of 42.5% from 1970 to 1981; GDP's was only 26.5% in the same period. The share of subsidies in GDP increased from 3.6% in 1970 to 13.4% in 1981, (Davila).

As world oil prices fell, the economic crisis became profound: the government deficit amounted to more than 15% of GDP, foreign debt reached nearly 80,000 million dollars, and annual inflation rose from 30% to 60%. The growth rate of the economy fell from 7.9% (in 1981), to -0.2%;and by August of that year the value of the peso in the free market had fallen to P83.50 per US dollar[3]. On the following September 1st the outgoing Mexican president Jose Lopez Portillo decreed a generalized currency exchange control and, along with it, the nationalization of the Mexican banking system, (Aguilar).

Lopez Portillo's succesor, Miguel de la Madrid started his administration with the presentation of a

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3. At this time, an official, double parity system was established; one called "preferential", at P49.50 per US dollar, devoted to first priority imports; and a second one at P69.50 per US dollar, for second-priority imports.

long-run plan of social and economic structural change. National Development Plan (PND) for 1983-1988, which included an Immediate Program of Economic Reordering and a Three main objectives of economic reordering were proposed: The abatement of inflation and currency exchange market instability; the protection of employment levels, domestic industry and basic consumption[4]; and the recovery of economic growth under a "different basis than that of the past." To achieve these goals, a number of policy changes were proposed: a decrease in the growth of government spending; the creation of employment in rural areas, and the protection of domestic industry to maintain present employment levels; the protection and stimulation of programs of basic foodstuff production, importation, and distribution under a "more rational subsidy structure"; an increment in government, income through tax reforms and rises in fees charged for public goods and services; a reduction in credit availability, and its allocation to development priorities; and the continuation of currency exchange rate and trade controls, among others, (PEF).

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4. The protection of employment and basic consumption are critical to social, and thus, to political stability in Mexico, where the Confederation of Mexican Workers (CTM) acts as the national labor party, and has significant control over the urban labor force.

Signs of economic recovery appeared through 1984 and 1985. By 1985, the share of the government in GDP was cut to 9.6%, and the growth rate rose to 4.0%. Inflation rates went from 101.8% in 1983 to 52.8% in 1984 and 63% in 1985, (Banamex, 1985).

Policy and the Agricultural Sector

From 1930 to 1960 Mexico's agricultural sector was able to satisfy domestic demand needs and to generate surpluses for export. Agricultural production grew at an average annual rate of 4.8%, surpassing that of the population (2.5% per year). Increments in cultivated area averaged 2.5% per year, and those of physical yields per hectare averaged 1.9% per annum, (Silos).

Dynamism was lost during the 1960s. The average growth rate of production decreased to 3.1% per year, due primarily to a slowdown in growth of cultivated area, which fell to 1.3% per year, and secondarily to diminished annual increments in yield, which averaged 1.7%. Meanwhile, the population growth rate increased to 3.4% and GDP per capita grew at an average rate of 3.4% per annum. Production continued to lag behind during the 1970s, averaging 2.0% annual growth rates, while those of population and GDP per capita surpassed 3.5% and 3.3%, respectively, (Silos and IMF). With guaranteed prices that grew at a real rate of less than 1% per annum (see Table 1, below), production

Table 1. Guaranteed Prices for Basic Staples and Oilseeds, 1970-1985.

Crops	Years 1970	1979	1980	1981	1982	1983	1984	1985	70-79	79-81	81-82	82-83	83-84	84-85
	Real Pesos/Mt a/								Annual growth (percent)					
Corn	2,910	2,944	2,981	3,428	2,915	3,133	2,907	2,469	0.1	0.1	1.6	-1.8	0.8	-0.8
Wheat	2,477	2,538	3,081	3,297	2,512	2,970	2,692	2,018	0.3	2.2	0.8	-3.0	1.9	-1.1
Rice	3,406	2,792	3,014	3,401	3,096	3,426	3,131	2,244	-2.2	0.9	1.4	-1.0	1.1	-1.0
Beans	5,418	6,345	8,038	8,373	6,950	5,384	4,578	3,852	1.8	2.7	0.5	-2.0	-2.8	-1.8
Sorghum	1,935	1,976	1,942	2,057	1,913	2,056	2,268	1,602	0.2	-0.2	0.6	-0.8	0.8	1.1
Soybeans	4,489	5,415	5,358	5,652	5,040	5,058	5,522	5,022	2.1	-0.1	0.6	-1.3	0.0	1.0
Sesame	7,740	7,657	6,062	8,124	6,884	8,158	10,847	9,417	-0.1	-2.6	3.3	-1.8	1.9	3.2
Safflower	4,644	4,230	5,090	4,082	3,340	4,307	3,797	3,955	-1.0	2.1	-2.4	-2.2	2.9	-1.4

a/ Deflated by the general CPI for Mexico, 1978=100. (See Appendix B, Table B.2)

SOURCE: - Silos, J. (1982) "El comportamiento Economico del Sector Agricola y Perspectivas para los Ochentas." In: Gonzalez, H., editor, El Sistema Economico Mexicano; un Analisis de su Situacion. Mexico.
- CONASUPO (1986) internal documents, (mimeographed). Mexico.

shifted from basic crops to more profitable ones,[5] and demand had to be increasingly satisfied through imports;[6] exports fell; rural unemployment increased; and unsatisfactory living conditions persisted for a large proportion of the rural population. In part, the above problems reflected the consequences of an uneven pattern of development of the sector. Until the mid 1970s public policy concentrated on the creation of a modern agriculture from essentially virgin regions; attempts to develop and modernize traditional agriculture were almost nonexistent. The benefits of public investments and modernization were distributed among a limited number of farmers, (SP).

In spite of a series of efforts to improve production, which were undertaken by the federal government since the mid-1970s, production was not able to keep up with the rapid growth in consumption. The satisfaction of domestic demand of basic staples and oilseeds became increasingly dependent on imports. From 1976 to 1980 the

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5. In 1925, 6 million hectares of cultivated land had produced 9 million tons of corn, wheat, and beans for a domestic population of 16 million. Fifty four years later, in 1979, the cultivated surface increased to 15 million hectares, but only twice as much grains were being produced (19 million tons), for four times the population (65 million), (Redclift).

6. In previous decades imports of basic grains had never been more than 8% of total grain production, but between 1970 and 1979 imports rose to an average 18% of production, (Redclift).

share of volume imported in domestic consumption increased from 10% to 23% for corn; from 0.1% to 23% for wheat; from 0% to 24% for rice; from 0% to 31% for beans; from 1% to 32% for sorghum; and from 54% to 63% for soybeans. (See Appendix B, Table B.4) Official studies conducted in the late 1970s foresaw further increases in food imports of 11.6% per year during the 1980s. On this basis, Mexico would be spending over 34% of the foreign exchange generated from oil exports on food imports by 1982, and by 1990 the share was projected to reach 72%, (Redclift).

Response to the problem came on March 1980, already late in Lopez Portillo's administration, in the form of an ambitious food program -- the Mexican Food System (SAM). The SAM was based on two major objectives: First, the state committed itself to providing the financial and material resources necessary to increase the production of basic foods, with the objective of regaining self-sufficiency in corn and beans by 1982, and in wheat, rice, sorghum, soybeans, sesame, and safflower by 1985.[7] Agricultural production among private small holders and ejidatarios would be revived through their organization and subsidization. Guaranteed prices would be raised; there would be greater

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7. The search for self-sufficiency in basic staples and oilseeds, most of which were (and still are) imported from the United States was also a search for greater independence of action in other issues; namely, energy policy and the migration of Mexican labor to that country.

access to credit, at lower interest rates, for producers of basic staples and oilseeds; fertilizer and pesticide prices would be reduced by 30%, and those of improved seed by 75%; there would be a 2/3 cut in crop insurance premiums and an increase in the area covered by this service; the government would "share the risks" of production, assuring producers of an income even if the harvest were to fail. The second major objective of the SAM was to improve the diet of a target population of 19 million, through the distribution of a "basic-food basket" at low, subsidized prices. On the whole, the SAM was expected to cost nearly seven billion dollars between the time it was implemented and the end of Lopez Portillo's administration in December, 1982, (Spalding and Grindle).

Implementation of the SAM started immediately, and through 1981 resources allocated to producers of basic staples and oilseeds increased dramatically in nominal and real terms. From 1979 to 1981, real guaranteed prices increased at an average annual rate of 9.8% for basic staples (corn, wheat, rice, beans, and sorghum), and 1.1% for oilseeds (soybeans, sesame, and safflower), compared with previous (1970-1979) average annual growth rates of 0.4% and 0.3%, respectively.(See Table 1, above.) Insured cropland grew at an average rate of 58.1% per year during the period (compared to a 5.8% average rate from 1970 to 1979), while real financial resources for insurance coverage

grew at rate of 47.8% (compared to a 5.3% average rate from 1970 to 1979). Coverage per hectare decreased at an average rate of 6.5% per annum. (See Table 2, below.) Agricultural credit grew in every respect: financed hectareage increased at an average rate of 37.9% per year from 1979 to 1981, (compared with a rate of 10.5% from 1970 to 1979); total credit allocated and amounts per hectare grew at real rates of 28.4% and 7.4%, respectively, (compared to rates of 9.1% and -1.3%, respectively, from 1970 to 1979).(See Table 3, below.)

The production response to the SAM's incentives was immediate. Production data indicates that basic staple crop production increased at the expense of oilseeds; the former increased at an average annual rate of 29.6% form 1979 to 1981 (compared to one of -0.2% from 1970 to 1979), while oilseed area declined by 17% per year (compared to a positive growth rate per year of 7.9% from 1970 to 1979).(See Table 4, below.) The sharp increase in basic staple production resulted in a diminished share of imports in the total volume of domestic consumption from 26.6% in 1980 to 18.5%in 1982.[8] The existence of surplus stocks from large imports made in 1981 resulted in a decrease in the share of soybean imports in total consumption from 62.6% to

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8. The year of 1982 is here considered instead of 1981 since imports are based on the previous year's stocks.

Table 2. Evolution of Crop Insurance Coverage, 1970-1982.

Coverage	YEARS 1970	1979	1980	1981 a/	1982	70-79	79-81	81-82
	Real Pesos b/					Annual growth (%)		
Total resources (million pesos)	8,430	13,363	18,687	29,196	22,166	5.3	47.8	-24.1
Surface (million has)	1.8	3.0	4.8	7.5	8.2	5.8	58.1	9.3
Coverage/hectare (pesos)	4,683	4,454	3,893	3,893	2,703	-0.6	-6.5	-30.6

b/ Estimate
a/ Deflated by the general CPI for Mexico, 1978=100. (See Appendix B, Table B.2)
SOURCE: - Silos, J. (1982) op. cit.
- ANAGSA (1986) internal documents, (mimeographed). Mexico.

Table 3. Evolution of Agricultural Credit Allocation, 1970-1982.

Allocation	1970	1979	1980	1981	1982 a/	70-79	79-81	81-82
		Real Pesos b/				Annual growth (%)		
Total resources (million pesos)	17,127	37,544	66,696	71,422	66,864	9.1	37.9	-6.4
Surface (million has)	2.2	5.4	6.9	8.9	9.3	10.5	28.4	4.5
Allocation/hectare (pesos)	7,785	6,953	9,666	8,025	7,190	-1.2	7.4	-10.4

b/ Estimate
a/ Deflated by the general CPI for Mexico, 1978=100. (See Appendix B, Table B.2)
SOURCE: Silos, J. (1982) op. cit.

Table 4. Production of Basic Staples and Oilseeds, 1970-1984.

Crops	Years							70-79	79-81	81-82	82-83	83-84
	1970	1979	1980	1981	1982	1983	1984	Annual growth (percent)				
	Metric Tons (thousands)											
Corn	8,879	8,124	12,383	14,766	10,030	13,061	14,050	-1.0	4.8	2.0	-4.2	3.0
Wheat	2,676	2,339	2,785	3,189	4,468	3,460	4,262	-1.5	2.0	1.5	3.8	-2.8
Rice	267	330	301	425	337	275	419	2.4	-1.0	3.9	-2.5	-2.2
Beans	925	601	971	1,469	1,093	1,282	1,270	-4.7	5.5	4.7	-3.2	1.8
Sorghum	2,747	3,917	4,812	6,296	4,720	4,846	6,729	4.0	2.3	3.0	-3.2	0.3
Soybeans	215	719	312	712	648	686	789	14.4	-8.9	9.6	-1.0	0.6
Sesame	165	173	176	86	46	87	92	0.5	0.2	-7.6	-6.7	7.3
Safflower	288	588	446	372	274	277	305	8.3	-3.0	-2.0	-3.3	0.1

SOURCE: - FAO (various years) Production Yearbook. Italy.
- Banamex (July, 1982) Review of the Economic Situation of Mexico. Mexico.

44.4%, in spite of a 9.0% fall in production in 1982. (See Appendix B., Table B.4)

The SAM lost impetus in 1982, along with the rest of the economy, when Mexico's oil boom came to a precipitous halt. It became impossible to continue subsidies at a level commensurate with an inflation rate of nearly 60%. From 1981 to 1982 real guaranteed prices fell by anaverage of 11.3% for basic staples, and by 14.8% for oilseeds. The rate of expansion of insured hectareage decreased to 9.3%, the total coverage in real pesos fell by 24%, and the amounts per hectare declined by 30.6%. Growth of credit coverage fell to 4.5%, and total and per hectare allocations decreased by 6.4% and 10.4%, respectively.

The response of farmers to changed incentives in 1982 was immediate. In 1982, production of basic staples fell by an average of 12.6%; that of oilseeds declined by 27.3%. In spite of this change, a decline in the growth of domestic demand and a drawdown of stocks allowed the government to reduce import shares of basic staples to 17.7% in 1983; soybean imports increased to 56.6% of domestic consumption in that year.

The altered economic situation after 1982, effectively terminated the SAM. The National Food Program (PRONAL) and the National Program for Integrated Rural Development were instituted instead. Subsidies were greatly reduced and their application became more selective. The

goal of food self-sufficiency was replaced by "food sovereignity", which allowed a more flexible food import policy. Emphasis on export crops was increased, (PEF). Real guaranteed prices of basic staples grew by 6.7% from 1982 to 1983, and those of oilseeds by 16%. The growth rate of the agricultural sector's GDP recovered from -0.6% in 1982 to 2.9% in 1983. Production of basic staples and oilseeds grew by 1.8% and 32%, respectively. The share of imports of basic staples fell to 13.5% in 1984, while that of soybeans increased to 62.5% in that year. During 1984, the growth of agricultural GDP dropped to 2.4%. In spite of a 6% decline in real guaranteed prices for basic staples, production grew by 24%. Oilseed prices increased by 10.1% in that year, and production grew by 10.2%.

Modern Agriculture in Mexico's Northwest

Mexico's Northwest has been one of the main regions benefitted by massive public investments in agriculture, through the development of large-scale irrigation projects, complemented by research, input, and credit programs. The states of Sonora and Sinaloa are within this region. Their irrigated cropland represents 30% of total irrigated land in the country, and 36% of the total area covered by the publicly administered irrigation districts, (SARH-DGEA, 1983). According to some authors these two states present the greatest degree of agricultural development in the

country; they have the largest composition of modern farms versus traditional and subsistence farms, (Rodriguez). Modern farms are characterized by their use of irrigation, hired labor, modern inputs (improved seeds, fertilizers and pesticides), machinery, and by the fact that they sell through commercial channels a large proportion of their output.

Recent studies have found, ironically, that inequities in income distribution within the above farm types are most pronounced in the modern farm sector. According to 1968 data, 23% of the farms classified as modern generate 50% of the income of that sector, (Rodriguez). Differences in income are today institiutionalized in all rural financial institutions in Sonora and Sinaloa, which classify producers, even within the modern sector, in four income level categories. The income differential between the lowest and highest income level category is three fold or more. Thus, an uneven pattern of development exists not only among regions, and among "types" of agriculture defined precisely in terms of their degree of modernization, but also within the modern sector.

The present study deals with a series of questions regarding modern agriculture in Sonora and Sinaloa during the 1984-1985 agricultural year: First, what was the structure of macroeconomic and sector policy and how did it

affect the modern agricultural sector? Second, which crops were likely to survive and what would be the consequent change in the crop mix under the austerity measures undertaken in the postSAM period; i.e. how did such policies affect social and private profitabilities, and thus, the role of Sonora and Sinaloa's modern agricultural sector as producer of basic staples, oilseeds and export crops? And third, what was the role of macroeconomic and agricultural policy in determining or counteracting income differentials among modern sector producers?

The Policy Analysis Matrix[9]

The basic approach of this study is encompassed in the Policy Analysis Matrix (PAM). The (PAM) uses accounting data on receipts and costs for an agricultural system to yield measures of competitiveness, efficiency, and policy transfer. An agricultural system is here defined to include

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9. This section borrows heavily from:
- Policy and Economic Studies Team(1982) Phase II Report: Comparative Advantage and Policy Choices in Portuguese Agriculture. Vol.I, The University of Arizona and Stanford University.
- Monke, E. and Pearson, S. (1984-1985).Policy Analysis of Agricultural Systems. (in process), Department of Agricultural Economics, University of Arizona, Tucson, Az..
- Monke, E. and Hillman J. (1985). Data Needs for Agricultural Policy Analysis in Developing Countries. (Mimeographed), Department of Agricultural Economics, University of Arizona, Tucson, Az..

activities beginning with the farm and ending with the wholesale market; that is, farming, farmer-to-processor marketing, processing, and processor-to-wholesaler marketing. Thus, four separate budgets are built, that include measures of receipts, costs and profits, which are then aggregated to represent the entire system. Focus on the agricultural system instead of just the farm-level allows the process of price determination to be understood more completely than if the analysis were limited to the single aspects of farm-level production.

The basic accounting identities that underlie the PAM are illustrated in Table 5, below. The first identity measures profits as the difference between receipts and costs, where cost items include both tradable inputs and domestic factors:

$$\text{Profits} = \sum_i p_i x_i - \sum_m p_m v_m$$
$$= \sum_i p_i x_i - \left(\sum_j p_j y_j + \sum_k p_k z_k\right)$$

where: x_i = quantities of output from the activity per hectare,

y_j = quantities of tradable inputs used by the activity,

z_k = quantities of labor and capital inputs used by the activity, and

p = price

Tradable inputs (B), are those that can be traded internationally, such as machinery and equipment, and most intermediate inputs (such as seeds, fertilizers, pesticides,

Table 5. Structure of the Policy Analysis Matrix.

	Receipts	Costs		Profits
		Tradable Inputs	Domestic Factors	
Private Prices	A	B	C	D a/
Social Prices	E	F	G	H b/
Effects of Policy and Market Imprfections	I c/	J d/	K e/	L f/

a/ Private profit, D = (A-B-C)
b/ Social profit, H = (E-F-G)
c/ Output transfers, I = (A-E)
d/ Tradable input transfers, J = (B-F)
e/ Domestic factor transfers, K = (C-G)
f/ Net policy transfers, L = (D-H) = (I-J-K)

fuel, etc.). Domestic factors (C), are those that cannot be traded internationally: capital, labor, land, and water. Intermediate inputs which are not tradable internationally, such as electricity, transportation, and other services, are disaggregated into their tradable-input and domestic factor components.

The profit measure is calculated in private (first row of PAM), and in social terms (second row of PAM). Private profit (D), is the residual when all actual market costs of inputs are subtracted from the market value of output. It shows the extent of actual competitiveness of an agricultural system, given current technologies, output values, input costs, and policy transfers.

Social profits (H), are calculated using social prices; that is, prices that reflect the social opportunity costs of inputs and outputs. Social opportinity costs are those that result solely from underlying supply and demand conditions in the domestic market, and are thus free from policy effects, unlike private (market) costs. Social profits are thus an indicator of efficiency in domestic resource use. In an economy with scarce resources, supply and demand conditions determine the value of resources in their most efficient allocation; that is, in the use that results in the greatest contribution to national income. Positive social profits (H>0) result when domestic resource costs (G) are smaller than value added (E-F). Therefore,

they also indicate a contribution to national income, or comparative advantage -- the ability of an agricultural system to compete in international trade efficiently, i.e., without the stimulus of subsidies or other government assistance.

The PAM is constructed on a long-run perspective, and both D and H are measures of long-run expected profit. Thus, physical yields per hectare and price data correspond to their long-run expected values rather than the values observed in a particular year. Specifically, the physical yields per hectare considered are those that the farmer expects, given a particular production technology the absence of externalities. Private market prices also reflect their expected values rather than those which might prevail during conditions of unusually high or low levels of supply. The appropriate social prices for tradable inputs and for outputs (most of which are tradable internationally), are the long-run world prices; the CIF port-of-entry price for imports, and the FOB port-of-exit price for exports. World commodity prices are used because they represent the government's choice of allowing imports to meet domestic needs at a cost to the economy equal to the foreign exchange needed to buy them, or to export to earn such foreign exchange. The same applies for inputs needed for domestic production; they can either be imported or domestically produced. Hence, the world price is the appropriate standard

for valuing their cost in domestic use. Furthermore, since Mexico has little or no market power in international trade of inputs and commodities, domestic policies have no significant effect on the corresponding social valuations. Adjustments are made for handling and transportation costs to the relevant locations of consumption, and for quality differences between imported (exported) and domestic inputs and outputs. For both imports and exports, the most efficient international and domestic transportation routes to the relevant locations are chosen, not necessarily those actually used. World prices are converted to domestic currency at the free market exchange rate, which, when different from the official exchange rate, may imply significant impacts on private profitabilities of agricultural systems.

The social opportunity cost of domestic factors represents the national income forgone when they are employed in their next best alternative use. Private factor prices are thus affected by distortions in output markets. The government can also enact factor tax or subsidy policies which create a divergence between their private costs (C) and their social costs (G). In practice, their valuation can only be approximate because of limited availability of information.

The second fundamental accounting identity in PAM is the one given by the difference between private and social

valuations of receipts, costs, and profits, giving a measure of the effects of policy and market distortions. With the exception of those policies implemented for the explicit purpose of correcting market distortions, policy effects reflect the degree to which product and factor markets are prevented from allocating outputs and inputs efficiently. In the absence of market distortions, the differences between A and E, and C and G represent a government transfer. For outputs, negative values indicate a tax and positive values indicate a subsidy to the system; for tradable inputs and domestic factors, negative values indicate a subsidy and positive values indicate a tax to the system. Transfers are caused by the combined effects of macroeconomic and sector policies (such as those affecting currency exchange rates, wages, land and water prices, and interest rates), and commodity and tradable input-specific price and trade policies (such as price controls, and tariff and non-tariff barriers to trade).

Output transfers [I = (A-E)], tradable input transfers [J = (F-B)], and domestic factor transfers [K = (C-G)], are added up to a net transfer measure L (= I-J-K). This net transfer is also the difference between private and social profitabilities [C = (D-H)]. There is a net output subsidy (tax) to producers if $I>0$ ($I<0$); a net input subsidy (tax) to producers if $J<0$ ($J>0$); a net domestic factor subsidy (tax) to producers if $K<0$ ($K>0$); and a net "system"

subsidy (tax) to producers if L>0 (L<0). These measures of total incentive effects indicate the extent to which policy encourages the expansion of a given agricultural system.

The present study consists of six chapters. The second characterizes the agriculture of Sonora and Sinaloa. The regionalization and organization of irrigated agriculture are discussed, followed by a review of changes in crop patterns, yields, and outputs in the past two decades. The final sections describe the main features of ejido and private land tenure systems, and compare their particular crop patterns.

Chapter three is devoted to the descritption of production technologies and marketing channels that prevailed in the 1984-1985 agricultural year, for the main crops subject of this study. Yields obtained in ejidos and private farms are first discussed. Main production activities and the type of inputs used in modern irrigated agriculture are then described. Detailed input quantities per crop are presented in Tables 11.1 to 11.4 and in Appendix A.2.

Chapter four provides the data that served as framework for the analysis of the effects of the Mexican economic policies on the major agricultural systems in Sonora and Sinaloa. Specific effects of policy on agricultural output prices are discussed in the first two sections; first in general, and subsequently for Sonora and

Sinaloa. Policy and prices of domestic factors and intermediate inputs are discussed in the final sections, at the general and regional levels. The methods, assumptions, and data sources used for price estimations are reviewed throughout.

Chapter five examines the PAM results on competitiveness, efficiency, income distribution, and policy transfers in the context of the questions subject of the present study. Conclusions are presented in chapter six.

CHAPTER 2

AGRICULTURE IN SONORA AND SINALOA

Size of the Agricultural Sector, and the Role of Irrigation and Technological Change

The states of Sonora and Sinaloa are part of Mexico's Northwest region, extending from the watershed boundary of the Sierra Madre Occidental mountains to the Pacific coast, and from the international border with the United States to the San Pedro river in the state of Nayarit. The agricultural sector[1] has been the basis for economic growth in both states, but the divergence between them with respect to growth rates and relative importance in the local economy has increased. In Sonora, contribution to the state's Gross Domestic Product (GDP) decreased over the last two decades. Its contribution fell from 18.8% in 1970, to 14.1% by 1977,[2] as other sectors experienced a more dynamic growth; the annual growth rate of its agriculture's GDP was of -1.1% versus 3.0% in the other sectors for that

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1. Does not include livestock, forestry, or fishing and hunting activities.

2. Although more actualized data was not available for the agricultural sector in particular, the primary sector, of which agriculture is a major component, contributed with only 19.5% of the state's GDP in 1983, (Taddei).

period. This stagnation has been attributed to water scarcity and agricultural pest problems, as well as to structural and economic impediments to increasing the area under cultivation, (Taddei).

In contrast, Sinaloa's agriculture's relative contribution to GDP remained almost constant, going from 25.1% to 25.6%. In absolute terms agricultural GDP grew at an average annual rate of 9.6%, while the rest of the state's GDP grew at a rate of 9.2%, (SARH-Sinaloa 1981).

In spite of the differences in growth rates, both states remain major producers of grains, cereals and oilseeds for domestic consumption, as well as vegetables, cotton and chick-peas, for export. The two states contribute almost 14% of the total value of Mexico's agricultural output, utilizing only 10.5% of the nation's harvested area, (SARH-DGEA, 1983). Most output is produced under irrigation, in the dry, hot coastal valleys. Their fertile soils may extend up to two hundred kilometers inland from the coast, following the westward course of numerous rivers that flow from the Sierra Madre Occidental mountains. In Sonora 96% of the area harvested in 1984 was irrigated -- aproximately 742,000 has. For the same year, irrigated agricultural land in Sinaloa represented 78% of the total -- aproximately 792,000 has, (CAADES, 1985).

The development of irrigated agriculture in Sonora and Sinaloa has been largely a result of the implementation

of the Hydraulic Plan of the Northwest (PLHINO). Through the construction of large scale infrastructure, including dams and canals that connect the hydrologic basins along 1,050 kilometers of the Pacific coast, irrigation water has been supplied to otherwise unproductive lands. Eight large scale dams are in Sonora, with a total capacity of 8,511 million M^3, and seven are in Sinaloa, with a capacity of 14,516 million M^3, (SARH-CNPH)[3].

Total irrigated surface in both states has increased at very different rates in the last two decades. Sonora's annual growth rate was 0.7% during 1968-1984, compared with one of 5.0% in Sinaloa. This rates translate into areas of 5,000 has versus 26,000 has per year. This five-fold difference in growth of irrigated land explains the differential growth of agriculture in the two states.

The Irrigation Districts

Almost all irrigated land is contained in twelve irrigation districts, (see Table 6), distributed throughout the North and South of Sonora, and the North and central regions of Sinaloa, as shown inFigure 1. These

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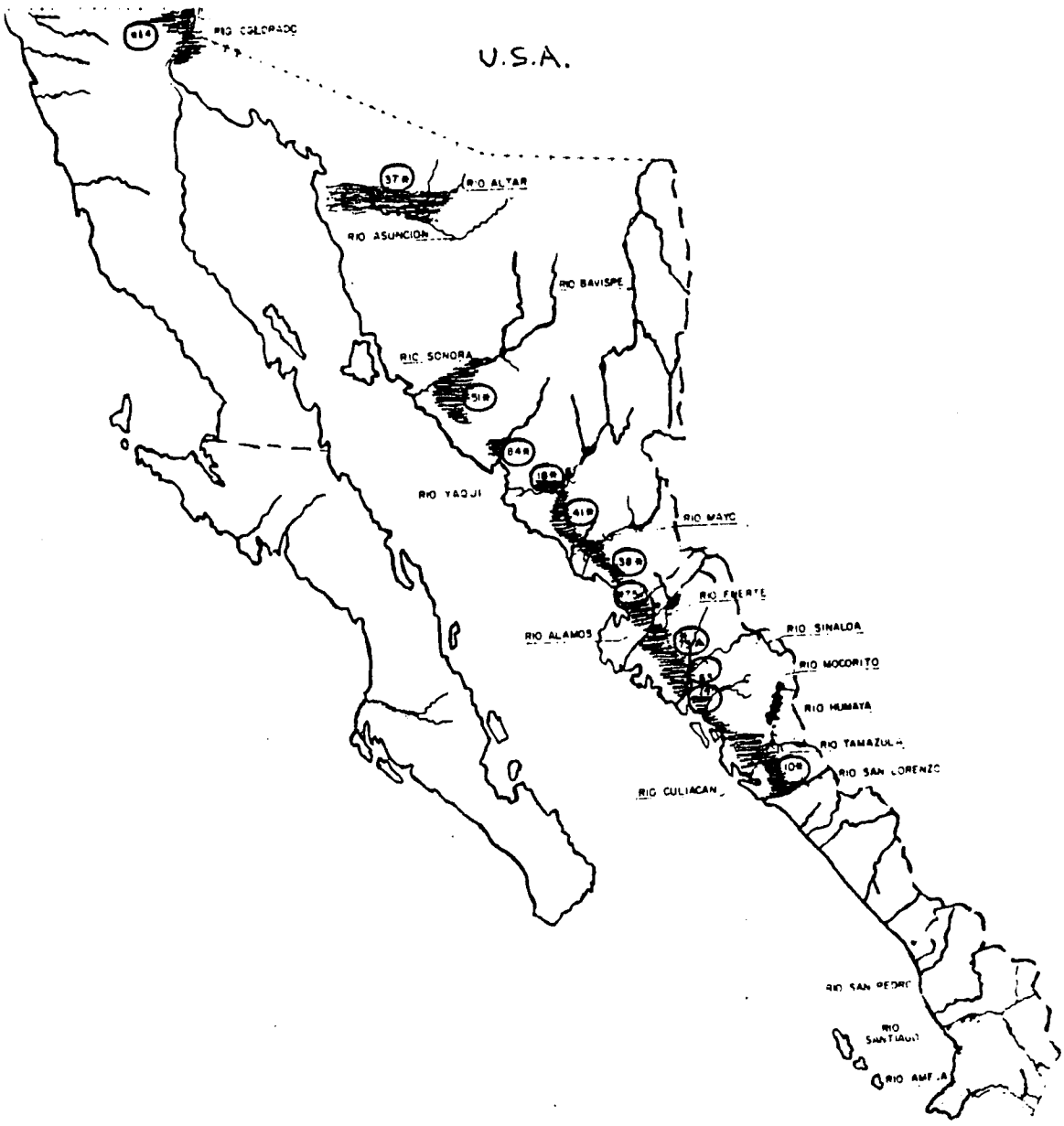
3. The 1984 version of PLHINO proposes actions that will permit the opening of 214,000 has of land to cultivation (121,000 in Sinaloa and 214,000 in Sonora) over a period of ten years, which means an average incorporation of 21,400 has per year to irrigated agriculture, (SARH-CNPH).

Table 6 Regionalization of Irrigation Districts in Sonora and Sinaloa.

State	Irrigation District	
	Name	Number
SONORA		
North	San Luis Rio Colorado	014
	Rio Altar, Pitiquito y Caborca	037
	Costa de Hermosillo	051
	Valle de Guaymas	084
South	Colonias Yaquis	018
	Rio Yaqui	041
	Rio Mayo	038
SINALOA		
North	Valle del Fuerte	075
	Valle del Carrizo	075-A
	Guasave	063
Center	Rio Mocorito	074
	Culiacan, Humaya y San Lorenzo	010

SOURCE: SARH-DGDUR (1979) Caracteristicas de los Distritos y Unidades de Riego - Region Noroeste y Centro Norte. Mexico.

Figure 1.Location of Irrigation Districts in Sonora and Sinaloa.



districts are the primary administrative and planning units of irrigated agriculture. The principal authority within the irrigation districts is the Agricultural Governing Board, comprised of the major public agricultural institutions and farmers' organizations.[4] Through a process of negotiation the interests of local farmers are harmonized with the priorities of national agricultural policy and water availabilities. Opinions vary as to the degree of direct effective influence that the government has in determining cropping patterns. Yet, macroeconomic and agricultural policies greatly influence the relative private profitabilities of the different crops, and thus affect the choices made by farmers.

Crop Mix and Changes in Crop Patterns

More than fourty different crops are grown in each state through-out the Spring-Summer and Fall-Winter growing seasons. Thirteen crops in Sonora and fourteen in Sinaloa are considered of major relevance, based on planted area and their contibution to the total value of agricultural output, (see Tables 7 and 8). Staples include corn, wheat, beans, sorghum, and rice; the latter crop is important only in Sinaloa. Oilseeds include soybeans, safflower, and

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4. Public institutions include: SARH, SRA, FIRA, BANRURAL, ANAGSA, and the nationalized commercial banks. Farmers' organizations include: CNC, CCI, UGOCM, and CAADES.

Table 7. Crop Mix and Changes in Crop Patterns in Irrigated Agriculture in Sonora, 1968-1984.

Crops	Surface Harvested (HAS) Average 1968-72 (a)	Average 1980-84 (b)	Percent Change (b-a)/a	Share of Total Surface (percent) : Average 1968-72 (c)	Average 1980-84 (d)	Percent Change (d-c)/c
I Basic grains				:		
corn	18,170	33,714	85.5	: 2.9	4.8	63.4
wheat	243,729	304,581	25.0	: 39.1	43.0	10.0
beans	1,298	8,652	566.6	: 0.2	1.2	486.8
sorghum	22,591	11,405	-49.5	: 3.6	1.6	-55.6
Subtotal	285,787	358,352	25.4	: 45.8	50.6	10.4
				:		
II Oilseeds				:		
soybeans	89,294	95,863	7.4	: 14.3	13.5	-5.5
safflower	48,766	36,608	-24.9	: 7.8	5.2	-33.9
sesame	18,691	25,515	36.5	: 3.0	3.6	20.2
Subtotal	314,737	157,986	-49.8	: 50.4	22.3	-55.8
				:		
III Vegetables				:		
tomatoes	627	2,662	324.6	: 0.1	0.4	273.8
green peppers	980	4,642	373.7	: 0.2	0.7	317.0
Subtotal	1,607	7,303	354.4	: 0.3	1.0	300.1
				:		
IV cotton	143,469	82,246	-42.7	: 23.0	11.6	-49.5
V chick-peas	4,616	17,165	271.9	: 0.7	2.4	227.4
VI grapes	1,129	23,219	1956.6	: 0.2	3.3	1710.6
VII alfalfa	8,375	18,889	125.5	: 1.3	2.7	98.6
				:		
Subtotal I-VII	601,734	660,713	9.8	: 96.4	93.2	-3.3
Other crops	22,333	46,930	110.1	: 3.6	6.6	85.0
				:		
Grand total	624,067	708,868	13.6	: 100.0	100.0	

SOURCE:-SARH-CNPH (1985), unpublished data. Mexico.
-SARH-DGEA (1978-82) Anuarios Estadisticos 1977-81. Mexico.
-SARH-Sonora (1986) Cifras Definitivas de Produccion Agricola, Ciclos 1982-1984. Hermosillo, Sonora.

Table 8. Crop Mix and Changes in Crop Patterns in Irrigated Agriculture in Sinaloa, 1968-1984.

Crops	Surface Harvested (HAS) Average 1968-72 (a)	Average 1980-84 (b)	Percent Change (b-a)/a	Share of Total Surface (percent) Average 1968-72 (c)	Average 1980-84 (d)	Percent Change (d-c)/c
I Basic grains						
corn	20,686	26,737	29.3	4.6	3.4	-26.0
wheat	44,481	147,844	232.4	10.0	19.0	90.3
rice	43,697	43,870	0.4	9.8	5.6	-42.5
beans	32,439	72,229	122.7	7.3	9.3	27.5
sorghum	60,253	69,209	14.9	13.5	8.9	-34.2
Subtotal	201,555	359,889	78.6	45.2	46.2	2.2
II Oilseeds						
soybeans	43,267	166,823	285.6	9.7	21.4	120.8
safflower	52,844	94,949	79.7	11.9	12.2	2.9
sesame	7,873	4,560	-42.1	1.8	0.6	-66.8
Subtotal	103,984	266,333	156.1	23.3	34.2	46.7
III Vegetables						
tomatoes	14,965	20,416	36.4	3.4	2.6	-21.9
green peppers	3,211	6,171	92.2	0.7	0.8	10.0
potatoes	1,759	5,209	196.1	0.4	0.7	69.6
Subtotal	19,934	31,796	59.5	4.5	4.1	-8.7
IV cotton	51,815	22,871	-55.9	11.6	2.9	-74.7
V chick-peas	5,077	11,279	122.2	1.1	1.4	27.2
VI sugarcane	38,585	40,301	4.4	8.7	5.2	-40.2
Subtotal I-VI	420,950	735,189	74.6	94.4	94.4	0.0
Other crops	24,969	43,573	74.5	5.6	5.6	-0.1
Grand total	445,919	778,762	74.6	100.0	100.0	

SOURCE:-SARH-CNPH (1985), unpublished data. Mexico.
-SARH-DGEA (1978-82) Anuarios Estadisticos 1977-81. Mexico.
-CAADES (various years) Analisis de la Agricultura Sinaloense. Culiacan, Sinaloa.

sesame. The main vegetables are tomatoes and green peppers, with potatoes also important in Sinaloa. Cotton and chick-peas are important export crops in both states. Grapes and alfalfa are major crops in Sonora as well. Sugarcane is also widely grown in Sinaloa. As Tables 7 and 8 indicate, staples occupy half of the irrigated land in both states. Their share has increased only slightly in the past sixteen years (1968-1984). Wheat is the major crop within this group, occupying 85% of the surface devoted to staples in Sonora and 41% in Sinaloa, showing a significant increase in its relative importantce in the latter. The relative share of surface occupied by sorghum has decreased in both states; corn and rice have diminished their relative shares in Sinaloa; that of beans has inncreased in both regions.

Oilseeds occupy 22% and 34% of the irrigated land in Sonora and Sinaloa, respectively. In Sonora their absolute and relative importance has decreased significantly, mainly due to a major decline in safflower plantings. Conversely, oilseed crops have grown in importance in Sinaloa, especially soybeans, whose expansion has more than compensated for the decline in sesame culivation.

The significance of vegetable crops (especially tomatoes and green peppers) in both states lies mainly in their contribution to total value of output. Vegetables occupy 1% and 4% of irrigated area in Sonora and Sinaloa, respectively, but their relative contributions to total

value of production are of 7% and 35%, respectively. Vegetables' area has expanded, both absolutely and relatively, particularly in Sonora. In Sinaloa, farmers' organizations have cooperatively restricted vegetable area in recent years.

Cotton area has significantly declined in both states, because of high water requirements. These contractions are especially noticeable in Sonora's northern region, where aquifer abatement problems prevail. In contrast, chick-peas have become increasingly important as an export crop, especially in Sonora.

Grapes are a relatively new crop in Sonora, but planted area has experienced the most rapid growth, reflecting a rapid expansion of the domestic wine industry and in the market for table grapes. Similarly, alfalfa's growing importance in Sonora may be attributed to growth in the beef and dairy industries. However, expansion has been slowed down by the crop's high water requirements, especially in northern Sonora.

The area devoted to sugarcane in Sinaloa has remained almost unchanged in spite of low prices paid to farmers. This may be explained by the fact that a minimum hectareage is required by law. Farmers are financed by the mostly state-owned sugarmills to ensure the industry's supply, (SARH-Sinaloa).

Yields and Total Output

The evolution of yields and total output from 1968 to 1984 for Sonora and Sinaloa is described in Tables 9 and 10. The behavior of average yields is a function of climatic conditions, adoption of improved technology, and the quality of agricultural land. Significant yield increments for corn, wheat, green peppers, cotton and alfalfa in Sonora, and for corn, wheat, rice and all vegetables in Sinaloa reflect the positive interaction of the above factors. The explanation of insignificant increases, or declines in yieldsof other crops would require investigation beyond the scope of the present study.[5]

The output of staples in Sonora and Sinaloa increased by a larger percentage than harvested area, reflecting the significant contribution by yield increases. Oilseed production in Sonora shows a similar experience;

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5. Two general explanations may be hypothesized for the extreme cases of significant yield declines: First, rapid increments in surface harvested may be accompanied by a decreasein average yields per hectare due to the utilization of marginal lands, and/or to the relative inexperience of farmers cultivating a crop for the first time. This might be the case for beans, tomatoes, chick-peas and sesame in Sonora, as well as for chick-peas in Sinaloa. Second, a decrease in the relative profitability of a given crop may result in a lack of utilization of an optimal, but more costly technology in the short run, and, most probably, in a reduction in the area destined to its cultivation in the medium and long runs, as more profitable crop options are adopted by farmers. This might explain yield behavior in the cases of sorghum and soybeans in Sonora, and of sesame and sugarcane in Sinaloa.

Table 9. Evolution of Average Yields and Total Output in Irrigated Agriculture in Sonora, 1968-1974.

Crops	Average Yield (Mt/Ha)			Total Output (Mt)		
	Average 1968-72 (a)	Average 1980-84 (b)	Percent Change (b-a)/a	Average 1968-72 (a)	Average 1980-84 (b)	Percent Change (b-a)/a
I Basic grains						
corn	2.84	3.48	22.5	51,572	117,231	127.3
wheat	3.60	4.75	32.0	876,808	1,446,165	64.9
beans	1.64	1.16	-29.5	2,132	10,016	369.7
sorghum	5.22	3.47	-33.5	117,981	39,607	-66.4
Subtotal				1,048,494	1,613,019	53.8
II Oilseeds						
soybeans	1.99	1.92	-3.7	177,607	183,702	3.4
safflower	1.83	1.88	2.9	89,045	68,790	-22.7
sesame	0.70	0.70	-0.3	13,069	17,781	36.1
Subtotal				279,721	270,273	-3.4
III Vegetables						
tomatoes	13.59	11.35	-16.4	8,519	30,219	254.7
green peppers	7.47	10.75	43.9	7,324	49,909	581.4
Subtotal				15,843	80,128	405.8
IV cotton	2.55	2.96	16.2	365,996	243,822	-33.4
V chick-peas	1.79	1.75	-2.4	8,260	29,986	263.0
VI grapes	9.45	9.45	0.0	10,664	219,387	1957.2
VII alfalfa (green)	55.75	64.31	15.3	466,906	1,214,660	160.2
Subtotal I-VII				2,195,883	3,671,275	67.2
Other crops				65,964	309,325	368.9
Grand total				2,261,847	3,980,600	76.0

SOURCE:-SARH-CNPH (1985), unpublished data. Mexico.
-SARH-DGEA (1978-1982) Anuarios Estadisticos 1977-81. Mexico.
-SARH-Sonora (1986) Cifras Definitivas de Produccion Agricola, Ciclos 1982-1984. Hermosillo, Sonora.

Table 10. Evolution of Average Yields and Total Output in Irrigated Agriculture in Sinaloa, 1968-1984.

Crops	Average Yield (Mt/Ha)			Total Output (Mt)		
	Average 1968-72 (a)	Average 1980-84 (b)	Percent Change (b-a)/a	Average 1968-72 (a)	Average 1980-84 (b)	Percent Change (b-a)/a
I Basic grains						
corn	1.74	2.58	48.3	35,927	69,047	92.2
wheat	3.04	4.19	37.8	135,212	619,076	357.9
rice	4	4	12.8	167,360	189,522	13.2
beans	1.20	1.22	1.7	38,976	88,082	126.0
sorghum	4.17	4.38	5.0	251,386	303,420	20.7
Subtotal				628,861	1,269,154	101.8
II Oilseeds						
soybeans	1.79	1.89	5.6	77,294	315,660	308.4
safflower	1.30	1.05	-19.2	68,957	99,290	44.0
sesame	0.64	0.56	-12.5	5,022	2,560	-49.0
Subtotal				151,273	417,510	176.0
III Vegetables						
tomatoes	19.90	28.66	44.0	297,786	585,205	96.5
green peppers	7.41	12.90	74.1	23,784	79,577	234.6
potatoes	18.15	23.36	28.7	31,929	121,671	281.1
Subtotal				353,499	786,453	122.5
IV cotton	2.37	2.44	3.0	122,596	55,715	-54.6
V chick-peas	1.48	1.28	-13.5	7,504	14,402	91.9
VI sugarcane	92.67	82.83	-10.6	3,575,659	3,338,194	-6.6
Subtotal I-VI				4,839,392	5,881,427	21.5
Other crops				238,158	595,677	150.1
Grand total				5,077,550	6,477,104	27.6

SOURCE:-SARH-CNPH (1985), unpublished data. Mexico.
-SARH-DGEA (1978-1982) Anuarios Estadisticos 1977-81. Mexico.
-CAADES (various years) Analisis de la Agricultura Sinaloense. Culiacan, Sinaloa.

output only decreased by -3.4%, in spite of a 50% decline in surface harvested. The rise in oilseed production in Sinaloa has been mainly due to increases in surface harvested.

Relative increments in vegetable production have been greater in Sonora than in Sinaloa; yield increments have played a major role in the latter case.

Cotton production in both states has declined, mainly due to significant decreases in the surface dedicated to its cultivation -- aproximately 50% in each case . But in Sinaloa yield increases were only 3%, whereas in Sonora yields have risen by 16% . Chick-peas' production increased by 263% in Sonora and 92% in Sinaloa, in spite of the 2% and 14% decreases in yields, which reflects significant increments in surface harvested.

Total output of grapes in Sonora rose by almost 2000%. This is mainly attributable to the expansion of its cultivated area, since yields have remained practically constant. Yield increments as well as area expansion have contributed to the 160% rise in the total output of alfalfa in Sonora. In Sinaloa the observed decline in sugarcane production has been the result of a 10.6% decline in yields, which has not been compensated by the almost unchanged area under cultivation.

Land Tenure and Land Distribution

Diverse land tenure systems emerged from the Mexican Revolution of 1910, which was largely agrarian in character. Today, the "ejido" and the "pequena propiedad" [small property] systems encompass most of the agricultural land. The ejido is an endowment of public land to a "nucleo de poblacion" [population nucleus]. The total land endowment becomes property of the community, and the General Assembly of "Ejidatarios" [ejido members] controls the use and distribution of land. It also decides whether agriculture within the ejido is to be practiced collectively or individually. Individual cultivation dominates.

The average endowment of agricultural land for individual ejidatarios is 7.72 has in Sonora, and 7.64 has in Sinaloa, (see Tables 11 and 12). This endowment is less than the legal minimum of 10 hectares of irrigated land established in the Federal Law of Agrarian Reform, (SRA). The Federal law "protects" the ejido against the influence of economic forces that tend toward land concentration, by making land inalienable and prohibitibng sale, rental, and theformation of partnerships. The law also forbids the use of hired labor by the ejidatario. Yet, as Roger Bartra described in his analysis of agrarian structure in Mexico: "The axes of the agrarian structure are not the official systems of land tenure; on the contrary, the forms of tenure adapt themselves to, and are expression of, the

Table 11. Land Tenure Structure in Sonora's Irrigation Districts, 1978.

Size of Farm (Has)	Ejidos					Private Property					
	Farmers		Total Surface		Average Size(Has)	Farmers		Total surface		Average Size(Has)	Farmers
	Number (a)	% (a/e)	(Has) (b)	% (b/f)	(b/a)	Number (c)	% (c/e)	(Has) (d)	% (d/f)	(d/c)	Number (e)
0.5 to 5.0	11,987	80.23	47,411	86.57	3.96	2,953	19.77	7,356	13.43	2.49	14,940
(a/g) %	42.79		21.93			25.94		1.95			37.92
5.1 to 10.0	10,587	85.70	67,857	82.87	6.41	1,766	14.30	14,031	17.13	7.95	12,353
(a/g) %	37.79		31.38			15.51		3.71			31.35
10.1 to 20.0	4,596	72.22	70,689	70.25	15.38	1,768	27.78	29,934	29.75	16.93	6,364
(a/g) %	16.41		32.69			15.53		7.92			16.15
20.1 to 50.0	828	23.66	28,315	20.30	34.20	2,672	76.34	111,174	79.70	41.61	3,500
(a/g) %	2.96		13.09			23.47		29.42			8.88
More than 50.0	17	0.76	1,960	0.90	115.29	2,226	99.24	215,372	99.10	96.75	2,243
(a/g) %	0.06		0.91			19.55		57.00			5.69
T o t a l (g)	28,015	71.10	216,232	36.40	7.72	11,385	28.90	377,867	63.60	33.19	39,400
%	100.00		100.00			100.00		100.00			100.00

SOURCE: SARH-DGDUR (1979), op.cit.

ructure in Sonora's Irrigation
).

j i d o s			Private Property									Total
l Surface		Average Size(Has)	Farmers		Total surface		Average Size(Has)	Farmers		Surface		Average Size (Has)
s))	% (b/f)	(b/a)	Number (c)	% (c/e)	(Has) (d)	% (d/f)	(d/c)	Number (e)	%	(Has) (f)	%	(f/e)
11 93	86.57	3.96	2,953 25.94	19.77	7,356 1.95	13.43	2.49	14,940 37.92	100.00	54,767 9.22	100.00	3.67
57 38	82.87	6.41	1,766 15.51	14.30	14,031 3.71	17.13	7.95	12,353 31.35	100.00	81,888 13.78	100.00	6.63
89 69	70.25	15.38	1,768 15.53	27.78	29,934 7.92	29.75	16.93	6,364 16.15	100.00	100,623 16.94	100.00	15.81
15 09	20.30	34.20	2,672 23.47	76.34	111,174 29.42	79.70	41.61	3,500 8.88	100.00	139,489 23.48	100.00	39.85
60 91	0.90	115.29	2,226 19.55	99.24	215,372 57.00	99.10	96.75	2,243 5.69	100.00	217,332 36.58	100.00	96.89
32 00	36.40	7.72	11,385 100.00	28.90	377,867 100.00	63.60	33.19	39,400 100.00	100.00	594,099 100.00	100.00	15.08

Table 12. Land Tenure Structure in Sinaloa's Irrigation Districts, 1978.

Size of Farm (Has)	Ejidos					Private Property					Num
	Farmers		Total Surface		Average Size(Has)	Farmers		Total surface		Average Size(Has)	
	Number (a)	% (a/e)	(Has) (b)	% (b/f)	(b/a)	Numbe (c)	% (c/e)	(Has) (d)	% (d/f)	(d/c)	far (
0.5 to 5.0	10,216	79.21	38,141	82.93	3.73	2,682	20.79	7,851	17.07	2.93	12,
(a/g) %	25.38		12.40			24.72		3.36			25
5.1 to 10.0	27,818	92.48	241,339	92.65	8.68	2,262	7.52	19,139	7.35	8.46	30,
(a/g) %	69.10		78.49			20.85		8.19			58
10.1 to 20.0	2,224	48.93	27,997	43.45	12.59	2,321	51.07	36,439	56.55	15.70	4,
(a/g) %	5.52		9.11			21.39		15.60			8
20.1 to 50.0	0	0.00	0	0.00	---	2,457	100.00	82,816	100.00	33.71	2,
(a/g) %	0.00		0.00			22.65		35.46			4
More than 50.0	0	0.00	0	0.00	---	1,128	100.00	87,326	100.00	77.42	1,
(a/g) %	0.00		0.00			10.40		37.39			2
T o t a l (g)	40,258	78.77	307,477	56.83	7.64	10,850	21.23	233,571	43.17	21.53	51,
%	100.00		100.00			100.00		100.00			100

SOURCE: SARH-DGDUR, (1979), op.cit.

cture in Sinaloa's Irrigation

idos		Private Property					Total				
Surface	Average Size(Has)	Farmers		Total surface		Average Size(Has)	Number of		Surface		Average Size (Has)
% (b/f)	(b/a)	Numbe (c)	% (c/e)	(Has) (d)	% (d/f)	(d/c)	farmers (e)	%	(Has) (f)	%	(f/e)
82.93	3.73	2,682 24.72	20.79	7,851 3.36	17.07	2.93	12,898 25.24	100.00	45,992 8.50	100.00	3.57
92.65	8.68	2,262 20.85	7.52	19,139 8.19	7.35	8.46	30,080 58.86	100.00	260,478 48.14	100.00	8.66
43.45	12.59	2,321 21.39	51.07	36,439 15.60	56.55	15.70	4,545 8.89	100.00	64,436 11.91	100.00	14.18
0.00	---	2,457 22.65	100.00	82,816 35.46	100.00	33.71	2,457 4.81	100.00	82,816 15.31	100.00	33.71
0.00	---	1,128 10.40	100.00	87,326 37.39	100.00	77.42	1,128 2.21	100.00	87,326 16.14	100.00	77.42
56.83	7.64	10,850 100.00	21.23	233,571 100.00	43.17	21.53	51,108 100.00	100.00	541,048 100.00	100.00	10.59

peculiarities of production, the economic understructure...". Accordingly, amendments to the law allow the rental of individual landholdings, as well as partnerships and the utilization of hired labor in the "exceptional" situation in which the ejidatario cannot grow a given crop or cannot practice certain agricultural activities "opportunely", even if he were to dedicate all his "time and effort". In reality, this situation is not exceptional, and the practice of land rental by ejidatarios is widespread in the irrigation districts of both states. Land is in heavy demand by private farmers, who are also willing to employ the ejidatario as agricultural labor. In the Rio Mayo irrigation district in Sonora, for example, recent studies estimate that as much as three fourths of the ejido lands are rented, (Palacios).

Private farmers constitute 21% and 29% of total farmers in Sonora and Sinaloa's irrigation districts, and own 64% and 43% of the agricultural land, with average farm sizes of 33.19 has and 21.53 has, respectively. Small farmers have tended to disappear in the private sector; those with less than 10 has represent only 6% of the total in Sonora, and less than 12% in Sinaloa. Medium size farms of 10 to 50 has belong to 37% of the farmers in Sonora, and to 51% in Sinaloa. Large farms, which average 96.75 has in the former region, and 77.42 has in the latter region, are owned by 20% and 10% of the farmers, and occupy 57% and 38%

of the total private farmland, respectively.

As shown in Tables 11 and 12, land distribution in the ejido sector is quite different from that in the private sector. Ejidatarios with endowments of 10 has or less constitute almost 90% of the total in Sonora, and nearly 95% in Sinaloa. Medium size endowments are operated by 19% and 6% of the ejidatarios, respectively. Large endowments are nonexistent in Sinaloa and comprise less than 1% of the ejidatarios in Sonora.

Crop Patterns in Ejidos and Private Farms

Differences between ejidos and private farms in the area devoted to different crops are demonstrated by the data in Table 13, below, for the 1983-84 year. In Sonora most staples, soybeans, and tomatoes occupy a larger share in ejidos, while beans, sesame, safflower, green peppers, cotton, alfalfa, and grapes take up a larger share of area in private farms. In Sinaloa most staples, soybeans, and safflower occupy larger shares of area in ejidos, while the opposite is true for vegetables, cotton, beans, and corn. Sesame, chick-peas and sugarcane are equally important in both sectors. Two possible explanations may account for differences in crop choices made by ejidatarios and those made by private farmers: First, ejidos and private farms differ in their access to capital, both in quantity and quality. Second, private farms may have an advantage in

Table 13.Crop Mix in Irrigated Agriculture in Ejidos and Private Farms in Sonora and Sinaloa; Differences in Shares of Surface Harvested per Crop, 1983-84.

	SONORA			SINALOA		
Crops	Ejidos (a)	Private Farms (b)	Percent Difference (b-a)/a	Ejidos 1968-72 (c)	Private Farms (d)	Percent Difference (d-c)/c
I Basic grains						
corn	1.2	0.7	-41.7	3.2	4.4	37.5
wheat	68.1	53.8	-21.0	30.1	19.3	-35.9
rice	--	--	--	7.6	4.1	-46.1
beans	0.2	0.3	50.0	5.5	6.0	9.1
sorghum	0.8	0.7	-12.5	8.4	7.9	-6.0
II Oilseeds						
soybeans	1.8	1.0	-44.4	23.7	22.2	-6.3
safflower	2.8	3.6	28.6	4.9	3.4	-30.6
sesame	0.5	0.7	40.0	0.1	0.1	0.0
III Vegetables						
tomatoes	0.5	0.3	-40.0	2.0	7.8	290.0
green peppers	0.1	0.2	100.0	0.5	2.4	380.0
potatoes	--	--	--	0.4	1.4	250.0
IV cotton	16.2	19.7	21.6	0.7	1.0	42.9
V chick-peas	0.1	3.4	3300.0	0.1	0.1	0.0
VI alfalfa	0.9	2.4	166.7	--	--	--
VII sugarcane	--	--	--	5.5	5.3	-3.6
VIII grapes	1.2	8.5	608.3	--	--	--
Subtotal I - VIII	94.4	95.3		92.7	85.4	
Other crops	5.6	4.7		7.3	14.6	
Grand total	100.0	100.0		100.0	100.0	
Total Surface (Has)	192,648	260,825		514,651	258,304	

SOURCE: SARH-DGDUR (1985) Informe de Produccion Agricola en los Distritos de Riego, Ciclo 1983-84. Hermosillo, Son. and Culiacan, Sin..

their access to technology and market. This is most probably the situation for vegetables in Sinaloa, where the Confederation of Agricultural Associations of the State of Sinaloa (CAADES), a private farmers' organization, plays a major role in marketing and extension. Improved access to these services reduces the risk associated with specific crops. Expected land and input productivities as well as expected output price thus increase.

CHAPTER 3

CROP PRODUCTION TECHNOLOGY AND MARKETING IN THE IRRIGATION DISTRICTS OF SONORA AND SINALOA

This chapter describes the main activities involved in the production and marketing of the principal crops in the States of Sonora and Sinaloa, on which the construction of crop budgets was based. Typical production technologies of four representative irrigation districts were chosen for this purpose -- two per state, and one per region. Total surface under cultivation, total number of farmers, and data availability served as representativity and choice criteria. These and other general characteristics of irrigation districts 37 and 41 in the North and South of Sonora, respectively; and 75 and 10 in the North and central regions of Sinaloa, respectively, are summarized in Table 14, below. Quantities of inputs were obtained from budgets prepared by credit institutions --mainly BANRURAL and FIRA -- as well as by farmers' organizations in both States.[1] Yields were obtained from actual statistical data for

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1. BANRURAL (1985) Determinacion de la Viabilidad Economica y Asignacion de Recursos Financieros PO-1A, 1984-85.

FIRA (1985) Costo de Produccion por Hectarea y Distribucion de Inversiones, 1984-85.

(continues page after next)

Table 14. Characteristics of Representative Irrigation Districts.

Irrigation District	Irrigated Surface		Farmers		Main Source of Water
	Has	% a/	Number	% a/	
037	52,943	27	3,599	45	ground
041	263,995	67	17,627	56	reservoir
075	240,673	67	8,045	47	reservoir
010	198,647	94	20,449	90	reservoir

a/ of regional total.
SOURCE: SARH-DGDUR (1979), op. cit.

the three years, 1982-83 to 1984-85, reported by the respective irrigation districts.[2]

Dissimilarities exist between yields obtained by ejidatarios and those achieved by private farmers. As shown by comparative yield data presented in Table 15, for 1983-84, yields, with a few exceptions, are almost consistently higher in private farms than in ejidos. Differences in corn in Sinaloa; sorghum, safflower, tomatoes and grapes in Sonora; and beans, soybeans, and sesame in both states stand out. This duality tends to be less intense in Sinaloa than in Sonora. These differences result from a combination of three main factors: land quality, production technology, and the effective application of inputs.

Due to lack of sector-specific data, identical crop technologies were assumed in the construction of crop budgets. Thus, profitability and income comparisons presented in chapter 5 are based strictly on differential policy effects and farm sizes.

(1. continued)
AOANS (1986) Costos de Produccion de Cultivos.
AOASS (1986) Costos de Produccion de Cultivos.
CAADES (1985) Costos de Produccion de Cultivos.
AARFS (1985) Costos de Produccion de Cultivos.
AARC (1985) Costos de Produciion de Cultivos.

2. Although it may be asserted that the input quantiites considered slightly overestimate those actually applied, and therefore, do not strictly correspond to actual yields , this discrepancy was judged to be inconsequential to the general character of the results.

Table 15. Yields in Irrigated Agriculture in Ejidos and Private Farms in Sonora and Sinaloa; Porcentual Differences per Crop, 1983-1984.

Crops	YIELD (Mt/Ha) Ejidos (a)	Private Farms (b)	Percent Difference (b-a)/a
I Basic staples			
corn			
Sonora	2.699	2.873	6.4
Sinaloa	3.053	3.793	24.2
wheat			
Sonora	4.826	5.220	8.2
Sinaloa	4.318	4.110	-4.8
rice			
Sonora	--	--	
Sinaloa	4.516	4.747	5.1
beans			
Sonora	0.799	1.566	96.0
Sinaloa	1.078	1.666	54.5
sorghum			
Sonora	2.602	3.019	16.0
Sinaloa	4.256	4.391	3.2
II Oilseeds			
soybeans			
Sonora	1.415	1.819	28.6
Sinaloa	1.865	2.421	29.8
safflower			
Sonora	1.532	1.810	18.1
Sinaloa	1.084	1.074	-0.9
sesame			
Sonora	0.550	0.782	42.2
Sinaloa	0.519	0.731	40.8
III Vegetables			
tomatoes			
Sonora	12.509	14.243	13.9
Sinaloa	30.996	31.964	3.1
green peppers			
Sonora	9.951	8.627	-13.3
Sinaloa	13.880	13.867	-0.1
potatoes			
Sonora	--	--	
Sinaloa	25.045	27.015	7.9
IV cotton			
Sonora	1.753	1.741	-0.7
Sinaloa	1.697	1.675	-1.3

(continues)

Crops		YIELD (Mt/Ha) Ejidos (a)	Private Farms (b)	Percent Difference (b-a)/a
V	chick-peas			
	Sonora	1.998	2.117	6.0
	Sinaloa	1.400	1.479	5.6
VI	alfalfa (green) a/			
	Sonora	65.856	66.727	1.3
	Sinaloa	--	--	
VII	sugarcane			
	Sonora	--	--	
	Sinaloa	90.348	81.408	-9.9
VIII	grapes			
	Sonora	4.891	6.974	42.6
	Sinaloa	--	--	

a/ 1 Mt of green alfalfa = 0.197 Mt of dry alfalfa.
SOURCE: SARH-DGDUR (1985), op. cit.

Crop Production Technology

A list of the crop budgets constructed for this study is presented in Appendix A.1.[3] The main indicators of farm level production technologies are presented in Tables 16.1 to 16.4, and are discussed below. (Detailed labor requirements for production activities are presented in Appendix A.2.)

Production Seasons

The practice of irrigation combined with widespread use of modern inputs and machinery, and a favorable climate makes it possible to have at least two crops per year in both Sonora and Sinaloa. The agricultural year is thus divided into two main cropping seasons or cycles: Spring-Summer (S-S), and Fall-Winter (F-W). In some situations a third short-cycle crop may be grown. Specific crop rotations, and therefore the resulting crop mix in a given year, are determined by agronomic compatibilities between crops,[4] as well as by their individual profitabilities, the availability of water, and of working capital.

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3. In spite of their relevance, crop budgets for grapes and ground tomatoes in Sonora , and sugarcane in Sinaloa had to be excluded from the present study, due to unavailability of detailed information on input quantities characterizing their production technologies.
Also, due to the bulkiness of detailed crop budgets they are not included in this document. They exist in floppy-disc form in the Department of Agricultural Economics, University of Arizona, Tucson, Az.

4. Length of growth cycle, sowing dates, etc..

Table 16.1 Sonora and Sinaloa: Main Indicators of Crop Production Technology for Basic Staples in Irrigated Agriculture, 1984-1985.

Crop/State/Region/ Irrigation District		Main Growing Season	Yield (Mt/Ha)	Total Tractor a/ Hours(/Ha)	Labor b/ (Hours/Ha) Unskilled	Skilled c/	Water (MM3/Ha)	Seed (Kg/Ha)	Fertilizer (Kg/Ha) N	P2O5	K2O	Harvest
Corn												
Sonora												
North	037	S-S	2.98	13.75	70.78	187.36	8.20	20	130	46	0	mech
South	041	S-S	3.67	14.50	55.03	111.67	7.50	20	152	46	0	mech
Sinaloa												
North	075	S-S	3.19	12.75	32.72	122.07	10.25	20	202	0	0	mech
Center	010	S-S	4.08	12.75	32.64	128.07	9.36	20	202	0	0	mech
Wheat												
Sonora												
North	037	F-W	5.02	9.50	29.97	189.75	8.75	200	150	23	0	mech
South	041	F-W	5.05	11.25	8.99	117.26	6.01	140	162	46	0	mech
Sinaloa												
North	075	F-W	4.72	8.25	24.95	112.30	8.50	160	30	34	0	mech
Center	010	F-W	4.36	9.00	49.30	122.44	7.50	180	133	46	0	mech
Rice d/												
Sinaloa												
North	075	S-S	4.45	7.25	56.73	156.37	15.63	140	184	0	0	mech
Center	010	S-S	4.38	7.25	56.80	161.67	14.28	140	184	0	0	mech
Beans												
Sonora												
North	037	S-S	1.35	12.00	56.52	155.94	6.29	60	46	35	0	manl
South	041	S-S	0.92	11.75	68.03	97.78	6.25	60	46	0	0	manl
Beans												
Sinaloa												
North	075	F-W	1.23	11.75	89.09	90.05	4.88	90	80	40	0	mn/mc
Center	010	F-W	1.14	11.75	102.25	96.31	6.38	100	72	36	0	mn/mc
Sorghum												
Sonora												
North	037	S-S	3.15	13.25	28.00	165.03	6.88	15	128	46	0	mech
South	041	S-S	3.97	13.25	31.24	111.09	6.88	15	175	46	0	mech
Sinaloa												
North	075	S-S	4.69	12.25	26.29	113.55	8.63	25	92	0	0	mech
Center	010	S-S	4.37	12.25	26.45	113.70	7.88	25	92	0	0	mech

a/ equivalent to tractor driver time; does not include custom mechanized harvesting.
b/ does not include storage, transportation and processing.
c/ includes irrigation, field supervising, labor supervising, custom services; does not include tractor operator.
d/ 1 Mt of paddy rice = 0.66 Mt of white rice.
SOURCE: Crop budgets listed in Appendix A.1 and Appendix A.2, Tables A.1 to A.4.

Table 16.2 Sonora and Sinaloa: Main Indicators of Oilseed Crop Production Technology in Irrigated Agriculture, 1984-1985.

Crop/State/Region/ Irrigation District		Main Growing Season	Yield (Mt/Ha)	Total Tractor a/ Hours(/Ha)	Labor b/ (Hours/Ha Unskill	Skilled c/	Water (MM3/Ha	Seed (Kg/Ha)	Fertil (Kg/Ha) P2O	K2O	Harvest
Soybeans											
Sonora											
South	041	S-S	1.89	12.75	59.74	122.15	7.88	100	46	0 0	mech
Sinaloa											
North	075	S-S	2.24	13.75	115.18	126.74	9.00	100	50	50 0	mech
Center	010	S-S	2.05	13.75	91.75	157.18	6.50	100	15	51 0	mech
Safflower											
Sonora											
North	037	F-W	1.89	11.75	30.78	168.60	7.00	25	150	23 0	mech
South	041	F-W	1.80	12.75	17.64	91.66	7.73	15	130	40 0	mech
Sinaloa											
North	075	F-W	1.62	12.75	23.49	84.38	9.75	18	120	0 0	mech
Center	010	F-W	1.00	10.75	16.95	103.68	8.25	20	115	0 0	mech
Sesame											
Sonora											
North	037	S-S	0.91	12.25	85.02	155.90	5.90	3	87	46 0	mn/mc
South	041	S-S	0.66	11.25	64.16	98.55	5.50	3	92	46 0	mn/mc
Sinaloa											
North	075	S-S	0.65	12.50	104.09	87.26	7.00	4	81	0 0	mn/mc

a/ equivalent to tractor driver time; does not include custom mechanized harvesting.
b/ does not include storage, transportation and processing.
c/ includes irrigation, field supervising, labor supervising, custom services; does not include tractor operator.
SOURCE: Crop budgets listed in Appendix A.1 and Appendix A.2, Tables A.1 to A.4.

Table 16.3 Sonora and Sinaloa: Main Indicators of Vegetable Crop Production Technology in Irrigated Agriculture, 1984-1985.

Crop/State/Region/ Irrigation District		Main Growing Season	Yield (Mt/Ha)	Total Tractor a/ Hours(/Ha)	Labor b/ (Hours/Ha Unskill	Skilled c/	Water (MM3/Ha	Seed (Kg/Ha)	Fertil (Kg/Ha) P2O	K2O	Harvest
Tomatoes											
-large staked											
Sonora											
South	041	F-W	12.84	24.00	611.26	172.26	7.00	1	276	114 68	manl
Sinaloa											
North	075	F-W	17.57	33.75	1606.45	583.64	12.60	1	444	444 ***	manl
Center	010	F-W	32.82	33.75	1606.95	591.00	17.00	1	444	444 ***	manl
-cherry staked											
Sinaloa											
North	075	F-W	26.09	33.75	1606.45	583.00	12.60	1	444	444 ***	manl
Center	010	F-W	17.42	33.75	1606.95	591.58	17.00	0	444	444 ***	manl
-saladette ground											
Sinaloa											
North	075	F-W	31.94	33.75	649.36	438.86	8.89	2	200	101 ***	manl
Center	010	F-W	37.62	33.75	649.78	445.57	12.00	2	200	101 ***	manl
Bell peppers											
Sonora											
South	041	F-W	8.31	21.50	186.50	136.83	7.00	1	210	46 0	manl
Sinaloa											
North	075	F-W	12.60	26.25	1235.66	664.58	14.94	2	342	342 ***	manl
Center	010	F-W	12.74	26.25	1236.10	666.11	16.60	2	342	342 ***	manl
Potatoes											
Sinaloa											
North	075	F-W	23.79	15.00	332.37	161.09	8.67	3,000	298	170 ***	manl
Center	010	F-W	28.00	15.00	370.69	163.25	7.92	3,000	298	170 ***	manl

a/ equivalent to tractor driver time; does not include custom mechanized harvesting.
b/ does not include storage, transportation and processing.
c/ includes irrigation,field supervising, labor supervising, custom services; does not include tractor operator.
SOURCE: Crop budgets listed in Appendix A.1 and Appendix A.2, Tables A.1 to A.4.

Table 16.4 Sonora and Sinaloa: Main Indicators of Production Technologies for Cotton, Chick-peas, and Alfalfa in Irrigated Agriculture, 1984-1985.

Crop/State/Region/ Irrigation District		Main Growing Season	Yield (Mt/Ha)	Total Tractor a/ Hours(/Ha)	Labor b/ (Hours/Ha Unskill	Skilled c/	Water (MM3/Ha	Seed (Kg/Ha)		Fertil (Kg/Ha) P2O	K2O	Harvest
Cotton d/												
Sonora												
North	037	S-S	3.22	14.75	84.70	269.84	10.00	35	183	46	0	mech
South	041	S-S	2.38	20.25	82.51	163.43	8.13	45	143	46	0	mech
Sinaloa												
North	075	F-W	2.12	15.75	95.71	256.04	11.88	50	207	46	0	manl
Center	010	F-W	1.55	15.75	95.74	261.93	10.63	50	207	46	0	manl
Chick-peas												
Sonora												
North	037	F-W	2.00	10.25	41.97	161.25	6.25	90	92	40	0	mech
South	041	F-W	1.43	10.25	31.22	94.65	5.13	90	92	40	0	mech
Sinaloa												
North	075	F-W	1.75	10.50	93.21	90.11	5.25	100	69	0	0	mech
Center	010	F-W	1.44	10.50	93.29	96.08	6.38	100	69	0	0	mech
Alfalfa e/												
Sonora												
North	037	Perennial	59.02	15.76	26.22	273.75	19.64	4	6	118	0	mech
South	041	Perennial	54.22	10.42	14.86	131.10	17.27	4	13	46	0	mech

a/ equivalent to tractor driver time; does not include custom mechanized harvesting.
b/ does not include storage, transportation and processing.
c/ includes irrigation,field supervising, labor supervising, custom services; does not include tractor operator.
e/ 1 Mt of seed cotton = 0.388 Mt of lint.
f/ all quantities are on an annual basis; calculations are a weighted average of years 1 to 7, considered to be the economic life of the crop. 1 Mt of green alfalfa = 0.197 Mt of dry alfalfa.
SOURCE: Crop budgets listed in Appendix A.1 and Appendix A.2, Tables A.1 to A.4.

Some crops -- corn, beans and sorghum -- can be cultivated in either season, but most crops are grown in a single period. The main cycles for the crops under consideration in both states are presented in Tables 16.1 to 16.4. Corn, sorghum, soybeans, and sesame are mostly grown in the Spring-Summer season, while wheat, safflower, all the vegetables, and chick-peas are cultivated in the Fall-Winter season. Beans and cotton are grown in Spring-Summer in Sonora, and in Fall-Winter in Sinaloa. Rice is a Spring-Summer crop in Sinaloa.

Irrigation and Land Preparation

The main sources of irrigation water are reservoirs or dams, and deep wells. All of the irrigation districts under consideration are supplied mainly by reservoir water, with the exception of irrigation district number 037 in the North of Sonora, (see Table 14, above). In the crop budgets for irrigation district 037, a 150 HP electric pump was taken as the standard.[5]

In the field, water is conducted through ditches and then distributed along furrows. Furrow irrigation is used in most crops, with the exception of wheat, rice and alfalfa, in which the flood irrigation technique is utilized. Usually, two laborers can irrigate five hectares, working

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5. Small diesel pumps are sometimes used to pump water from the main canal in the rest of the irrigation districts, but were not included in the respective budgets.

24-hour shifts. The total time required per hectare for each irrigation varies with the crop.

A number of production activities are directly related to the application of irrigation water -- levelling bunding and ditching, furrowing, bund erasing, irrigation design (considered for flood irrigated crops only), bund finishing, and canal cleaning (considered for reservoir-based irrigation only). The first five are mechanized, (see Table 17, below), and the latter three are manually done, requiring an average of 1, 2, and 5 unskilled labor-hours per hectare, respectively. Levelling is done with a wooden "tablon" (frame) for most crops; a land plane is used for cotton, alfalfa, wheat, and vegetables. Other previous land preparation activities, all mechanized, include subsoiling -- for alfalfa and vegetables only --, plowing, and harrowing; the latter is done twice for most crops.

Just after the land is prepared so that it is ready for sowing, a heavy pre-sowing irrigation is usually carried out. The total number of irrigations is highly variable. Partial and total volumes of water applied per hectare vary greatly as well; not only between different crops, but also among regions, because of variations in technology and climate (temperature, rainfall, and relative humidity).[6]

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6. Total volume of water applied per hectare for each crop and location was calculated based on volumes recommended by SARH (SARH-DGPEA), and assuming an average in-field application efficiency of 75%, (Palacios).

Table 17. Machinery Requirements for Mechanized Agricultural Activities.

Activity	Tractor	Implement	Hours/Ha
Subsoiling	150 HP	subsoiler 3 shanks	3.50
Plowing	150 HP	disc plow 5 discs	2.50
Harrowing	150 HP	double disc harrow 28 discs	1.00
Levelling	150 HP	"tablon" 24' x 12'	1.00
	150 HP	land plane 45' x 12'	0.75
Furrowing	80 HP	lister 5 shanks	1.00
Bunding	80 HP	hiller 6 discs	0.50
Ditch making	80 HP	ditcher	0.50
Sowing	80 HP	unit planter 4 row	1.00
	80 HP	grain drill	1.00
Cultivating	80 HP	vertical cultivator	1.00
Spraying	80 HP	sprayer (asper jet)	0.75
	high	clearance sprayer (spider tractor)	0.75
Fertilizing	80 HP	fertilizer spreader	0.75
Bund erasing	150 HP	terrace blade	0.50
Shredding	80 HP	rotary cutter	1.50
Mowing	80 HP	mower	0.81
Raking	80 HP	raker	0.43
Baling	80 HP	baler	0.75

a/ two-wheel drive; average diesel consummption per hour is 9 liters for 80 HP and 18 liters for 150 HP.

SOURCES: -FIRA-Hermosillo, Son.; John Deere agricultural machinery distributors in Los Mochis, Sin. and Hermosillo, Son.

-Byerlee (1983) Comparative Adavantage and Policy Incentives in Wheat Production in Rainfed and Irrigated Areas of Mexico. CIMMYT (Mimeographed) Mexico.

A weighted average of water volume applied per hectare per production cycle for the four irrigation districts under consideration is approximately 10.33 MM^3.(SARH-DGDUR)

Sowing and Crop Maintenance

Seeds are supplied by state-owned National Seed Producer (PRONASE)and commercial firms. The higher quality of the commercially produced seed is widely recognized by farmers. Sowing is done mechanically for all crops except vegetables. A 4-row unit planter is usually utilized, except in the cases of wheat and alfalfa, where a grain drill and a spreader, respectively, are used.

Tomato and green pepper seeds are germinated inside greenhouses, under controlled environmental conditions. The small plants are then transplanted into the field. This procedure results in a more efficient use of the mostly imported seed, yields stronger and healthier plants, and permits an early start of the crop in cases when the field is still occupied by the previous one. A replanting is usually carried out to replace dead or weak plants. In the case of cotton, a "desahije" or plant clearing is done a few days after germination to eliminate excess plants and arrive at the desired spacing and plant density. Potato tubers are sown by hand.

Land cultivation is usually carried out two or three times to eliminate weeds, preserve soil moisture and give

plants a strong support at the base. Manual and chemical weed control is also widely practiced, usually in combination with mechanical cultivation. Hand weeding labor requirements range from 4 to 16 or more man-hours, depending on the crop and the simultaneous use of chemical and mechanical control methods.

Use of pesticides for the prevention and control of insect pests and deseases is widespread. Applications are mostly aerial, although manual and ground mechanical sprayings are also practiced. Vegetables and cotton require the highest dosages of pesticides among all crops. On a regional basis, Sinaloa's central region's high temperature-high humidity conditions increase disease and pest infestation, thus requiring relatively higher dosages of pesticides. The use of services of entomologists and plant pathologists for diagnosis and adequate pest control is common in all regions. Bird control, usually with firecrackers, is a common practice, especially in Sinaloa.

Fertilizers are usually applied twice, just before or during sowing, and before the first or second cultivation. Chemical fertilizers are used. Applications are mostly mechanical, using a unit planter with fertilizer tanks or a fertilizer spreader. Nitrogen dosages are highest in most crops. Amounts of phosphorus are lower, and are usually applied in the second fertilization. Potassium is applied almost exclusively for vegetable crops. State-owned

Fertilizantes Mexicanos (FERTIMEX), is the main manufacturer and supplier. Seed inoculants are used in beans, chick-peas, soybeans and alfalfa to increase soil nitrogen fixation.

Other important crop maintenance activities include prunning in cotton, staked tomatoes and green peppers, and the installation and removal of stakes, staking wire and cord in staked vegetable crops.

Harvesting

Harvesting of most crops is mechanized. Combines are used for harvesting and threshing corn, wheat, rice, sorghum, soybeans, safflower, and chick-peas. Bean plants are pulled out and sesame plants cut and bundled, both manually. Both are left to dry in the field and are later threshed mechanically.

Cotton is mostly harvested mechanically in Sonora, and manually in Sinaloa, in which case an average of 120 man-hours is employed (aproximately 32% of total labor requirements for the crop.) The fact that yields are 53% greater and wages 13% higher in Sonora than in Sinaloa apparently justifies the use of cotton pickers in the former.

All vegetables are harvested manually. Large staked tomatoes are picked mostly in their "vine-ripe" stage, although some proportion is harvested in the "green" stage.[7] Labor used in harvest may represent up to 30% of total.

Output Marketing and Processing

The organization of marketing pools is common in both states, especially for potential export crops such as sesame, and those actually exported like chick-peas, cotton and vegetables. Advance sales contracts between farmers and industry or wholesalers is also common in rice, cotton, and vegetables,[8] where the latter provide working capital needed for production, that is then reclaimed at the time of sale.

Although CONASUPO's participation has decreased substantially in the last few years, both in terms of market share and the degree of price subsidization, it remains a major buyer of wheat (33% of Sinaloa's production in 1984-85 (SAPSE-Sinaloa)), corn (90% of Sonora's production in 1980 (SARH-Sonora)), beans, and, to a lesser extent, of soybeans (16% of Sinaloa's output in 1985 (SAPSE-Sinaloa)), and sesame, in both states.[9]

Demand for basic grains and cereals, with the exception of wheat, is mostly local; either by retailers or by industry. Corn is bought by "tortilla" factories. Wheat is

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7. In 1983-84, 87% of the volume of tomatoes for export in Sinaloa was "vine-ripe"; the rest was exported in the "green" stage, (CAADES, 1985).

8. In the mid 1970s as much as 75% of capital needed for Mexican vegetable production was provided by American distributors in Nogales, (Bredhal).

9. CONASUPO bought more than 40% of Sinaloa's wheat production in 1984. While it used to be the major (continues next page)

mostly sent to mills located in large cities like Monterrey, Guadalajara, and Mexico. Rice in Sinaloa is refined locally and then exported to the rest of the country.[10] Beans are consumed locally in both states, although Sinaloa exports a small fraction to the national market. Sorghum in Sonora is sold directly to livestock, swine, and poultry producers, or to the local feed industry. In Sinaloa it is mostly exported to other States (77% of output in 1985, (SAPSE-Sinaloa)).

Oilseeds are either bought by local industries, which carry out primary processing, or are shipped, unprocessed, to large urban centers. Soybeans and sesame are demanded mainly by out-of-State industries (57% of Sinaloa's soybean output in 1985 (SAPSE-Sinaloa)), while safflower is mostly processed by local industry (65% of Sinaloa's output in 1985, (SAPSE-Sinaloa)). This difference in distribution is probably due the larger variety of uses for soybeans and sesame in the food, soap, and cosmetic industries.

(9. continued)
intermediary between rice, sorghum, and safflower producers and industry, its market participation in 1985 in that state was nul, (SAPSE-Sinaloa).

10. An average of 0.66 tons of white rice is obtained per mt of paddy rice.

Export vegetables -- tomatoes and green peppers -- are selected and packed by local processing plants. Packing plants are mostly owned by large vegetable producing firms[11], and also service smaller producers. Produce that meets export-quality requirements is precooled and transported to Nogales, Sonora, the main port of exit to the United States. Residual or lower quality produce is designated for the domestic market. Aproximately 63% of large staked tomatoes, almost 100% of cherry staked tomatoes, and 97% of green peppers were exported in 1983-84, (CAADES, 1985). The share of the domestic market for vegetables has increased in the past few years due to more stringent quality standards and controls by the Mexican producers' organizations -- CAADES and the National Union of Vegetable Producers (UNPH) -- in an effort to maintain the good reputation of Mexican produce abroad, and to prevent flooding of foreign markets, and low prices.

Although a fraction of potato production in Sinaloa is destined to the export market, it supplies mostly domestic demand, localized mainly in large urban centers.

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11. Emerson (1980), reports that in Sinaloa, large scale producers, with farms of 300 to 1500 hectares and several packing houses control roughly half of the vegetable export market. These firms are generally run by a family that oversees the growing, packing, and marketing operations. Since the law limits size of irrigated farms to 100 Has., several family members hold title to the land.

Seed cotton is locally ginned. Gins are owned by local farmers' organizations or by private national and multinational corporations.[12] In the first two cases the processed cotton lint is sold to foreign wholesalers, or to the domestic textile industry[13]; in the latter, marketing is done directly. Cotton seed is sold to the local oilseed industry. CONASUPO participates with a fraction of the cotton seed market. Important ports of exit for cotton lint are Mazatlan, Sin.; Guaymas, Son.; Ensenada, BCN; and Mexicali, BCN. When transported through Mexicali, cotton lint arrives at southwestern United States ports; from there it is shipped to Japan, China, Europe, and South America.

Chick-pea marketing in both states is carried out by the National Union of Chick-pea Producers and Exporters (UNPEG). The Union of Ejidos of Agricultural Production at Navolato, Sin. (UEPAN), handles part of the marketing in Sinaloa, (SAPSE-Sinaloa) where 87% of output is exported. In Sonora, 80% of output is destined to the export market, (SARH-CGDA) Spain, Cuba, and Venezuela are the main buyers of Mexican chick-peas.

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12. An average of 0.388 tons of lint are obtained for every ton of seed-cotton.

13. Most cotton production is exported, but exact figures of domestic and foreign market shares were not available.

Alfalfa in Sonora is either sold fresh "green",or "achicalada" (sun-dried). It is bought directly by livestock and dairy producers, and by local feed industries.

CHAPTER 4

POLICY AND PRICES

Policy and Output Prices

In the absence of policy a devaluation of the domestic currency increases the domestic price of exports as well as that of imports, creating a direct incentive effect for exporters and import substituting activities. The devaluation of the Mexican peso increased the potential revenues for producers of export crops such as cotton, chick-peas, and vegetables[1], as well as those received by producers of basic staples and oilseeds -- import substituting -- crops. But trade restrictions, exchange rate controls and domestic price policies have prevented the full manifestation of price adjustments. This section discusses the effects that currency exchange controls, trade, and price policies have had on output prices of export crops, and basic staples and oilseeds.

Effects on Export-Crop Producers

The importance of agricultural exports as sources of foreigncurrencyis reflected inthe relatively loose trade policy governing these crops. Trade permits are not required

1. Sesame exports, which averaged 40 thousand mt/year from 1975 to 1984, dropped to 1 thousand in 1985.

for export crops, except for chick-peas. There is a 1% ad valorem export tax on vegetables[2] and a 5% tax on cotton[3]; all other crops are exempt, (Mayer, 1986).

Exchange rate policy,[4] however, has had an increasingly significant effect on export revenues. While controlled and free market currency exchange rates were similar during 1982, the former has lagged behind in subsequent years. Overvaluation of the peso with respect to the US dollar was by 25% in 1983, 10% in 1984, and 20% in 1985, (see Appendix B, Table B.3). Controlled exhange rates for export revenues are enforced through the establishment of a legal obligation on all private exporting entities to sell their revenues in foreign currency to the Mexican banking system, at controlled rates. Foreign currency exportation and production-input expenses may be deducted from these foreign currency sales commitments. Also, an official output price, usually lower than the actual market price, is used as the basis for export revenue calculations, thus, partially offsetting the implicit tax from controlled

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2. Vegetable export taxes are levied on a per box basis, and are calculated from an official price in US dollars per box, which is converted to domestic currency at the controlled exchange rate.

3. Cotton export taxes are levied on a per kilogram basis, and are calculated from an official price of P44.00/kg.

4. Official decrees dealing with currency exchange rate controls were first published in the Federal Official Diary, on December 13 and 20, 1982.

exchange rates. Thus, a portion of foreign exchange revenues may be exchanged at market rates.

Effects on Basic Staple and Oilseed Producers

Because priority is given to the satisfaction of domestic demand for basic staples and oilseeds, an export licence is required for all such products; licences are almost never granted. The Mexican government is a major participant in the marketing of these products. The National Company of Popular Sustenances (CONASUPO), intervenes as a buyer with theoretically unlimited demand at an official guaranteed price. CONASUPO acts also as a wholesaler of these products to industry, retailers, and consumers. Because CONASUPO is practically the sole importer and has the largest storage infrastructure, it exerts significant control over market prices for both consumers and producers.

The relationship between guaranteed and world prices for basic staples and oilseeds has varied substantially in the last decade. The evolution of world and domestic CONASUPO prices to producers and consumers from 1975 to 1985 is illustrated in Figures 2.1 to 2.7 for each of seven basic staples and oilseeds: corn, wheat, white rice, beans, sorghum, soybeans, and sesame. Absolute transfers in domestic prices, and relative transfers as percentages of world price, are presented in Table 18, below. (See Appendix B.1, Table B.1 for calculations.)

Table 18. Evolution of Output Transfers by CONASUPO for Basic Staples and Oilseeds, 1975-1985.

Crops	YEARS 1975	1976	1977	1978	1979	1980	1981 a/	1982	1983	1984	1985
					Real Pesos/Mt						
I Basic Staples											
CORN											
To producers	(198)	715	317	(159)	(86)	117	1,309	(280)	(349)	28	(1,022)
As % of price	-6%	25%	10%	-5%	-3%	4%	62%	-9%	-10%	1%	-29%
To consumers								811	1,920	1,322	1,417
As % of price								24%	53%	44%	39%
WHEAT											
To producers	(1,520)	(812)	(332)	(732)	(1,029)	(120)	735	(1,807)	(664)	385	(1,560)
As % of price	-33%	-21%	-12%	-22%	-29%	-4%	29%	-42%	-18%	17%	-44%
To consumers									1,523	404	2,179
As % of price									40%	17%	58%
WHITE RICE											
To producers	(3,530)	(10,062)	(4,123)	(10,151)	(1,172)	(2,198)	(610)	322	(6,454)	(97)	(1,817)
As % of price	-31%	-61%	-41%	-68%	-22%	-32%	-11%	7%	-55%	-2%	-35%
To consumers									8,217	1,304	160
As % of price									67%	26%	3%
BEANS											
To producers	1,012	(4,463)	(10,208)	(8,243)	(4,602)	(3,928)	(1,010)	433	(4,647)	(3,716)	(6,297)
As % of price	11%	-37%	-65%	-58%	-42%	-33%	-11%	7%	-46%	-45%	-62%
To consumers								(847)	6,706	6,391	6,912
As % of price								-12%	64%	74%	65%
SORGHUM											
To producers	(257)	(405)	(537)	(634)	(636)	(540)	22	(834)	(1,895)	(660)	(1,651)
As % of price	-8%	-13%	-18%	-24%	-24%	-22%	1%	-33%	-48%	-23%	-51%
To consumers									2,440	307	1,129
As % of price									59%	10%	33%
Averages for I											
To producers	(898)	(3,005)	(2,977)	(3,984)	(1,505)	(1,334)	89	(433)	(2,802)	(812)	(2,470)
As % of price	-13%	-21%	-25%	-35%	-24%	-17%	14%	-14%	-36%	-10%	-44%
To consumers								(18)	4,161	1,946	2,359
As % of price								6%	57%	34%	40%

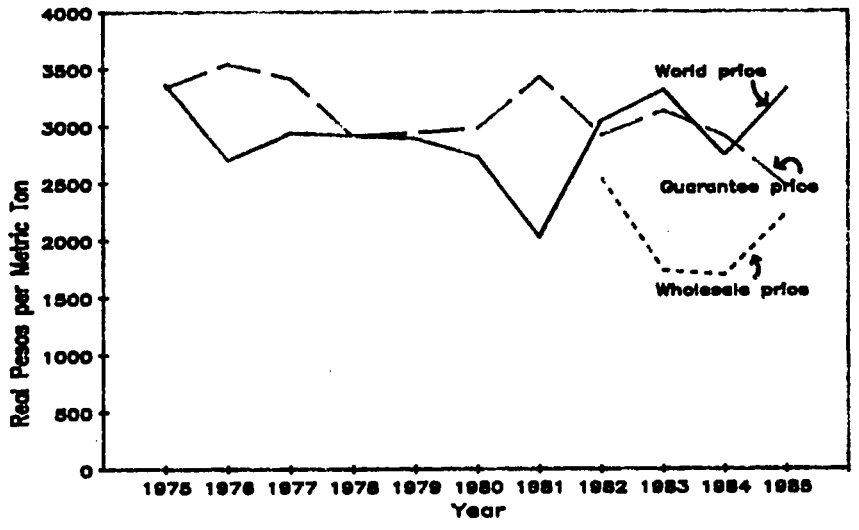
(continues)

(Table 18 continued)

Crops	1975	1976	1977	1978	1979	1980	1981 a/	1982	1983	1984	1985
					YEARS						
					Real Pesos/Mt						
II Oilseeds											
SOYBEANS											
To producers	(1,595)	(2,011)	(3,571)	(614)	(602)	887	1,344	(914)	(1,214)	(367)	(1,285)
As % of price	-21%	-25%	-43%	-10%	-10%	20%	31%	-15%	-19%	-6%	-20%
To consumers							352	2,173	3,010	2,563	2,734
As % of price							8%	35%	46%	42%	41%
SESAME											
To producers	(6,558)	(6,609)	(11,153)	(11,621)	(9,406)	(9,513)	(11,673)	(13,332)	(17,689)	(4,099)	(7,891)
As % of price	-38%	-40%	-59%	-61%	-55%	-61%	-59%	-66%	-68%	-27%	-46%
To consumers							16,049	12,617	20,634	7,029	11,226
As % of price							77%	60%	76%	45%	62%
Averages for II											
To producers	(4,076)	(4,310)	(7,362)	(6,118)	(5,004)	(4,313)	(5,164)	(7,123)	(9,451)	(2,233)	(4,588)
As % of price	-30%	-32%	-51%	-35%	-33%	-21%	-14%	-41%	-44%	-17%	-33%
To consumers							8,201	7,395	11,822	4,796	6,980
As % of price							0	0	1	0	1
Global averages											
To producers	(1,806)	(3,378)	(4,230)	(4,593)	(2,505)	(2,185)	(1,412)	(2,345)	(4,702)	(1,218)	(3,075)
As % of price	-18%	-25%	-33%	-35%	-26%	-18%	6%	-22%	-38%	-12%	-41%
To consumers							8,201	3,689	6,350	2,760	3,679
As % of price							43%	27%	58%	37%	43%

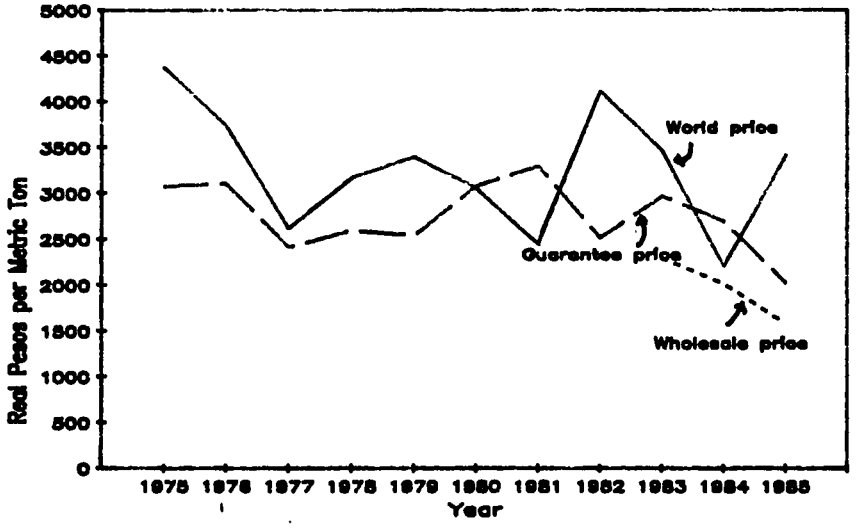
a/ Deflated with general CPI for Mexico, 1978=100.(See Appendix B, Table B.2)
Figures in parentheses are negative transfers or taxes.
SOURCE: Appendix B, Table B.1

Figure 2.1 Domestic and World Prices for Corn, 1975-1985.



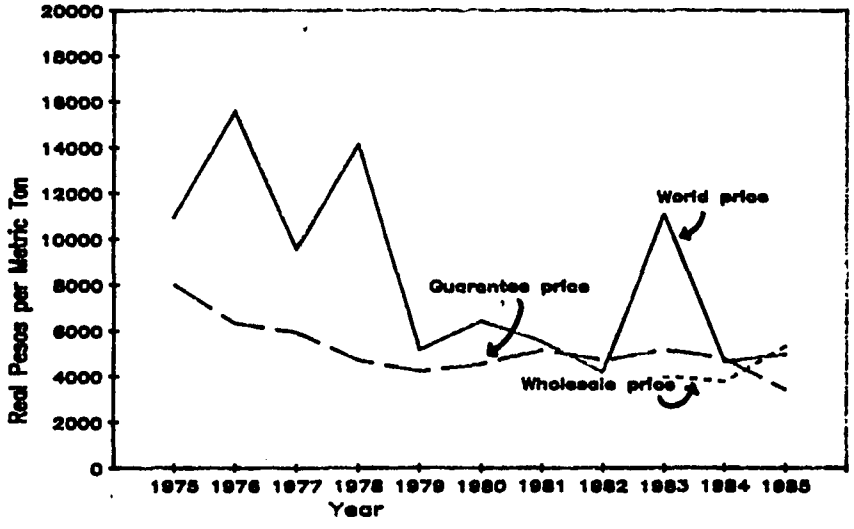
Source: Table B.1 Appendix B.

Figure 2.2 Domestic and World Prices for Wheat, 1975-1985.



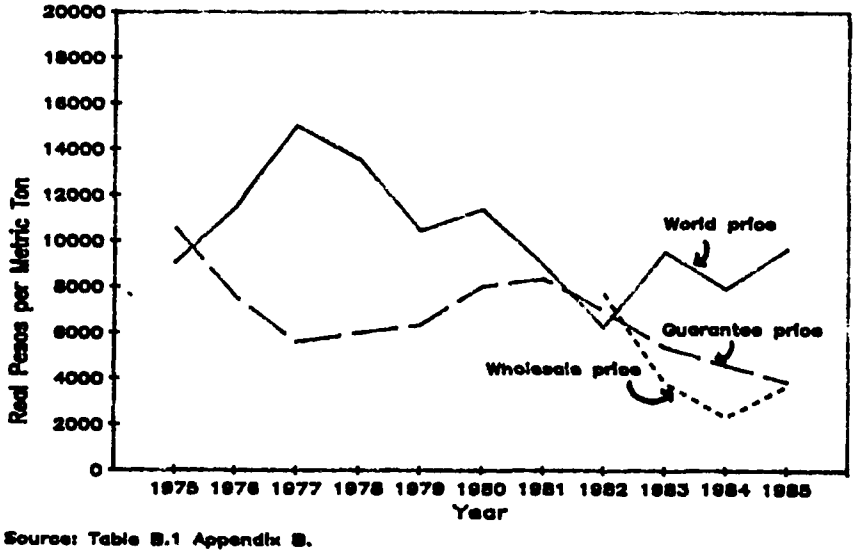
Source: Table B.1 Appendix B.

Figure 2.3 Domestic and World Prices for Rice, 1975-1985.



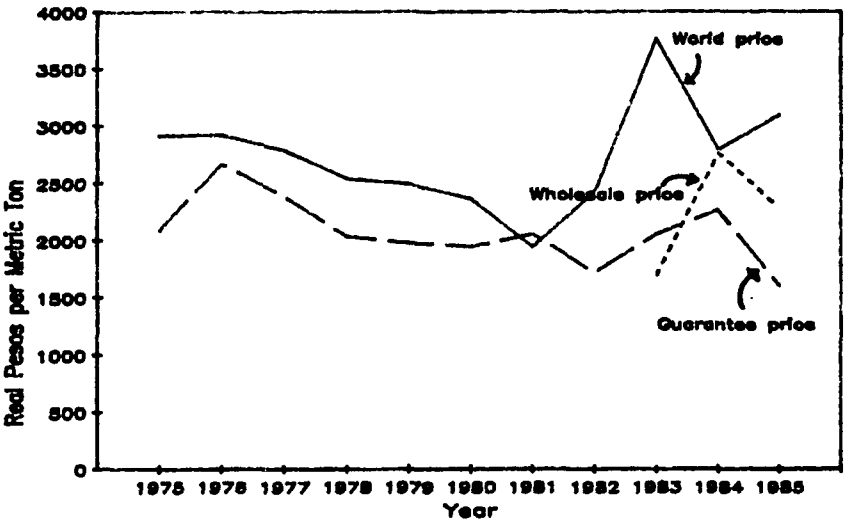
Source: Table B.1 Appendix B.

Figure 2.4 Domestic and World Prices for Beans, 1975-1985.



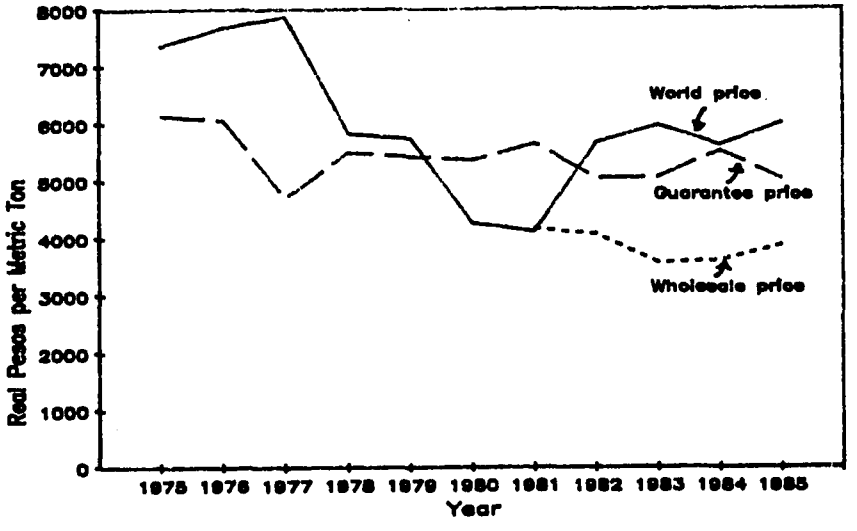
Source: Table B.1 Appendix B.

Figure 2.5 Domestic and World Prices for Sorghum, 1975-1985.



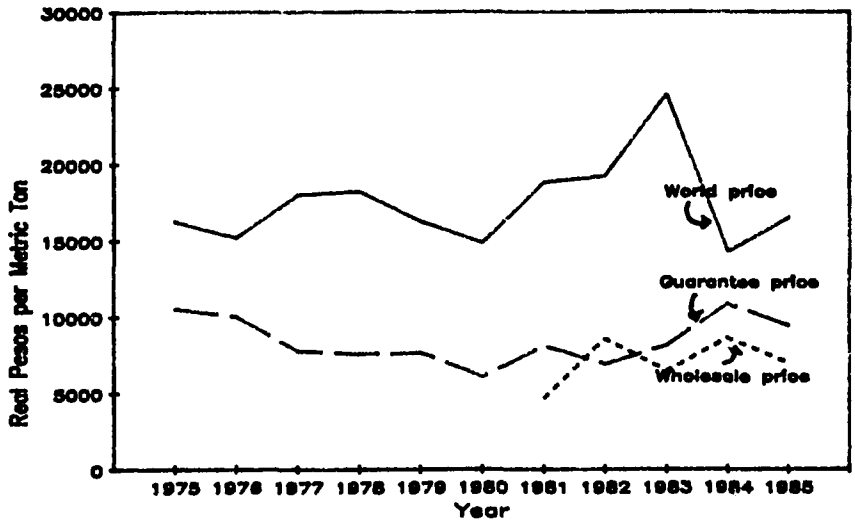
Source: Table B.1 Appendix B.

Figure 2.6 Domestic and World Prices for Soybeans, 1975-1985.



Source: Table B.1 Appendix B.

Figure 2.7 Domestic and World Prices for Sesame, 1975-1985.



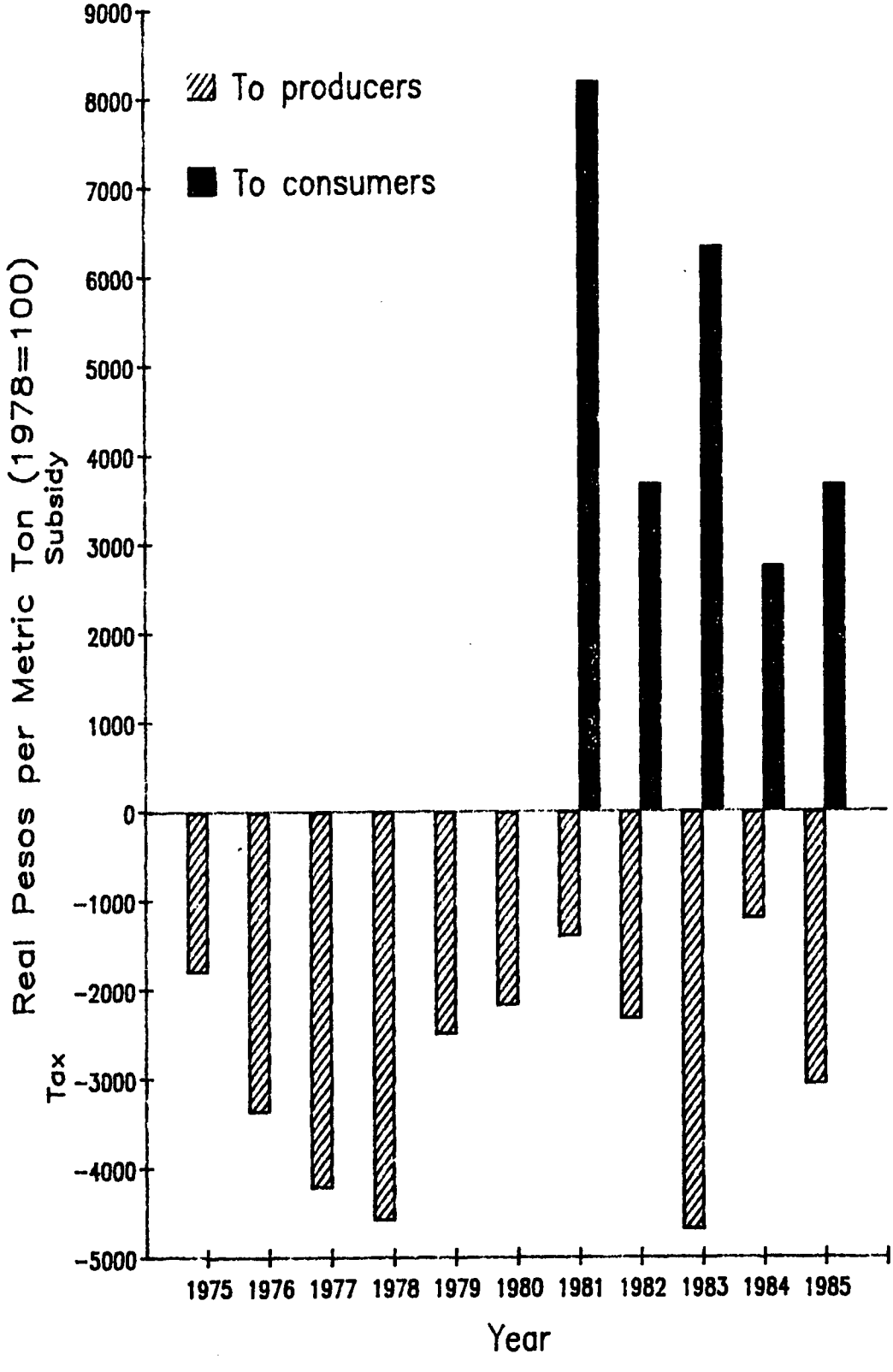
Source: Table B.1 Appendix B.

Based on the above evidence, two generalizations can be made regarding the behavior of domestic vs world price relationships, and hence, about transfers to producers and consumers of basic staples and oilseeds during the last decade: First, real guaranteed prices decreased in real terms for all crops (except sesame), which, in the context of a continuous devaluation of the Mexican peso, caused an increasing gap between world and domestic price levels. The average tax to producers was 25% during the period, with a minimum of 6% in 1981 -- attributable to SAM --, and a maximum of 41% in 1985. Consumer prices were consistently subsidized; by 42% on average, from 1981 to 1985, with a minimum of 27% in 1982, and a maximum of 58% in 1983. Subsidies decreased significantly (by 55%) in the period. The second generalization is a consequence of the first: producers of basic staples and oilseeds paid for a significant share of the financial burden implied by consumer subsidies. Disincentives to production and demand stimulation resulted in an increased reliance on imports. (See Figure 3).

Policy and Output Prices in Sonora and Sinaloa, 1985

The long-run perspective on which the PAM is based requires private and social output prices to be representative of expected prices, and not necessarily equivalent to short run domestic guaranteed and world prices

Figure 3. Evolution of Average Output Transfers by CONASUPO for Basic Staples and Oilseeds, 1975-1985.



prices prevailing in 1985. The considerations and methods used for private and social price determination are discussed separately below. Private and social output price estimates are presented in Table 19.

Private Prices

Private prices at the farm level for crops destined primarily for the domestic market were based on regional averages for 1982-83 to 1984-85 crop years. Crops under this category include corn, wheat, rice, beans, sorghum, soybeans, sesame, safflower, potatoes, alfalfa, and cotton seed. Expected prices at the processing and wholesale levels were estimated by augmenting farm level prices by the costs per mt of output for each post-farm activity. Government and private publications, as well as interviews with farmers and sector-related firms and organizations served as sources of staple and oilseed price data.[5]

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5. Main output price sources for Sonora and Sinaloa included:
- SARH-DGIES (1986) Precios Medios Rurales 1984-1985. (Mimeographed) Mexico, D.F..
- CONASUPO (1986) Precios de Venta al Mayoreo de Productos Basicos. (Mimeographed) Mexico, D.F..
- Gobierno del Estado de Sinaloa-SAPSE (various years) Agricultura en Sinaloa Culiacan, Sinaloa.
- Gobierno del Estado de Sinaloa-SAPSE (various years) Mercados y Productos. Culiacan, Sinaloa.

Table 19.Private and Social Output Prices for Sonora and Sinaloa, 1984-1985.

SYSTEM	Irrigation District ID037 Private	ID037 Social	ID041 Private	ID041 Social	ID075 Private	ID075 Social	ID010 Private	ID010 Social
	Prices Pesos/Mt							
CORN								
Farm	41,273	53,631	41,278	53,633	41,455	64,688	41,455	64,688
Post-farm	43,599	56,446	43,599	56,446	43,599	67,306	43,599	67,306
System	43,599	56,446	43,599	56,446	43,599	67,306	43,599	67,306
WHEAT								
Farm	34,843	58,757	34,843	58,757	34,988	69,777	34,988	69,777
Post-farm	50,975	78,823	47,990	75,093	45,227	82,497	44,681	81,814
System	50,975	78,823	47,990	75,093	45,227	82,497	44,681	81,814
RICE								
Farm	----	----	----	----	78,416	121,973	78,416	121,973
Post-farm main	----	----	----	----	83,610	128,359	83,610	128,359
Post-farm secondary	----	----	----	----	30,000	32,258	30,000	32,258
System	----	----	----	----	83,610	128,359	83,610	128,359
BEANS								
Farm	102,725	159,471	102,681	159,427	102,955	170,576	102,955	170,576
Post-farm	105,099	162,334	105,099	162,334	105,099	173,194	105,099	173,194
System	105,099	162,334	105,099	162,334	105,098	173,193	105,099	173,193
SORGHUM								
Farm	31,035	53,693	31,035	53,693	31,105	64,638	31,105	64,638
Post-farm	33,200	56,347	33,200	56,347	33,200	67,207	33,200	67,207
System	33,200	56,347	33,200	56,347	33,200	67,207	33,200	67,207
SOYBEANS								
Farm	----	----	85,715	102,469	85,988	113,617	85,988	113,617
Post-farm	----	----	88,000	105,243	88,000	116,103	88,000	116,103
System	----	----	88,000	105,243	88,000	116,103	88,000	116,103
SAFFLOWER								
Farm	60,458	140,217	60,458	140,217	60,702	151,336	60,702	151,336
Post-farm	62,714	142,962	62,714	142,962	62,714	153,822	62,714	153,822
System	62,714	142,962	62,714	142,962	62,714	153,822	62,714	153,822
SESAME								
Farm	147,620	254,822	147,445	254,647	147,988	244,345	----	----
Post-farm	150,000	257,691	150,000	257,691	150,000	246,831	----	----
System	150,000	257,691	150,000	257,691	150,000	246,831	----	----
TOMATOES-LARGE(D) a/								
Farm	----	----	57,313	114,591	57,341	112,036	57,341	112,036
Post-farm	----	----	120,476	188,964	117,918	183,240	117,918	183,240
System	----	----	120,476	188,964	117,918	183,240	117,918	183,240

(continues)

(Table 19. continued)

SYSTEM	Irrigation District: ID037 Private	ID037 Social	ID041 Private	ID041 Social	ID075 Private	ID075 Social	ID010 Private	ID010 Social
	Prices: Pesos/Mt							
TOMATOES-LARGE(X) b/								
Farm	----	----	146,435	154,272	143,228	150,199	143,228	150,199
Post-farm main	----	----	187,925	199,930	187,926	199,930	187,926	199,930
Post-farm secondary	----	----	49,000	49,000	49,000	49,000	49,000	49,000
System	----	----	187,925	199,930	187,926	199,930	187,926	199,930
TOMATOES-CHERRY(D)								
Farm	----	----	----	----	64,580	161,259	64,580	161,259
Post-farm	----	----	----	----	125,157	232,463	125,157	232,463
System	----	----	----	----	125,157	232,463	125,157	232,463
TOMATOES-CHERRY(X)								
Farm	----	----	----	----	149,532	161,259	149,532	161,259
Post-farm	----	----	----	----	193,689	210,314	193,689	210,314
System	----	----	----	----	193,689	210,314	193,689	210,314
TOMATOES-SALADETTE(D)								
Farm	----	----	----	----	21,077	65,777	21,077	65,777
Post-farm	----	----	----	----	75,183	128,894	75,183	128,894
System	----	----	----	----	75,183	128,894	75,183	128,894
TOMATOES-SALADETTE(X)								
Farm	----	----	----	----	111,997	118,131	111,997	118,131
Post-farm main	----	----	----	----	153,418	164,013	153,418	164,013
Post-farm secondary	----	----	----	----	18,500	18,500	18,500	18,500
System	----	----	----	----	153,418	164,013	152,396	164,013
GREEN PEPPERS-BELL(D)								
Farm	----	----	61,430	162,412	61,447	151,765	61,447	151,765
Post-farm	----	----	140,510	256,733	131,456	234,797	131,456	234,797
System	----	----	140,510	256,733	131,456	234,797	131,456	234,797
GREEN PEPPERS-BELL(X)								
Farm	----	----	151,076	166,011	142,235	155,034	142,235	155,034
Post-farm main	----	----	190,836	209,454	190,736	209,454	190,736	209,454
Post-farm secondary	----	----	48,000	48,000	48,000	48,000	48,000	48,000
System	----	----	190,836	209,454	190,736	209,454	190,736	209,454
POTATOES								
Farm	----	----	----	----	25,082	81,400	25,082	81,400
Post-farm	----	----	----	----	27,244	84,036	27,244	84,036
System	----	----	----	----	27,244	84,036	27,244	84,036

(continues)

(Table 19. continued)

SYSTEM	Irrigation District ID037 Private	ID037 Social	ID041 Private	ID041 Social	ID075 Private	ID075 Social	ID010 Private	ID010 Social
	Prices							
	Pesos/Mt							
COTTON(D)								
Farm	271,391	323,155	271,391	323,155	271,640	323,430	271,640	323,430
Post-farm main	323,691	385,192	323,691	385,192	357,093	426,830	357,093	426,830
Post-farm secondary	48,000	64,584	48,000	64,584	48,000	53,724	48,000	53,724
System	323,691	385,192	323,691	385,192	357,093	426,830	357,093	426,830
COTTON(X)								
Farm	271,391	323,155	271,391	323,155	271,640	323,430	271,640	323,430
Post-farm main	554,631	563,562	554,631	563,562	554,631	563,562	554,631	563,562
Post-farm secondary	48,000	64,584	48,000	64,584	48,000	53,724	48,000	53,724
System	554,631	563,562	554,631	563,562	554,631	563,562	554,631	563,562
CHICK-PEAS(D)								
Farm	71,615	152,616	71,615	152,589	50,782	171,968	50,782	171,968
Post-farm	93,983	179,489	91,000	175,647	67,655	191,690	67,655	191,690
System	93,983	179,489	91,000	175,647	67,655	191,690	67,655	191,690
CHICK-PEAS(X)								
Farm	156,763	170,729	156,763	170,697	156,486	170,676	156,486	170,676
Post-farm main	169,029	184,605	169,029	184,605	169,029	184,605	169,029	184,605
Post-farm secondary	57,978	57,978	57,978	57,978	57,978	57,978	57,978	57,978
System	169,029	184,605	169,029	184,605	169,029	184,605	169,029	184,605
ALFALFA								
Farm	3,346	2,857	3,346	2,856	----	----	----	----
Post-farm	5,693	5,693	5,693	5,693	----	----	----	----
System	5,693	5,693	5,693	5,693	----	----	----	----

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market; includes profits from sales of residual and lower quality product sold in the domestic market.

Private prices for export crops were calculated starting at the wholesale level, based on FOB Mexico long-run price estimates. Export taxes and costs per mt associated with each marketing stage were subtracted from these, to arrive at the output price equivalent for each stage.

Cotton. A time series (1980-1984) of constant prices for cotton lint (Middling 1-3/32", CIF Northern Europe), was constructed, based on commodity price data published by the World Bank. For the same years a current-price time series was constructed for FOB Mexico prices for cotton lint,[6] which was then deflated by the Manufacturing Unit Value Index (MUV), (1983=100), to yield constant prices. An average conversion factor between the two constant-price series was then estimated, allowing conversion of the constant long-term (1990) World Bank price estimate to its FOB Mexico equivalent. The long-run (expected) price was inflated by the 1985 MUV index to obtain a current 1985 FOB Nogales price for cotton lint, which amounted to $1,760.40 per mt, or P563,328 per mt at free market exchange rates (P320 per US dollar in 1985). However, the official price is only P44,000 per ton. This price implies that the

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6. FOB Mexico prices were calculated from export volume and value data published in various years of FAO Trade Yearbook. Mexican export cotton is also Middling 1-3/32" quality.

producer needs to exchange only $165.41 per mt to national banks at the controlled exchange rate (P266.00 per US dollar in 1985). This amount was added to the residual $1,595 dollars per mt, which was converted at the free market exchange rate. Thus, the wholesaler obtains an FOB Nogales price of cotton lint of P554,405 per mt. The farm-level price for seed cotton was equal to P271,391 per mt, based on gin outturn data provided by the Union of Cotton Producers of Mexico (UPARM).

Chick-peas. Data for chick-pea world prices was obtained from the 1984 Foreign Agricultural Trade of the Unided States (FATUS) supplement.[7] Current prices for 1982 to 1984 were deflated by the MUV index; from these, an average constant price for chick-peas was estimated, and then inflated by the 1985 MUV index to obtain a 1985 FOB Nogales, Mexico[8] price equivalent equal to $576.89 per mt. An offial chick-pea price was assumed at 50% of the market price, then converted to foreign currency at the controlled exchange rate. The residual difference between actual export value and `oficial' export value was converted from dollars to pesos at the free market rate, yielding an FOB

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7. FAO trade data and World Bank price estimates were not available.

8. No adjustments for transportation and handling were made, since custom-value prices are based on the foreign market value or export value, and exclude import duties, freight, insurance and other charges incurred in moving the commodity to the US port.

Nogales price of P169,029 per mt. Residual and low quality chick peas account for about 16% of production. In 1985 their price, FOB processing plant, was P57,978 per mt, (SAPSE-Sinaloa).

Vegetables. FOB Nogales prices for tomatoes and green peppers were obtained from USDA's Marketing Mexico Fruits and Vegetables, 1984-1985 Season.[9] Prices for large, vine-ripe tomatoes and green, large tomatoes were averaged using weights of 64% and 36%, respectively, which were the corresponding percentage shares in total volume of large-tomato exports from Sinaloa in 1983-84, (CAADES, 1985). The resulting average price was $7.46 per box ($604.36 per mt).[10] The official price was $1.25 per box ($101.30 per mt), which was converted to domestic currency at the controlled rate. The residual fraction of price, $6.21 per box ($503. 06 per mt), was converted to pesos at the free market rate, yielding an estimate of P187,925 per mt. Residual and non-export quality large tomatoes represent an average of 37% of production, and were sold in the domestic market in 1985 at an average price of P49,000.00 per mt, FOB processing plant, (AARFS, 1985).

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9. These prices don't include duty and crossing charges.

10. Large tomatoes average 81.04 boxes per mt.

Cherry tomatoes had an average FOB Nogales price of $4.75 per box ($633.08 per mt).[11] The official price of $1.25 per box ($166.60 per mt), was converted to domestic currency at the controlled rate. The residual fraction of price, $3.50 per box ($466.48 per mt), was converted at the free market exchange rate, giving a 1985 estimate of P193,689 per mt. Almost 100% of cherry tomato production is exported.

Saladette tomato prices were assumed equivalent to large vine-ripe tomato prices of $7.48 per box ($490.16 per mt).[12] An official price of $1.25 per box ($81.91 per mt) was converted to domestic currency at the controlled rate, and the residual fraction of $6.23 per box ($408.25 per mt), was converted at the free market rate, yielding a price of P152,396 per mt. Residual and non-export quality saladette tomatoes, which constitute aproximately 37% of production, were sold in the domestic market at P18,500 per mt in 1985, FOB processing plant, (AARFS, 1985).

The average 1985 FOB Nogales price for green (bell) peppers was $8.69 per box ($613.69 per mt).[13] The official price was $1.50 per box ($105.93 per mt). The residual fraction of $7.19 per box ($507.76 per mt), was converted

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11. Cherry tomatoes average of 133.28 boxes per mt.

12. Saladette tomatoes average 65.53 boxes per mt.

13. Bell peppers average 70.62 boxes per mt.

at the free market rate, yielding an FOB Nogales price of P190,736 per mt. Residual and non-export quality green (bell) peppers, which represent aproximately 3% of production, were sold in the domestic market at an average price of P48,000.00 per ton, FOB processing plant, (AARFS, 1985).

Social Prices

Social price estimates for most of the crops followed the procedure described for the calculation of private prices of cotton. Conversions to domestic currency were made using the free market exchange rate. CIF(FOB) Sonora and Sinaloa social price equivalents for imported(exported) crops were calculated by adding(subtracting) transportation and handling costs -- valued in social prices --, to(from) corresponding CIF(FOB) Nogales, Mexico prices. Corn, wheat, grain sorghum, rice, and soybeans price estimates were based on World Bank projections. FAO trade data were used to estimate the relashionship between Mexican prices and World Bank quotations. For grain sorghum, the corn conversion factor was utilized to convert the World Bank long-run (1990) price estimate to the FOB Mexico equivalent. Calculations for beans, sesame, safflower, cotton seed, potatoes, and alfalfa are reviewed below; they required different methods of social price estimation, because World bank price

estimates and/or FAO trade data were unavailable.

Beans. FOB Washington US bean prices for 1979 to 1984 were obtained from the FAO Production Yearbook. These were deflated by the MUV index, and averaged -- with an increasing weight on recent years --, to obtain an FOB US, expected price in constant dollars.. A 1% adjustment was made for transportation, insurance, and handling costs to Nogales, Mexico, yielding a price of P154,083.00 per mt.

Sesame. Current soybean and sesame prices for 1976 to 1984 were obtained from the FAO Trade Yearbook. These were used to calculate the price relationship between CIF Mexico sesame prices and FOB Mexico soybean prices. The long-run (expected) FOB Mexico, 1985 current price of soybeans (based on World Bank estimates) was adjusted by this factor to arrive at an expected price for sesame of $830.76 per mt or P265,843.

Safflower and Cotton-seed. Safflower prices were based on soybean and soybean meal prices, because no safflower world prices were available. The CIF Nogales, 1985 expected price was $421.28 per mt, or P134,810 per mt. The social price of cotton seed was $227.30 per mt or P72,736, based on the 1985 expected soybean price. (See Appendix C, Sections C.1 and C.2 for review of calculation method.)

Potatoes. An FOB Nogales, Mexico current potato price series was constructed based on trade data from the FAO Trade Yearbook. These prices were deflated by the MUV

index, and averaged with an increasing weight on recent years, to obtain an FOB Nogales price of $203.29 per mt, or P65,024.00 per mt.

Alfalfa. The social price of green alfalfa was assumed to be equal to its market price. International trade is not significant, and no evidence of related price or trade policies was found.

Policy and Domestic Factor Prices in Sonora and Sinaloa

Labor

Empirical studies of economic growth have emphasized two developments in the labor market, -- salaries become relatively more important as economies evolve, and rural labor is absorbed by the growing industry and service sectors. The Mexican experience clearly reflects these tendencies. The share of salary recipients in total employment increased from 59.1% in 1960, to 66.5% in 1975, and 69.7% in 1977. Also, the participation of the agricultural labor force in total employment decreased, falling from 53% in 1960 to 39% in 1975, (Reyes 1983, 1984). The consequent growth in the urban labor force has been only partially absorbed by the industrial and service sectors, resulting in the development of a large pool of unemployed and underemployed urban workers.

Similar processes have occurred within Mexico's agricultural sector. Among the agricultural labor force, the

"jornaleros" (agricultural workers without land) constituted 43.7% of the total by 1970. In Sonora and Sinaloa the figure amounted to 56% and 50%, respectively in that year, (Coll). The rapid expansion of labor supply relative to demand in the sector has also resulted in unemployement and underemployment. In 1950 jornaleros worked an average of 190 days per year; in 1960 they were only employed an average of 100 days per year, (Hewitt).

In order to maintain wage levels above those that would result from market forces, an elaborate system of minimum wages was developed. Today, minimums are established for each of eighty-nine regions of the country by a National Minimum Wage Commission (CNSM), which works through local commissions made up of representatives of the government, organized labor, and private industry. Until 1981, minimums were established for two categories of unskilled workers; urban and rural. Rural minimums remained, on average, 14% below urban minimums from 1970 to 1980. From 1981 on, both were equalized throughout the country. Minimum wages are also established for eighty categories of skilled labor, on a regional basis. New minimum wage schedules were set every two years, but, as a result of high inflation rates, the Federal Labor Law was amended to provide for annual reviews as from January, 1976, (Waterhouse). Minimum and market wages are highly correlated in urban areas where well developed labor organizations and public institutions

introduce rigidities and modify the salary structure. This is not the case in agriculture, where wages are set by the interaction of supply and demand forces, (Reyes 1983).

Agricultural workers in Sonora and Sinaloa are mainly seasonal inmigrants from rural, poor states of Oaxaca, Puebla, and Hidalgo. This unskilled labor has the alternative of migrating to Mexico City or to other large urban centers. But the probablity of finding a job in the modern sector is slight, because unemployment and underemployment already abound. In the short-run, the best that a prospective migrant to the city can expect is to become a part of the urban traditional sector[15] where he will earn, on average, 20% less than the prevailing minimum wage, (Reyes, Contreras).[16]

Incentives for migration to Sonora and Sinaloa instead of Mexico City arise because of differences in the cost of living and wages for agricultural workers. Wages for unskilled agricultural workers in Sonora and Sinaloa were approximately P1,453.00 per day in 1985, 15% higher

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15. This sector can be defined as that encompassing the overtly unemployed, the underemployed or sporadically employed, and those involved in petty retail trades and services(Todaro).

16. A study conducted in 1971 in Mexico City found that 36% of the rural inmigrants with a job were employed in marginal occupations, receiving less than the minimum salary, (Reyes 1983).

than official minimums[17] (P1,263.00 per 8-hour day in 1985). This rate is 20% higher than that which could be expected in Mexico City's traditional sector (P1,167.00 per day); in addition, the cost of living is 13% higher in Mexico City. On a daily wage basis (i.e., without considering job permanence) the official minimum of P1,458.00 (1985) paid by the modern sector was roughly equivalent to the short-run expected wage for agricultural workers in Sonora and Sinaloa for 1985, (CNSM).

Labor costs are affected by Social Security taxes. The Mexican Social Security Institute (IMSS) was established in 1942, and the Social Security Law is in effect in many agricultural regions, including Sonora and Sinaloa. Monthly social security premiums are based on total employee earnings, excluding overtime pay, up to a maximum of ten times the monthly minimum-wage earnings, and are payable every two months. Of the total premium, 12.5% is contributed by the Federal Government, 25% is deductible from the employee's salary, and 62.5% is paid by the employer, (Waterhouse).

For the present study, wages for unskilled agricultural labor in Sonora and Sinaloa for 1985 were considered determined by market forces, at a level 15% above

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17. Official minimums are calculated considering the legal obligation on the part of the employer to pay a 7th day equivalent for a 6-day working week, (STPS).

regional minimums. The estimated per hour wages amounted to P192.86 in Sonora, and P170.23 in Sinaloa. Wages for farm machinery operators were assumed equivalent to the official minimum established for that category of skilled labor -- P277.40 per hour for Sonora, and P248.53 for Sinaloa. Other skilled labor costs were based on estimates as reported in the various sources of crop-budgets.

Land

Land is considered a fixed or immobile domestic factor, with its private and social valuation determined within the agricultural sector. In Mexico, the maximum legal size of an irrigated farm is 100 has, with the exception of land for cotton (a maximum of 150 has), or sugarcane, grapes, fruit trees and other perennials (excluding alfalfa), with a limit of 300 has. Farms within legal size limits are "unaffectable", as long as they are under exploitation or remain idle for not more than two consecutive years, (SRA). Larger farms are, however, common in both states, where property titles are shared among family members. No limit exists on the hectareage that may be rented by a single farmer or firm.

Markets for irrigated agricultural land are well developed in Sonora and Sinaloa. In 1985, land sales prices ranged from P200,000 to P250,000 per hectare for land suited for basic staple and oilseed production, and were up to

P500,000 per hectare for lands suited for vegetable production. Land is rented on a per-cycle or per-year basis. Rental rates are also determined by the crop that will be grown. In 1985, basic staple and oilseed rates were approximately P40,000 per cycle-hectare, and those for vegetables were about P60,000.

Two land taxes are levied by the state government. One is a private property tax[18], which is paid whether the land is cultivated or not. The corresponding per-hectare rates depend on the fiscal value assigned by state authorities to each type of land. The other tax is a "sowing permit" levied on both ejidos and private farms, for each crop cycle.

The estimation of the social value of land (except for that located near cities or towns), for use in one crop, is, in theory, determined by the land's worth in growing alternative crops. Due to crop rotation practices, it would be measured by some weighted average of the social rents accruing from the set of alternative crops, (Pearson) But the correct weights and social rents associated with each crop are not known in this case, so the social opportunity cost cannot be estimated accurately. For this reason, land costs were not included in the corresponding budgets.

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18. Although the Federal Law of Land Reform establishes in its article 106 a similar tax for ejidos, no evidence was found of its actual levying.

Therefore, estimated profits per hectare represent rents to land (and water), agricultural management skills, and to risk bearing.

Water and Water Distribution

Irrigation water is here considered a fixed domestic factor, since its private and social valuations are determined within the agricultural sector. Mexico's Federal Water Law declares water a public property, regardless of its source and use. Irrigation water rights are sold mainly on a per-crop cycle basis to farmers in irrigation districts. A cost for water rights is suggested by the Directive Committee of each irrigation district, and approved by SARH. No intrinsic scarcity value is imputed to water itself; user fees are calculated on the basis of operation, maintenance and capital amortization costs of irrigation districts. Trade of water rights between farmers is rarely permitted.

Before the early 1980s, user fees were largely symbolic; as much as 80% of operation and maintenance costs were paid by the federal government, and capital costs of infrastructure were excluded from fee calculations. Federal budget constraints in subsequent years brought about a radical adjustment in irrigation water fees. A Federal Water Law was decreed in 1981, and amendments were made to the Federal Law of Rights. Water user fees would have to cover

irrigation district operation, conservation, and maintencance costs, as well as capital amortization costs of federal investments on infrastructure. Irrigation districts were classified according to total irrigated surface and mean farm size, and a period for the attainment of financial self-sufficiency was established for each district. Most of Sonora and Sinaloa's irrigation districts have an irrigated surface of more than 50,000 has and a mean farm size greater than 5 has. The districts of Valle del Carrizo, Sin., and Valle de Guaymas, Son. fall under a second category, having an irrigated surface of less than 50,000 has, and an average farm size greater than 6 Has. Both categories were required to cover 80% of their operation, conservation and maintenance costs by 1984. Water fees would have to cover 100% of these costs by 1985, and capital amortization costs by 1986. Furthermore, fees would be calculated on a volume basis, with no distinction among crops or farmers, (SARH, 1981).

Field information gathered in 1985 indicates that irrigation districts in Sinaloa were still charging crop-specific, per-cycle fees, that covered between 50 and 70% of operation, conservation, and maintenance costs. Exceptions included irrigation district 41 in Southern Sonora, which was charging fees on a volume basis, and covering 100% of costs; and irrigation district 37 in Northern Sonora, which operates with ground water pumped from private wells, and

which was charging a fee to cover road and drainage maintenance costs, and administration costs.

The cost of dam and water distribution infrastructure was estimated in the 1984 version of the Hydraulic Plan of the Northwest (PLHINO). When converted to 1985 pesos[19], the initial investment required to bring water to one hectare amounted to P1,089,011 -- a capital cost of P32,628.82 per crop cycle.[20] Maintenance and repair costs added an extra P526.98 per cycle-hectare. The total amounted to P33,155.79 per cycle-hectare, (CNPH). Considering an average volume of water applied per cycle-hectare, of 10.3 thousand cubic meters (MM^3), the resulting social cost per MM^3 amounted to P3,210.29, of which 98% is imputed to capital costs.[21] This social cost of

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19. The MUV index, 1983=100 was used.

20. Two crop cycles per year are assumed. Capital costs were based on a 0.33 share of annual use (the rest is imputed to electricity generation, household and industrial uses); a 55 year useful life, with no salvage value; and a 9% real interest rate (average return to capital investments in the Mexican economy).

21. The operation and maintenance costs are not included here, because their magnitude is not significant compared with initial investment costs. Also, these are compensated by the benefits from supplying water to households and industries, the generation of electricity, and the use of dams for recreation and aquaculture. The only operation and maintenance costs considered are those related to the pumping stations of the dams and water distribution systems.

water distribution was used in the crop budgets for all irrigation districts under consideration, except for Altar, Pitiquito and Caborca district (37), where water fee charges represented the social opportunity cost of road and drainage maintenance, and of related administration costs. (Private and social water fees are listed for Sonora and Sinaloa, in Appendix C, Tables C.1 and C.2, respectively.)

Capital

The Banking System, Credit, and Interest Rates. On September 1, 1982, outgoing president Jose Lopez Portillo announced the nationalization of all banks except the branches and representative offices of foreign banks then operating in Mexico. Today (as well as before nationalization), the banking system is regulated by the Bank of Mexico (Banxico), supervised by the National Banking and Insurance Commission. The nationalized banks are divided into two groups -- development banks and commercial banks. The former include those previously established by the government for special purposes, such as financing agriculture [National Bank of Rural Credit (BANRURAL)], export trade [national Bank of Foreign Trade (BANCOMEX)], and housing developments.

Real interest rates have been erratic in the past eight years, as shown in Table 20, below. Nominal lending rates at commercial banks were above inflation rates between

Table 20 Nominal and Real Interest Rates in Mexico, 1978-1985.

		YEARS							
		1978	1979	1980	1981	1982	1983	1984	1985
Commercial bank lending rate	nominal	18.20	19.90	28.10	36.60	46.02	63.03	54.73	63.96
	real	0.55	1.90	1.57	8.60	-12.88	-38.85	-10.73	6.88
Treasury bill rate (3 months)	nominal	12.75	17.89	27.73	33.23	57.44	53.78	49.18	61.93
	real	-4.90	-0.11	1.20	5.23	-1.46	-48.10	-16.28	4.85
Time deposit rate (1 year)	nominal	12.00	16.75	26.15	31.82	52.54	54.70	47.78	47.99
	real	-5.65	-1.25	-0.38	3.82	-6.36	-47.18	-17.68	-9.09

SOURCE: - IMF (1985) Financial Statistics Yearbook. Washington, D.C.
- Banamex (1985) Resumen de la Situacion Economica de Mexico. Mexico, D.F..

1978 and 1981, fell drastically below inflation rates from 1982 to 1984, and were again above the inflation rate during 1985, averaging 6.88% in real terms. Yields on short term deposits, represented by 3-month treasury bills, were below inflation in 1978 and 1979; rose slightly above in 1981, (to 1.2% in real terms); continued to rise in 1981, reaching 5.23%; fell drastically below inflation rates from 1982 to 1984; and were again above inflation in 1985, averaging 4.84% in real terms. Yields on one-year time deposits were below inflation rates from 1978 to 1980; yielded a positive real return of 3.82% in 1981; fell below inflation rates from 1982 to 1984; and remained negative during 1985 (-9.09%).

Credit for agriculture is channeled through BANRURAL and commercial banks. FIRA, a series of trusts instituted to finance agriculture, which is part of Banxico, provides the commercial banks with a percentage of the agricultural credit funds involved in each loan. Interest rates and the share of funds to be supplied by FIRA are determined by the Banxico, on a crop and farm-type basis.

Ejidatarios and private farmers differ in their access to credit. BANRURAL, the main source of financing for ejidos, offers highly subsidized interest rates. An excess demand exists for credit because of a constrained budget. Capital scarcity as well as crop-specific credit lines limit the ejidatario's crop alternatives. Furthermore, the

agrarian reform and rural credit laws require all ejido credit operations involving BANRURAL or FIRA to be channeled through the ejido's authorties, preventing direct involvement by the ejidatario in credit negotiations, (SRA). While private farmers have greater credit flexibility, since, unlike ejidatarios, they may offer their land as collateral, they pay higher interest rates. Most of Sonora and Sinaloa's private farmers fall under the category of "OTP" -- they have a net annual income of 3,001 or more times the regional minimum wage. In 1985 FIRA provided only half of the funds channelled through commercial banks, at a 41% interest rate (the remaining funds were lent at a 52% interest rate by the commercial bank) for short term loans to basic staple and oilseed OTP producers. The interest rate for OTP vegetable producers was 70%. In contrast, FIRA provided 80% of short-term-loan funds for "PIM" -- medium income --[22] producers at a 36% interest rate (the residual was lent at 41% interest), and 90% of short-term-loan funds for "PIBs", -- low income and ejidatario producers --[23] at a

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22. With annual income from 1001 to 3000 times the regional minimum wage.

23. Annual income less than 1000 times the regional minimum wage.

28% interest rate (the remainder was lent at 33% interest).[24] FIRA's 1985 loan budget was lowest for OTP producers,[25] (Banxico 1985).

Estimates of the rate of return to capital investment were based on results of research by the Mexican Association of Bankers (AMB). Returns to capital investment were measured as the average ratio of generated cash flow to paid capital plus capital stock, for a sample of 47 manufacturing and service firms, during the period 1971 to 1975. The average return on investment for the period amounted to 22.5%, which, corrected for an average annual inflation rate of 14%, yields a real return of roughly 9%.

Private interest rates for long and short-term agricultural credit were determined by correcting the shadow price of capital for existing interest rate taxes(subsidies) for the sector. (See Table 21, below.) Subsidies(taxes) were determined by subtracting the actual interest rate paid by each type of producer[26], from the weighted average cost of obtaining bank funds throughout Mexico (CPP), calculated by

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24. For long-term loans FIRA provided the same shares of funds, at 40%, 35%, an 27% interest rates for OTPs, PIMs, and PIBs, respectively. (The remainder was provided at 51%, 40%, and 32% interest rates, respectively). FIRA and bank funds for OTP vegetable producers were provided at 69% interest, (Banxico, 1985).

25. Adjustments to these interest rates were made in April, 1985.

26. Weighted average of FIRA and commercial bank interest rates, based on shares of loan funds.

Table 21. Interest Rates for Agricultural Credit, Nov.1984-Oct. 1985.

	Private farmers (vegetables)	Private farmers (basic staples and oilseeds)	Ejidatarios (all crops)
LONG-TERM (machinery and buildings)			
Social (real) (a)	9.00	9.00	9.00
Commercial banks (nominal) (b)	53.30	53.30	53.30
Agriculture (nominal) (c)	58.88	47.38	28.46
Subsidy(+)/tax(-) (d=b-c)	-5.58	5.92	24.84
Agriculture (real) (a-d)	14.58	3.08	-15.84
SHORT-TERM (working capital)			
Social (real) (a)	9.00	9.00	9.00
Commercial banks (nominal) (b)	53.30	53.30	53.30
Agriculture (nominal) (c)	59.88	47.96	30.04
Subsidy(+)/tax(-) (d=b-c)	-6.58	5.34	23.26
Agriculture (real) (a-d)	15.58	3.66	-14.26

Notes: a = rate of return to capital investment in its best alternative in the Mexican economy.
b = weighted average cost of obtaining bank funds in Mexico, 1985 (CPP), calculated by the Bank of Mexico.
c = interest rates established for agriculture; weighted average from November 1984 to October 1985.

SOURCES: - Banco de Mexico-FIRA (1983, 1985) Esquema de Tasas de Interes y Desc to para el FIRA. Circulars 1904/83 and 1923/85. Mexico, D.F.
- Banamex (1985) Review of the Economic Situation of Mexico. Mexico, D.F..

Banxico. Actual interest rates as well as the CPP were weighted averages of values prevailing from November, 1984 to October, 1985.

Agricultural Machinery. Mechanization of agriculture in Mexico increased sharply in the past fifteen years. While agricultural output grew at an average annual rate of 2% during the 1970s, domestic consumption of tractors increased at 9.8%, reaching 21,663 units in 1980, (SPP 1981). By 1981 the number of tractors in use, relative to 1980, increased by 23,078 units; clearly a response to SAM's incentives. In 1982 only 14,922 more tractors were in use, and in 1983 the figure dropped to 12,000 more tractors in use, reflecting a drop in demand as a consequence of postSAM austerity credit and price policies.[27]

Mexico's Northwest is the most mechanized region in the country; almost 98% of the cultivated surface is totally or partially mechanized, (Palacios). The evolution of the mean number of hectares per tractor is indicative of changes in mechanization levels in Sonora and Sinaloa. (See Table 22) From 1978 to 1984, the tractor population in Sonora decreased at an average annual rate of 0.1%, while cultivated surface grew at a 2.6% rate per year, which

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27. Although no data on recent tractor consumption was available, annual changes in absolute numbers of units in use, which represent tractor sales minus those that go out of use, are indicative of corresponding changes in demand. Various issues of FAO Production Yearbook served as source of annual data on number of tractors in use.

Table 22. Number of Tractors and Mean Surface per Tractor in Irrigation Districts of Sonora and Sinaloa, 1974 and 1984.

	YEARS	
	1978	1984
SONORA		
Cultivated hectareage a/	539,533	627,818
Tractors (units)	7,710	7,672
Mean surface/tractor (Has)	69.98	81.83
SINALOA		
Cultivated hectareage a/	644,387	835,297
Tractors (units)	10,190	13,674
Mean surface/tractor (Has)	63.24	61.09

a/ Includes irrigated and rainfed surface within irrigation districts.
SOURCE: -SARH-DGDUR (1979), op.cit..
-SARH-DGDUR (1985) Form EM-1 (mimeographed) Mexico, D.F..

resulted in a 17% increase in the surface share per tractor. A shift towards high powered, more efficient tractors is a probable explanation for this change. In Sinaloa, cultivated surface grew at a rate of 4.4% from 1978 to 1984; while tractor population averaged a 5.0% annual growth rate, with a consequent decrease of 3.4% in the surface per tractor. The higher tractor intensities in Sinaloa are indicative of a more extensive agriculture in Sonora, where farm sizes average 15.08 has, compared of 10.59 has in Sinaloa. Also, the more complex cropping system in Sinaloa, where two or more crop cycles per year are standard, may create more restrictions on the timely use of machinery.

Domestic tractor production increased at an average rate of 15.9% per year from 1970 to 1980, reaching 17,261 units in the last year. Imports remained relatively stable; they grew at an average rate of 0.35% per year in the period, and averaged 3,824 units per annum. Their share in total sales fell from one of 53% in 1970 to 20% in 1981, (SPP 1981). Estimated production in 1985 was down to 11,525 units, (Banamex 1986).[28] Tractors of 150 HP or less that are

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28. The domestic tractor industry is now largely owned by the government. Up to the late 1970s only one of the five tractor manufacturing firms in Mexico was owned by the government; Siderurgica Nacional (Sidena). Just before the end of the decade, Massey Ferguson was bought by the government, and was renamed Agromak, S.A.. In 1982 the International Harvester branch in Mexico closed. Soon after that, Ford Tractors and Agromak fused into what is today a majority government-owned firm. John Deere, which was owned (continues next page)

assembled in Mexico have a 40 to 60% domestic content. Agricultural implements are almost totally domestic in content, except for specialized implements such as land planes, grain drills, high clearance sprayers, and combines.

Permits are required for the importation of all tractors, implements, combines (except cotton pickers), and water pumps. No permits are usually granted for the importation of new tractors of 150 HP or less, nor for new water pumps, because they are domestically manufactured. Permits for higher powered tractors, new or used, and for used small tractors and water pumps are usually granted; no duty is charged. Permits are usually granted for the importation of agricultural implements, new or used; a 10% to 15% duty is charged on models equivalent to those manufactured domestically. Combines are also granted permits; a 10% duty is charged, excepting cotton pickers. A value added tax (IVA) of 20% is payable on all imports, in addition to normal import duties. The taxable value is the value declared for import duties plus the amount of the latter. Theoretically, the IVA charged on agricultural

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(28. continued)

by Banamex, was nationalized with the bank and remained so until 1984, when it was sold back to one of prior Banamex private share holders. It is today the only manufacturer with a majority of shares in private hands.

imports is reimbursable, but transaction costs are so high that the process is not worth the farmer's time. No IVA is charged on domestic sales of agricultural machinery, (SHCP-SECOFI). Currency exchange regulations guarantee the avaliability of foreign currency at the controlled rate for all authorized imports of agricultural machinery and implements.[29]

Tractor prices are controlled by the Ministry of Commerce (SECOFI); adjustments are periodically made to account for increments in production costs, (SPP 1981). During 1985, price adjustments of about 9% to 10% were made every three months, (John Deere, Son.). Private prices of domestically produced and imported agricultural machinery were obtained from various distributors in the main cities of Sonora and Sinaloa. A common average price was estimated and used in crop budgets for both States.

Social prices were based on 1985 Arizona farm machinery retail prices for equivalent models. These were reduced by 30% to reflect differences in US and Mexican marketing margins. A 1% transportation and handling cost from Nogales to Sonora-Sinaloa was added to arrive at the corresponding CIF social prices. The resulting social prices for 1985 reflected a 27% domestic price subsidy for

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29. Deposits are made in the creditors bank account, which prevents any diversion of foreign currency for unintended uses.

tractors, and a 36% subsidy for implements. The private price of irrigation pumps was assumed to represent its social opportunity cost.

Fixed costs per crop cycle for agricultural machinery were estimated from the capital recovery factor:

$$K = i/[1-1/(1+i)^{y}][A-S][H]$$

where: K = capital cost per crop cycle
i = interest rate (in decimals)
y = useful life (in years)
A = aquisition value (in pesos)
S = salvage value (in pesos)
H = share of annual use (in decimals).

Data on private and social acquisition values for agricultural machinery is presented in Appendix A, Tables C.3 and C.4. A useful life of 8 years was assumed for tractors and implements, and one of 11 years for the irrigation pump. A salvage value equal to 20% of aquisition cost was assumed for all agricultural machinery. (Methods of calculation of share of annual use, and maintenance and repair costs are described in Appendix C, Sections C.4, and C.5, respectively.)

Working Capital. Working capital costs were calculated from total variable costs:

$$W = i/12 \sum_{k=1} I_k M_k$$

where: W = total working-capital cost per cycle-hectare
I_k = investment in a particular month
= [total variable cost, in pesos][$month_k$'s investement share of total variable cost, (in decimals)]
M_k = months to maturity of I_k
i = annual interest rate on short-term loan.

Monthly investment schedules were based on various bank documents. (Monthly shares of working capital requirements per crop are presented in Appendix C, Table C.7.)

Policy and Intermediate Input Prices in Sonora and Sinaloa

Seeds

The use of improved seed varieties in Mexico increased at an average annual rate of 6.7% from 1970 to 1982; their share of planted area went from 25% to 46% in the period. Close to 100% of the irrigated surface is sown with improved seed in Sonora and Sinaloa. The government-owned National Seed Producer (PRONASE), and about ten private firms supply the seed of basic staples, oilseeds, cotton, chick-peas, and alfalfa, among other crops . Although PRONASE produces vegetable seed, farmers prefer to import it. Private firms have only recently started to produce vegetable seeds.

All seed imports require a permit. No import duty is charged in most cases. Foreign currency, at the controlled rate, may be obtained for all authorized seed imports. A 20% IVA is charged on imports; domestic seed sales are exempt.

Seed prices are controlled by SECOFI, and adjusted periodically for increments in production costs. PRONASE maintains two sets of prices; a low price for ejidos receiving credit from BANRURAL, and a higher price for the

general public. According to information provided by private seed distributors in Sinaloa, 1985 PRONASE prices were 30% lower than those authorized for private firms, (Mexagro).

Market seed prices for staples, oilseeds, cotton, chick-peas, alfalfa, and ground tomatoes were obtained from 1985 PRONASE price lists. These were adjusted by 30% to estimate the corresponding social prices. Market prices for green pepper, cherry, and large staked tomato imported seeds were obtained from seed distributors in Sinaloa. These were converted to US dollars at the controlled rate, and back to pesos at the free market rate, to arrive at the corresponding social prices. (Private and social 1985 seed prices for Sonora and Sinaloa are listed in Appendix C, Tables C.1 and C.2.)

Fertilizers

Demand for fertilizers grew at an average rate of 10.9% from 1970 to 1980, reaching more than 3 million tons by the end of the period, (FAO) and covering close to 60% of the cultivated surface in the country by 1982, (Silos). Today, practically 100% of the irrigated surface in Sonora and Sinaloa is fertilized. Nitrogenous fertilizers constitute approximately 70% of total demand; phosphate and potassium represent the remaining 25% and 5%, respectively, (SPP 1981).

Domestic production grew at a rate of 7.5% from 1970 to 1980, reaching more than 2.5 million mt at the end of the period. Nitrogenous fertilizers constitute 80% of production, and phosphates the remaining 20%; practically all potassium fertilizers are imported. The quantity share of imports in total consumption went form 18% in 1980, to 30% in 1982, and 16% in 1984, (SPP 1981 and FAO). Government -ownedMexican Fertilizers (FERTIMEX) produces and imports practically 100% of the volume of domestic demand.[30] The state of Veracruz, located in the Gulf of Mexico is where the bulk of production occurs and the main port of entry of imports. Fertilizers are distributed mainly by rail, and are sold at a uniform price throughout the country, (Byerlee). Private fertilizer imports require a permit; a 5% duty is charged in some cases, but most formulations are exempt. The 20% IVA is only charged on imports; domestic sales are exempt, (SHCP-SECOFI).

Market fertilizer prices were those charged by FERTIMEX at the retail level in April, 1985. Social prices for nitrogenous fertilizers were based on Arizona retail prices for 1985, less 30%, to arrive at CIF Nogales Mexico retail price equivalents. These were converted to domestic currency at the market exchange rate, and adjusted for social transportation and handling costs to Sonora

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30. Most private imports constitute leaf-fertilizers and microelement formulations.

and Sinaloa (P8,152.00 and P19,012 per mt, respectively). The resulting CIF Sonora and Sinaloa prices were about 70% above the corresponding domestic market prices. A similar calculation procedure was followed for phosphate fertilizers' social price estimations. The resulting CIF Sonora and Sinaloa social prices were about 53% above domestic market prices. A 1983 FOB Vancouver, World Bank price estimate for potassium chloride (muriate of potash) was converted to its 1985 equivalent and adjusted for transportation and handling costs. The resulting CIF Sonora-Sinaloa price in domestic currency was 19% above the domestic market price. Social prices for mixed fertilizers were calculated quantity-weighted, based on subsidy levels for nitrogen phosphate and potassium fertilizers. (Private and social prices of fertilizers are listed in Appendix C, Tables C.1 and C.2.)

Pesticides

The demand for pesticides in Mexico grew at an average rate of 6.7% per year from 1970 to 1980, amounting to almost 31,000 mt at the end of the period; production grew at a rate of 5.6% per year, reaching approximately 20,000 mt. Active ingredients manufactured domestically constitute only 32% of those used in pesticide formulations; the rest is imported. More than 400 different formulations exist in the domestic market. The government owns 50% of

total production capacity, (SPP 1981).

Imports of formulated pesticides shared an average of 30% of the volume of domestic consumption from 1970 to 1980. Insecticides comprised 74% of the volume of imports, followed by fungicides (18%), and herbicides (8%). No permit is required for pesticide imports. An average duty of 42.5% is charged. No IVA is levied on imports or domestic sales, (SHCP-SECOFI).

Wholesale and retail pesticide prices are regulated by SECOFI, and are periodically adjusted for increments in production costs. Before 1980, domestic wholesale prices were as much as three times world price levels. But by 1985, CIF Sonora-Sinaloa world price equivalents were already 6% higher than domestic market prices. Calculations were based on Arizona retail prices for a sample of ten major pesticide formulations, discounted by 30% to reflect differences in US and Mexican marketing margins, and adjusted for transportation and handling costs from Nogales. Market prices were obtained from various retail distributors in Sonora and Sinaloa, and were therefore adjusted by a 6% subsidy to arrive at the corresponding social prices. (Private and social pesticide prices for Sonora and Sinaloa are listed in Appendix C, Tables C.1 and C.2, respectively.)

Fuel

Agricultural tractors and commercial road and railroad transportation utilize diesel fuel. Diesel production is destined for both export and domestic markets;[31] it amounted to 224 thousand barrels per day in 1983, and 233 thousand in 1984, (PEF 1985).

While domestic and world prices for diesel fuel were practically equivalent in 1960, world prices (in domestic currency) increased by 246% during the next fifteen years, while domestic prices remained frozen; the subsidy to domestic diesel consumers reached almost 75% by 1975. (See Table 23) The difference between domestic and world prices continued to increase until 1982; the latter grew at an average rate of 41% per year, while the former did so at 29% per annum; the subsidy to domestic consumers reached almost 85% in 1982. Domestic prices then increased by 643% by the end of 1983 (from P1.91 to P14.19 per liter), and world prices increased by 136%, reducing the subsidy level to 52%. In 1984, the domestic price went up to P26.56, and the subsidy level fell to 28% in that year.

The expected, FOB Gulf of Mexico price for diesel was calculated based on a long-run (1990), World Bank price estimate of crude oil. The latter was converted to its current 1985 equivalent by the MUV index, and then to an

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31. Data on domestic and export market shares was not available.

Table 23.Evolution of World and Domestic Diesel Prices, 1960-1985.

	YEARS											
	1960	1965	1970	1975	1979	1980	1981	1982	1983	1984	1985	
	Current pesos/Mt a/											
World price	0.33	0.37	0.39	1.14	6.50	6.18	6.78	12.48	29.45	36.84	73.73	b/
Domestic price	0.32	0.32	0.32	0.32	0.50	1.00	n.s.	1.91	14.19	26.56	30.00	
Subsidy	3.0%	13.5%	18.0%	71.9%	92.2%	83.8%	--	84.7%	51.8%	27.9%	59.1%	

a/ Per barrel prices were converted to a per-liter basis by multiplying the former by a factor of 0.00629; 1 barrel of diesel=1 metric ton/7.23, and 1 metric ton of diesel=1149 liters.
b/ Long-term (expected) current 1985 price equivalent.
SOURCES: From 1960 to 1980: Rizzo, S. (1984) "Generation and Allocation of Oil Economic Surpluses" In: Aspe, P. et.al., The Political Economy of Income Distribution in Mexico. New York.
-From 1981-1985:-World Bank (1985) Commodity Trade and Price Trends, Washington.
-UN (1985) Energy Statistics Yearbook. New York.
-PEMEX (1985) Anuario Estadistico. Mexico, D.F.

equivalent diesel price, by dividing it by a factor of 0.862 (representative of the 1984 crude oil-diesel price relationsip). The resulting price of $36.62 per barrel was converted to a per-liter basis to represent a per-liter price of P73.73. Transportation costs from the Gulf of Mexico to Sonora-Sinaloa were estimated at P8.56 per ton-km; aproximately P16.46 per liter. The resulting CIF Sonora-Sinaloa social price for diesel amounted to P90.19 per liter. Compared to the 1985 market price of P30.00 per liter, the subsidy for domestic consumers was 59% . (See Appendix C, Tables C.1 and C.2.)

Electricity

Costs of electricity are important for the ground-water irrigation district of Altar, Pitiquito,and Caborca (037) in Northern Sonora. The government-owned Federal Electric Commission (CFE) generates and distributes electrical energy. In 1985 CFE fees covered only 17% of costs, and those for irrigation-ralated consumption covered only 6.47% of costs. Private fees for the latter use amounted to P0.95 per kilowatt-hour (KWHr) in 1985, which, corrected for a 93.5% subsidy, yields in a social price of P14.68 per KWHr, (Nafinsa). The electric motor of the 150HP pump considered in crop budgets for irrigation didtrict 37 uses an average of 95.16 KW per hour, giving a private cost of P90.40 per hour of use, and a social cost of P1,397.25;

and pumps one MM^3 every 5.56 hours, which amounts to a private cost of P502.62 per MM^3, and a social cost equivalent of P7,768.71.(See Appendix C, Table C.1.)

Custom Harvesting, Spraying, and Processing

Harvesting, aereal spraying, and processing were treated as hired custom services for all crops, except alfalfa, where it was assumed that the farmer owns a mower, a raker, and a baler to harvest. Fees for custom harvesting and aereal spraying are controlled and authorized on a per-crop basis by the state governments. From 1984 to 1985, fees for custom harvesting and aereal spraying increased by 62% and 69%, respectively, in Sinaloa, (SAPSE-Sinaloa). (Private prices for aereal spraying and harvesting services during 1985 for Sonora and Sinaloa are listed in Appendix C, Table C.8.)

Although no apparent subsidies(taxes) for users of these services exist, implicit capital and fuel subsidies distort costs and therefore,authorized market prices. The cost structure of custom services (including a 30% profit margin), based on BANRURAL's 1985 estimates, was adjusted for social capital and fuel costs. The estimated social prices were 7% higher than the authorized market prices; this was considered as the general subsidy level for these services in both states. Market processing costs were also adjusted for a 7% subsidy to arrive at social costs.

Transportation

Railways and trains in Mexico are government owned. Mexican Railways (Ferrocarriles Mexicanos) has operated with an increasing deficit, which increased from 1,907 million pesos in 1974 to 6,658 million in 1980, (Rizzo).

Local road transportation fees are controlled and authorized by state governments, on a per ton basis, for a set of distances. An average distance of 50 km was considered here for the estimation of local private transportation costs of inputs and outputs. Road transportation costs were also considered from Sonora and Sinaloa to the main output markets of Nogales and Mexico City.[32] Social transportation costs were estimated adjusting for diesel fuel prices. The average estimated subsidies for 1985 amounted to 5% for local transportation, 25% for that to Mexico City, and 8% for transportation to Nogales. (Distances, and the corresponding private and social costs are presented in Appendix C, Table C.9.)

Output Storage and Handling

Formal [33] storage capacity in Mexico amounted to aproximately 12 million tons in 1980, while production of

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32. For the case of vegetables, specific per ton estimatesd were made, based on per trailer rates obtained from CAADES and other sources.

33. Does not take into account small, farm-level storage facilities, nor those owned by FERTIMEX and by BANRURAL, nor outdoor improvised facilities.

basic staples and oilseeds alone reached of 25 million tons. At least 12% of the crop was lost in that year due to inadequate storage, (Guadarrama). The government owns 60% of the formal storage capacity. Although Sonora and Sinaloa have a relatively well developed storage infrastructure, improvised outdoor storage facilities are usually seen at harvest times.

Per ton market storage costs for 1985 were estimated to be P6.47 per month for capital costs, and P10.00 per month for labor. Handling costs were estimated to be 0.5% of the value of the output, for most cases. Related subsidies(taxes), if any, were disregarded due to the small share that storage and handling costs have in the total cost of the system.

Crop Insurance

All production financed by BANRURAL is insured by the National Agriculture and Livestock Isurance Company (ANAGSA). Insurance premiums are determined by the Ministry of Finance (SHCP), and authorized by ANAGSA. In cases of crop failure or damage ANAGSA is obliged to cover 100% of variable costs, including the farmer's labor, incurred up to the time of crop damage or failure, (ANAGSA).

Per hectare insurance premiums for each crop were obtained from various crop-budget documents, mainly those of BANRURAL. Significant explicit subsidies prevailed during

the SAM years, and they probably still do, but none were considered in the present study because of lack of related information. Relative to other input and output distortions, the magnitude of insurance subsidies is probably small.

CHAPTER 5

PROFITABILITY, POLICY AND INCOME DISTRIBUTION

This chapter examines the profitability and policy transfers for the principal agricultural systems of Northwest agriculture. The first section presents measures of profitability and net policy transfers. The second section focuses on policy effects in domestic factor markets as these costs figure prominently in total production costs and in the structure of agricultural policy. In the third section policy transfers are decomposed into their output, tradable input, and domestic factor components. The last section focuses on ejido-oriented policies and their effectiveness in promoting agriculture in the sector and in reducing the income gap between the ejidatario and the private farmer.

Competitiveness, Efficiency and Policy

An agricultural system is competitive when it yields positive private profits (D>0); returns are greater than the amount required to pay all tradable input costs and to provide mobile domestic factors the market rate of return. Rankings of relative competitiveness provide an indicator of the attractiveness of particular systems. The private cost ratio [PCR = C/(A-B)] is the cost of domestic

resources required to generate a unit of value added, where all inputs are valued in market prices. Value added is the difference between the value of output and the costs of tradable inputs; it shows how much the system can afford to pay domestic factors (including a normal return to capital) and still ramain competitive. The PCR is used here as a measure of relative profitability because it permitted comparisons among systems that produce different outputs.

Similarly, excess social profits (H>0) are indicative of a system's ability to compete in the absence of policy transfers, by producing at social costs that are lower than the costs of importing (or exporting). The domestic resource cost ratio [DRC = G/(E-F)] is used as an indicator of sociaal profitability. The DRC is the cost of domestic resources, in social prices, needed to produce a unit of value added (also in social prices).

Policy effects are the difference between private and social profitabilities, equivalent also to the sum of output, tradable, and factor transfers. The producer subsidy equivalent (PSE) was here used as a measure of the magnitude of net transfers. In terms of the PAM framework, the PSE = (L/A)(100) is the percentage subsidy, relative to private receipts, which would substitute for the actual mixture of commodity and macro policy effects on the system. Positive PSEs denote a net subsidy to the system, and negative PSEs

represent a net tax.[1]

Table 24 presents PCR and DRC ratios for the various agricultural systems along with their rankings.[2] Tables 25.1 to 25.4 present data on harvested area from 1981 to 1984: these data indicate changes in crop mix as a result of shifts in relative competitiveness.

Irrigation District Rio Altar, Pitiquito y Caborca (037), Northern Sonora

High ground water retrieval costs have decreased private profitability in this region. Relative private profitabilities for 1984-85 are consistent with recent shifts in crop mix. (See Table 25.1) Total surface harvested decreased by an average of almost 3% per annum from 1981 to 1984; plantings of beans, corn, and safflower were sharply reduced, in favor of crops with lower water requirements, such as sesame and fruit trees. Private profitabilities for 1984-1985 indicate that only producers of sesame, cotton (for domestic and export markets), and chick-peas for export were able to make positive profits. Producers of wheat, beans, safflower, and alfalfa incurred a loss, but were able

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1. This section borrows heavily from Policy and Economic Studies Team, 1982; Monke and Pearson, 1985-1985; and Monke and Hillman, 1985. op. cit.

2. Unless otherwise specified, domestic consumpiton is considered for all system outputs. The option of domestic sales was considered for every export crop. The social costs, profits and transfers in this case represent those corresponding to the export market; i.e. the next best alternative to the domestic market.

Table 24 Private and Social Profitability of Agricultural Systems in Private Farms of Sonora and Sinaloa, 1984-1985.

	Irrigation District											
	ID 037				ID 041				ID 075			
	PROFITABILITY											
	Private		Social		Private		Social		Private		Social	
SYSTEM	PCR	Rank	DRC	Rank	PCR	Rank	DRC	Ran	PCR	Rank	DRC	Rank
Corn	3.62	10	-12.12	11	0.57	6	0.77	11	0.53	8	0.69	19
Wheat	1.27	5	1.27	6	0.60	9	0.51	7	0.54	9	0.40	9
Rice	----		----		----		----		0.57	10	0.59	17
Beans	1.47	6	1.58	7	1.00	15	0.95	14	0.62	12	0.54	16
Sorghum	3.63	11	5.56	8	0.67	11	0.61	10	0.42	7	0.34	6
Soybeans	----		----		0.58	7	0.83	13	0.38	6	0.53	15
Safflower	2.12	9	1.03	4	0.59	8	0.41	5	0.61	11	0.43	10
Sesame	0.95	4	1.23	5	0.98	14	0.79	12	0.94	15	0.86	21
Tomatoes-large(D) a/	----		----		0.69	12	0.42	6	1.04	16	0.62	18
Tomatoes-large(X) b/	----		----		0.25	3	0.27	2	0.42	7	0.46	13
Tomatoes-cherry(D)	----		----		----		----		0.66	14	0.32	5
Tomatoes-cherry(X)	----		----		----		----		0.27	3	0.27	3
Tomatoes-saladette(D)	----		----		----		----		0.84	14	0.44	11
Tomatoes-saladette(X)	----		----		----		----		0.24	2	0.24	2
Green peppers-bell(D)	----		----		0.66	10	0.33	3	1.05	17	0.47	14
Green peppers-bell(X)	----		----		0.16	1	0.17	1	0.35	5	0.36	7
Potatoes	----		----		----		----		0.64	13	0.12	1
Cotton(D)	0.78	3	1.03	4	0.51	5	0.60	9	0.64	13	0.84	20
Cotton(X)	0.35	1	0.50	1	0.24	2	0.34	4	0.29	4	0.45	12
Chick-peas(D)	1.52	7	0.95	3	0.97	13	0.59	8	1.04	16	0.37	8
Chick-peas(X)	0.39	2	0.62	2	0.28	4	0.41	5	0.22	1	0.31	4
Alfalfa	1.84	8	-8.10	10	0.59	8	0.99	15	----		----	

	ID 010			
	Private		Social	
SYSTEM	PCR	Rank	DRC	Ran
Corn	0.46	7	0.54	12
Wheat	0.73	11	0.51	10
Rice	0.60	9	0.62	13
Beans	1.18	17	1.37	18
Sorghum	0.50	8	0.67	14
Soybeans	1.02	15	1.03	17
Safflower	1.71	19	0.83	16
Sesame	----		----	
Tomatoes-large(D) a/	0.67	10	0.40	6
Tomatoes-large(X) b/	0.26	2	0.27	3
Tomatoes-cherry(D)	0.89	13	0.42	7
Tomatoes-cherry(X)	0.36	5	0.36	5
Tomatoes-saladette(D)	0.80	12	0.42	7
Tomatoes-saladette(X)	0.22	1	0.23	2
Green peppers-bell(D)	1.05	16	0.48	9
Green peppers-bell(X)	0.35	4	0.32	4
Potatoes	0.50	8	0.12	1
Cotton(D)	0.95	14	1.40	19
Cotton(X)	0.44	6	0.72	15
Chick-peas(D)	1.55	18	0.53	11
Chick-peas(X)	0.29	3	0.44	8
Alfalfa	----		----	

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market; includes profits from sales of residual and lower quality product sold in the domestic market.

SOURCE: Monke, E. and Avalos B. (1986) "Private and Social Profitabilities for Principal Agricultural Systems in the States of Sonora and Sinaloa, Mexico. Research Report No. 37, Department of Agricultural Economics, University of Arizona, Tucson, Az..

Table 25.1 Sonora, Irrigation District Altar, Pitiquito y Caborca (037): Surface Harvested, 1981-1984.

CROPS	YEARS 1980-81	1981-82	1982-83	1983-84	Average rate of annual gowth (%)	Share of Total80-81(%)	Share of Total83-84(%)
		Hectares					
corn	1,241	1,154	109	125	-53.5	2.4	0.3
wheat	15,040	20,425	17,194	13,174	-4.3	28.9	28.6
chick peas	0	0	0	0			
sorghum	799	1,305	968	329	-25.6	1.5	0.7
beans	718	173	231	60	-56.3	1.4	0.1
safflower	3,532	1,822	1,344	1,828	-19.7	6.8	4.0
sesame	126	856	824	446	52.4	0.2	1.0
cotton	9,272	6,729	7,486	8,330	-3.5	17.8	18.1
alfalfa	3,516	5,515	5,060	3,593	0.7	6.8	7.8
other crops	17,788	17,655	14,328	18,215	0.8	34.2	39.5
grand total	52,032	55,634	47,544	46,100	-4.0	100.0	100.0

SOURCE: -SARH-Representacion General en el Estado de Sonora (1986) Cifras Definitivas de Produccion Agricola, ciclos 1981-82 y 1982-83. Hermosillo, Son.
-SARH-DGDUR (1985) Informe de Produccion Agricola en el Distrito de Riego 037, ciclo 1983-84. Mexico, D.F..

to cover variable costs. Continued production thus permitted at least a partial coverage of fixed costs. Revenues for chick-peas sold in the domestic market, corn, and sorghum were less than variable costs; production thus resulted in a greater loss than non production.

The social profitability results indicate that only cotton and chick-peas for export are profitable; indeed, their profitability was enhanced by policy. Sesame producers would have suffered a loss without government intervention, and the loss for corn, bean, sorghum, and alfalfa producers would ahave been increased in the absence of policy. Wheat producers were unaffected on balance, while safflower producers experienced net taxes.

Irrigation District Rio Yaqui (041), Southern Sonora

Export crops, which include large tomatoes, green peppers, cotton, and chick-peas, had the highest private profitabilities during 1984-85. Plantings of these crops showed significant increases in the post-SAM period. (See Table 25.2) Producers of basic staples, oilseeds and alfalfa made positive profits; they broke even in the case of beans. However, harvested area of these corps had negative average annual growth rates from 1981 to 1984 [except that of sorghum (7.6%) and wheat, which remained constant]. This behavior indicates a reduction in policy support in the period: Real guaranteed prices decreased at an annual rate

Table 25.2 Sonora, Irrigation District Valle del Yaqui (041): Surface Harvested, 1981-1984.

CROPS	YEARS 1980-81	1981-82	1982-83	1983-84	Average rate of annual gowth (%)	Share of Total80-81(%)	Share of Total83-84(%)
		Hectares					
corn	23,743	10,843	14,764	15,768	-12.8	7.9	5.1
wheat	125,845	152,551	116,800	125,877	0.0	42.0	40.7
chick peas	72	1,042	3,197	1,480	173.9	0.0	0.5
sorghum	3,706	6,012	2,131	4,621	7.6	1.2	1.5
beans	2,222	557	234	351	-45.9	0.7	0.1
soybeans	25,100	8,167	24,601	6,494	-36.3	8.4	2.1
safflower	65,537	72,458	86,918	5,219	-57.0	21.9	1.7
sesame	1,604	2,752	18,788	525	-31.1	0.5	0.2
tomatoes	147	151	284	297	26.4	0.0	0.1
green peppers	13	13	24	264	172.8	0.0	0.1
cotton	42,499	12,696	37,434	49,903	5.5	14.2	16.1
alfalfa	4,574	3,886	2,824	1,899	-25.4	1.5	0.6
other crops	4,624	4,898	5,508	96,763	175.6	1.5	31.3
grand total	299,686	276,026	313,507	309,461	1.1	100.0	100.0

SOURCE: -SARH-Representacion General en el Estado de Sonora (1986) Cifras Definitivas de Produccion Agricola, ciclos 1981-82 y 1982-83. Hermosillo, Son.
-SARH-DGDUR (1985) Informe de Produccion Agricola en el Distrito de Riego 041, ciclo 1983-84. Mexico, D.F..

of 5.3% for corn, 6.5 % for wheat, 18.2 % for beans, 7.7% for soybeans, and 7.0% for safflower. They increased at a rate of 3.3% per annum for sorghum, , and 10% for sesame. It also reflects a shift towards more profitable corps not covered in this study .[3]

All systems provided a net positive contribution to national imcome during 1984-85. Those with highest social profitability were export-crop systems. Privated profits were increased by policy in the cases of corn, soybeans, large tomatoes, green peppers, cotton, chick-peas, and alfalfa; they were reduced for the rest of the systems.

Irrigation District Valle del Fuerte (075), Northern Sinaloa

Export crops, soybeans, and sorghum were the most profitable corps during 1984-85. Domestic marketing of export corps was generally unprofitable, with the exceptions of saladette tomatoes and cotton. All other systems demonstrated positive profits. Export crops experienced rapid growth rates in the 1980s, with the exception of cotton. Unlike 1984-85, disincentives for soybean and sorghum producers probably prevailed after 1981, as indicated by falls in harvested surface. The safflower and bean systems have low relative profitability, consistent

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3. The surface harvested for "other crops" experienced an average annual growth rate of 176% from 1981 to 1984. Their share of total surface harvested went form 1.5% to 31.3% in the period. They include watermelon, squash, citrus and pecans.

with observed reduction in cultivated areas. A significant propotion of sesame production was exported between 1981 and 1984; high profitability for this system explains the expansion of harvested surface. (See Table 25.3) But in 1984-85, sesame was sold mainly in the domestic market, significantly reducing profitability.

All systems yielded a net positive contribution to national income. Export crops and sorghum were the highest in rank, followed closely by wheat and safflower. Excess profits were augmented by government policies in the corn, rice, soybean, large tomato, green pepper, cotton, and chick-pea systems; decreases occurred for wheat, beans, sorghum, safflower, sesame and potatoes; cherry and saladette tomatoes were unaffected on balance.

Irrigation District Culiacan, Humaya y San Lorenzo (010), Central Sinaloa

Export-crop and corn systems were the most profitable in 1984-85. Producers of soybeans and green peppers for the domestic market incurred small losses, while producers of beans, safflower and domestic market chick-peas experienced substantial losses. Data on the changes in harvested area during the post-SAM period are consistent with the pattern of private profitabilities. Export crops (except cotton), and corn experienced high growth rates. Beans, safflower, and soybeans declinced in importance. The sharp decline in rice area is indicative of decreasing

Table 25.3 Sinaloa, Irrigation District Valle del Fuerte (075): Surface Harvested, 1981-1984.

CROPS	YEARS 1980-81	1981-82	1982-83	1983-84	Average rate of annual gowth (%)	Share of Total80-81(%)	Share of Total83-84(%)
		Hectares					
rice	11,713	6,911	10,515	13,110	3.8	4.4	4.9
corn	8,556	8,424	12,707	9,944	5.1	3.2	3.7
wheat	41,523	62,399	31,246	54,001	9.2	15.5	20.2
chick peas	428	2,429	2,392	1,838	62.5	0.2	0.7
sorghum	26,358	28,608	31,499	19,228	-10.0	9.9	7.2
beans	29,974	37,124	31,977	26,658	-3.8	11.2	10.0
soybeans	28,459	13,660	36,604	6,316	-39.5	10.6	2.4
safflower	71,505	89,468	59,424	63,278	-4.0	26.7	23.7
sesame	369	233	2,287	536	13.3	0.1	0.2
tomatoes	8,894	9,519	11,758	14,047	16.5	3.3	5.3
green peppers	1,191	1,427	1,181	3,085	37.3	0.4	1.2
potatoes	3,532	4,413	4,512	5,014	12.4	1.3	1.9
cotton	25,824	8,033	13,986	21,777	-5.5	9.7	8.2
other crops	9,097	9,616	25,256	28,207	45.8	3.4	10.6
grand total	267,423	282,264	275,344	267,039	0.0	100.0	100.0

SOURCE: -SARH-Representacion General en el Estado de Sinaloa (1986) Cifras Definitivas de Produccion Agricola, ciclos 1981-82 y 1982-83. Culiacan, Sin..
-SARH-DGDUR (1985) Informe de Produccion Agricola en el Distrito de Riego 075, ciclo 1983-84. Mexico, D.F..

profitability of the crop; its guaranteed price decreased by an annual rate of 2.7% from 1981 to 1984. (See Table 25.4)

Bean and soybean systems were socially unprofitable, although policy reduced the magnitude of losses for producers. Profits were increased by government intervention in corn, rice, sorghum,, large tomatoes, saladette tomatoes, cotton, and chick-peas; they were decreased for safflower, wheat and green peppers; and were unaffected for cherry tomatoes.

Several generalizations may be made regarding private and social profitabilities and the effects of policy. First, ground water agricultural systems are much less profitable than reservoir-based agricultuure. Most systems contribute positively to national income in this latter case, in spite of substantial costs associated with irrigation infrastructure. Second, behavior of harvested surface during the post-SAM years (1981-1984), corresponds closely to the ralative profitability of agricultural systems in 1984-85; indicative of a constancy in policy incentives during the period. The cotton system is the only consistent exceptionto this generalization; planted area declined in spite of a relatively high level of profits. Yet, this inconsistency arises because most of the system's profits accrue to the post-farm activities: the farmer received only 22% of the total profits of the system in southern Sonora, almost broke even in northern Sonora,

Table 25.4 Sinaloa, Irrigation District Culiacan, Humaya y San Lorenzo (010): Surface Harvested, 1981-1984.

CROPS	YEARS 1980-81	1981-82	1982-83	1983-84	Average rate of annual gowth (%)	Share of Total80-81(%)	Share of Total83-84(%)
	Hectares						
rice	46,191	35,080	18,669	26,745	-16.7	16.2	9.2
corn	5,394	7,379	8,587	13,633	36.2	1.9	4.7
wheat	34,756	49,677	36,997	58,121	18.7	12.2	20.0
chick peas	939	3,431	4,969	4,714	71.2	0.3	1.6
sorghum	31,682	46,857	44,066	33,565	1.9	11.1	11.5
beans	27,121	37,082	21,217	13,081	-21.6	9.5	4.5
safflower	55,305	33,143	33,539	15,802	-34.1	19.3	5.4
sesame	63,549	72,116	59,630	56,671	-3.7	22.2	19.5
tomatoes	8,860	8,380	10,890	23,373	38.2	3.1	8.0
green peppers	2,016	2,027	3,093	5,029	35.6	0.7	1.7
potatoes	87	83	2	3	-67.5	0.0	0.0
cotton	1,818	0	101	65	-67.1	0.6	0.0
other crops	8,251	7,730	44,061	39,863	69.1	2.9	13.7
grand total	285,869	302,985	285,821	290,665	0.6	100.0	100.0

SOURCE: -SARH-Representacion General en el Estado de Sinaloa (1986) Cifras Definitivas de Produccion Agricola, ciclos 1981-82 y 1982-83. Culiacan, Sin..
-SARH-DGDUR (1985) Informe de Produccion Agricola en el Distrito de Riego 010, ciclo 1983-84. Mexico, D.F..

received 15% of total system profits in northern Sinaloa, and experienced a loss in central Sinaloa. Farm-level PCRs averaged 0.87 versus 0.33 for system PCRs.[4] Third, systems that produce for export provided the highest private and social profitabilities in 1984-85; profits were either augmented by policy or only slightly reduced. The opposite situation prevailed for basic staple and oilseed crops; producers were consistently taxed by policy, or at best only slightly subsidized.

The Structure of Policy Transfers

Tables 26.1 to 26.4 present data on the composition of net policy transfers for the private-farm agricultural systems. Tradable inputs were subsidized; average subsidies were large in basic staples (31%), oilseeds (35%), and alfalfa (36%); and small for vegetables (8%), cotton (12%), and chick-peas (12%). Net percent subsidies on tradable inputs are less in the latter three crops, because pesticides, which are less subsidized (6%) than fertilizers (47%) and seeds (30%) are used in larger quantities. The subsidy on capital was substantial in all systems except in vegetables. Transfers are accounted for mainly by

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4. The situation was alleviated in those cases where cotton gins, and national and multinational wholesalers provided working capital needed for porduction and then reclaimed it at the time of sale.

Table 26.1 Sonora, Irrigation District 037: Components of Producer Subsidy Equivalent in Private Farms, 1984-1985.

System	Output	Tradables	Domestic Factors		PSE	Rank
			Labor	Capital		
Corn	-29.5	68.6	-0.9	23.6	61.8	2
Wheat	-54.6	44.6	-0.3	13.2	2.9	9
Beans	-69.7	47.3	-0.8	17.5	9.5	8
Sorghum	-69.7	74.7	-1.4	25.1	28.7	3
Safflower	-128.0	66.3	-0.5	20.8	-41.4	11
Sesame	-21.0	74.3	-0.7	18.9	20.7	5
Cotton(D) a/	-21.0	26.3	-0.4	10.0	14.9	7
Cotton(X) b/	-4.2	15.3	-0.2	6.2	17.1	6
Chick-peas(D)	-91.0	49.4	-0.5	15.0	-27.1	10
Chick-peas(X)	-6.9	22.7	-0.3	7.4	22.9	4
Alfalfa	0.0	57.7	-0.4	17.1	74.4	1

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market.
SOURCE: Monke and Avalos (1986) op. cit..

Table 26.2 Sonora, Irrigation District 041: Components of Producer Subsidy Equivalent in Private Farms, 1984-1985.

System	Output	Tradables	Domestic Factors		PSE	Rank
			Labor	Capital		
Corn	-29.5	21.1	-0.9	21.6	12.3	4
Wheat	-56.5	21.4	-0.4	12.4	-23.1	12
Beans	-54.5	20.4	-1.4	30.7	-4.8	9
Sorghum	-60.7	25.3	-1.3	24.1	-21.6	10
Soybeans	-19.6	14.1	-0.8	22.6	16.3	2
Safflower	-128.0	23.3	-0.9	31.7	-73.8	16
Sesame	-71.8	22.5	-1.2	28.6	-21.9	11
Tomatoes-large(D) a/	-56.9	13.3	-0.4	1.6	-42.4	13
Tomatoes-large(X) b/	-5.1	5.6	-0.3	1.2	1.4	7
Green peppers-bell(D)	-82.7	14.7	-0.3	1.9	-66.4	15
Green peppers-bell(X)	-7.8	4.4	-0.2	1.2	-2.4	8
Cotton(D)	-21.0	14.3	-0.7	11.5	4.1	6
Cotton(X)	-4.2	7.9	-0.4	7.1	10.4	5
Chick-peas(D)	-93.0	23.1	-0.8	21.1	-49.6	14
Chick-peas(X)	-6.9	9.8	-0.4	10.1	12.6	3
Alfalfa	0	13.2	-0.6	19.0	31.6	1

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market.
SOURCE: Monke and Avalos (1986) op. cit.

Table 26.3 Sinaloa, Irrigation District 075: Components of Producer Subsidy Equivalent in Private Farms, 1984-1985.

System	Output	Tradables	Domestic Factors		PSE	Rank
			Labor	Capital		
Corn	-54.4	25.9	-0.5	30.6	1.6	6
Wheat	-82.4	17.1	-0.3	16.6	-49.0	14
Rice	-41.4	12.5	-0.2	19.0	-10.1	10
Beans	-64.8	22.3	-0.1	18.2	-25.0	12
Sorghum	-102.4	17.4	-0.4	23.4	-62.0	16
Soybeans	-31.9	15.9	-0.4	19.1	2.7	5
Safflower	-145.2	27.3	-0.6	38.7	-79.8	19
Sesame	-64.6	23.5	-0.8	31.6	-10.3	11
Tomatoes-large(D) a/	-55.4	15.9	-0.3	2.4	-37.4	13
Tomatoes-large(X) b/	-5.1	8.2	-0.2	1.8	4.7	4
Tomatoes-cherry(D)	-85.7	12.3	-0.2	1.7	-71.9	18
Tomatoes-cherry(X)	-8.6	5.6	-0.1	1.1	-2.0	9
Tomatoes-saladette(D	-71.4	14.3	-0.5	2.1	-55.5	15
Tomatoes-saladette(X	-6.2	5.0	-0.4	1.2	-0.4	8
Green peppers-bell(D	-78.6	16.7	-0.2	-3.6	-65.7	17
Green peppers-bell(X	-7.8	6.8	-0.1	1.6	0.5	7
Potatoes	-208.5	21.8	-0.3	2.0	-185.0	21
Cotton(D)	-18.6	18.3	-0.5	15.4	14.6	2
Cotton(X)	-2.4	10.0	-0.3	10.4	17.7	1
Chick-peas(D)	-183.3	23.6	-0.8	21.7	-138.8	20
Chick-peas(X)	-6.8	7.5	-0.3	7.7	8.0	3

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market.
SOURCE: Monke and Avalos (1986) op. cit.

Table 26.4 Sinaloa, Irrigation District 010: Components of Producer Subsidy Equivalent in Private Farms, 1984 1985.

System	Output	Tradables	Domestic Factors Labor	Domestic Factors Capital	PSE	Rank
Corn	-54.4	21.2	-0.5	24.2	-9.5	10
Wheat	-83.1	22.9	-0.4	18.1	-42.5	14
Rice	-41.4	13.1	-0.2	18.7	-9.8	11
Beans	-64.8	49.7	-0.7	29.0	13.2	4
Sorghum	-102.4	19.2	-0.5	70.0	-13.7	12
Soybeans	-31.9	15.3	-0.5	18.0	0.9	6
Safflower	-145.3	38.9	-0.9	52.1	-55.2	15
Tomatoes-large(D) a/	-55.4	12.5	-0.2	0.7	-42.4	13
Tomatoes-large(X) a/	-5.1	5.6	-0.1	1.2	1.6	5
Tomatoes-cherry(D)	-85.7	14.5	-0.3	2.7	-68.8	18
Tomatoes-cherry(X)	-8.6	7.0	-0.2	0.7	-1.1	8
Tomatoes-saladette(D	-71.4	13.7	-0.4	2.2	-55.9	16
Tomatoes-saladette(X	-6.2	4.6	-0.3	1.3	-0.6	7
Green peppers-bell(D	-78.6	16.7	-0.2	-3.3	-65.4	17
Green peppers-bell(X	-7.8	6.8	-0.1	-1.9	-3.0	9
Potatoes	-208.5	18.8	-0.2	2.6	-187.3	20
Cotton(D)	-48.6	23.9	-0.7	20.7	25.3	1
Cotton(X)	-2.4	13.9	-0.5	13.9	24.9	2
Chick-peas(D)	-183.3	28.9	-1.0	32.9	-122.5	19
Chick-peas(X)	-6.9	9.4	-0.4	11.7	13.8	3

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market.
SOURCE: Monke and Avalos (1986) op. cit.

interest rate subsidies on short and long term loans (59% and 66%, respectively); on tractor prices (27%) and implements (36%); and on water retrieval and distribution costs (92%). Capital subsidies on vegetables were affected by a tax on interest rates on short and long term loans (73% and 62%, respectively). Subsidies on capital averaged 26% for basic staples, 28% for oilseeds, 1% for vegetables, 19% for alfalfa, and 9% for both cotton and chick-peas. Labor was slightly taxed, by an average of less than 1% in all crops and regions. This reflects small social security taxes and a minimum official wage that is not binding; that is, a labor market that results in a higher equilibrium wage than the official minimum.

World price equivalents for basic staples and oilseeds were significantly higher than domestic prices, translating into an important tax on producers. Average taxes on output were 42% for corn, 69% for wheat, 41% for rice, 64% for beans, 84% for sorghum, 137% for safflower, 26% for soybeans, and 53% for sesame. Currency exchange rate controls meant only a small tax on revenues of export crop producers; they averaged 3% for cotton, 7% for chick-peas, 7% for tomatoes, and 8% for green peppers. Calculations of export revenues sold to official banks at the controlled exhchange rate were based on official prices way below prevailing market prices, reflecting a support for export crops.

The low PSE figures show that output taxes on basic staples and oilseeds largely offset tradable input and capital subsidies. In those cases where the PSE was positive, tradable input and capital subsidies more than compensated producers of basic staples and oilseeds for revenues forgone due to output taxes. Positive PSEs occur in ID37, where heavy subsidies on electricity raise tradable input transfers by 62% above the average for districts using reservoir water; they are also present for bean and soybean producers in district 010, and corn and soybean producers in districts 041 and 075. In all other cases, PSEs were negative.

Net policy transfers were of substantially smaller magnitude for export-vegetable systems. Producers of large staked tomatoes received an average net transfer of 3%. Those that produced cherry tomatoes for export were taxed an average of 2% of total revenues. Saladette tomtato producers that exported their product were taxed less than 1% of total revenues. Similarly, production of green bell peppers for export was taxed and average 2% of revenues. Potatoes were sold mainly in the domestic market, which meant 186% less revenues than those offered by the export market alternative.

Tradable input and capital subsidies for cotton and chick-pea systems were only partially offset by output and labor taxes. The average net transfer to export cotton was

18%, and it was 15% for cotton sold in the domestic market. The net transfer to alfalfa producers averaged 53% of revenues.

Production Costs and Policy

Table 27 below, presents measures of the share of labor and capital costs in the total costs of production for private-farm agricultural systems. Labor and capital costs represented approximately two thirds of total system costs. Most systems represented capital intensive technologies, as shown by the capital cost shares evaluated in social terms. Only vegetable and cotton production use labor intensive technologies.

Private labor and capital cost shares differ from their social equivalents when policy transfers provide incentives to increase the use of one factor relative to the other. For example, a system that reflects a higher share of capital costs when valued in private terms than in social terms indicates the presence of policies that decrease the capital/labor price ratio and promote the use of capital. The degree to which capital use would decrease in the absence of policy depends not only on relative factor prices, but also on the technical substitutability of one factor for the other. Consequent effects on private and social profitability would require consideration in order to fully evaluate the effects of such policies.

Table 27. Cost Structure of Agricultural Systems in Private Farms in Sonora and Sinaloa, 1984-1985.

System	Irrigation District: ID 037 Private L a/	ID 037 Private K b/	ID 037 Social L	ID 037 Social K	ID 041 Private L	ID 041 Private K	ID 041 Social L	ID 041 Social K	ID 075 Private L	ID 075 Private K	ID 075 Social L	ID 075 Social K	ID 010 Private L	ID 010 Private K	ID 010 Social L	ID 010 Social K
	Cost as Percent of Total/ MT of Output															
Corn	32	28	21	27	40	20	24	32	32	20	17	36	33	21	19	35
Wheat	26	31	17	28	31	24	21	28	30	20	20	31	30	24	20	29
Rice	--	--	--	--	--	--	--	--	32	23	22	35	31	25	22	35
Beans	29	28	19	28	42	18	27	33	39	15	25	26	32	15	18	24
Sorghum	27	30	17	28	38	21	22	32	38	21	21	37	36	24	14	56
Soybeans	--	--	--	--	37	17	24	32	32	16	20	31	22	14	16	24
Safflower	28	30	17	28	35	21	19	37	35	20	18	38	33	22	19	37
Sesame	42	35	21	28	40	19	26	32	42	15	27	31	--	--	--	--
Tomatoes-large(D) c/	--	--	--	--	30	25	25	23	31	22	26	21	28	25	25	22
Tomatoes-large(X) d/	--	--	--	--	32	21	27	21	33	19	28	19	30	21	26	21
Tomatoes-cherry(D)	--	--	--	--	--	--	--	--	31	24	26	23	32	23	27	22
Tomatoes-cherry(X)	--	--	--	--	--	--	--	--	30	22	26	22	32	21	28	19
Tomatoes-saladette(D)	--	--	--	--	--	--	--	--	28	28	23	25	27	28	23	26
Tomatoes-saladette(X)	--	--	--	--	--	--	--	--	30	25	25	24	29	25	24	25
Green peppers-bell(D)	--	--	--	--	27	28	22	25	34	25	30	19	33	26	29	20
Green peppers-bell(X)	--	--	--	--	24	24	20	23	34	23	29	23	34	24	31	18
Potatoes	--	--	--	--	--	--	--	--	20	11	16	11	22	12	17	12
Cotton(D)	26	27	18	27	35	21	25	28	43	17	29	26	43	17	29	27
Cotton(X)	26	26	18	27	36	20	25	28	46	14	30	26	44	15	29	27
Chick-peas(D)	27	28	18	27	32	22	22	30	39	20	27	29	38	21	25	32
Chick-peas(X)	27	27	17	26	32	21	21	30	40	19	27	29	38	20	25	32
Alfalfa	28	32	18	29	42	26	28	37	--	--	--	--	--	--	--	--

a/ L = Labor
b/ K = Capital
c/ D = Product sold in the domestic market.
d/ X = Product sold mainly in the export market.
SOURCE: Monke and Avalos (1986) op. cit.

The results for basic staple, oilseed, chick-pea, and alfalfa systems show that capital subsidies and labor taxes were large enough to increase the share of labor costs beyond those of capital. The only exceptions occur in ID 37, where the use of pumps to retrieve ground water for irrigation creates substantial capital costs for wheat, sorghum, and alfalfa production.

Although most vegetable systems reflected labor intensive technologies, lower yields, which decrease labor requirements during the harvest and increase fixed capital costs per unit of output, and the absence of labor intensive stakingand prunning activities explain the high share of capital costs for saladette tomatoes relative to the staked tomato systems. The same is true for green pepper producction in ID 041, relative to districts 010 and 075. In all vegetable systems, labor taxes increased the share of labor costs significantly, while taxes on capital incresased capital cost shares only slightly.

Cotton systems in Sonora's irrigation districts are capital intensive, but capital subsidies and only minor taxes on labor caused the share of labor costs to increase way beyond those of capital. The only exception occurs in the ground water systems (ID 037). Sinaloa's cotton systems are labor intensive because harvest is done manually. Labor taxes and capital subsidies again resulted in a higher share of labor costs.

Ejido-Oriented Policies, Farm Size and Income Distribution

Tables 28.1 to 28.4 analyze the differences between ejidos and private farms in net policy transfers during 1984-85. Differences arise mainly for capital inputs; the main mechanism consisted in the porducer-income interest rate structure, where ejidatarios are, by decree, considered as low income producers, and thus have access to the lowest interest rates. The real rate on short term loans for ejidatarios was of -15.84%, implying a subsidy of 276%. The rate on long term loans was of -14.26%, which meant a subsidy of 158%. The close link between BANRURAL and FIRA (through commercial banks) and the ejido authorities, which serve as middle-men in credit negotiation and administration, highly guarantee that the use of subsidized credit is as intended. The excess demand for credit that results from subsidized interest rates increases transaction costs for both, the ejidatario and the banks. This discourages the former from seeking institutional credit and the latter from serving small and new ejidatarios. Quotas for specificd credit lines and producers, which arise as a consequence of interest rate subsidies, also contribute to imcrements in transaction costs, since ejidatarios have to compete for their share of resources. Actual benefits from such subsidies by ejidatarios are constrained by quotas. Incentives are also created to use subsidized credit in more profitable activities, and supervision costs to assure that

Table 28.1 Sonora, Irrigation District 037: Net Differences in Transfers Between Ejidos and Private Farms, 1984-1985.

System	Tradables	Domestic factors		Net transfer difference
		Labor	Capital	
	Thousand Pesos/Cycle-Ha			
Corn	0.76	1.35	49.33	51.44
Wheat	2.13	1.25	53.87	57.25
Beans	0.42	1.87	38.45	40.74
Sorghum	0.46	1.84	40.45	42.75
Safflower	0.25	1.38	37.77	39.40
Sesame	0.16	0.50	35.44	36.11
Cotton(D) a/	2.16	1.80	77.23	81.19
Cotton(X) b/	2.16	1.80	77.23	81.19
Chick-peas(D)	0.80	1.36	42.48	44.64
Chick-peas(X)	0.80	1.36	42.48	44.64
Alfalfa	0.32	1.25	98.43	100.00

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market.

SOURCE: Monke and Avalos (1986) op. cit..

Table 28.2 Sonora, Irrigation District 041: Net Differences in Transfers Between Ejidos and Private Farms, 1984-1985.

System	Tradables	Domestic factors		Net transfer difference
		Labor	Capital	
	Thousand Pesos/Cycle-Ha			
Corn	0.06	1.86	13.95	16.40
Wheat	1.75	1.36	13.93	17.04
Beans	0.54	1.86	13.43	15.83
Sorghum	0.82	1.86	12.62	15.30
Soybeans	1.29	1.36	12.75	15.4
Safflower	0.40	1.36	11.60	13.36
Sesame	0.03	0.85	14.75	15.63
Tomatoes-large(D) a/	2.49	1.88	70.14	74.51
Tomatoes-large(X) b/	2.49	1.88	70.14	74.51
Green peppers-bell(D	0.98	1.88	57.92	60.78
Green peppers-bell(X	0.98	1.88	58.06	60.92
Cotton(D)	1.73	1.36	18.89	21.98
Cotton(X)	1.73	1.36	18.89	21.98
Chick-peas(D)	0.80	1.36	14.71	16.87
Chick-peas(X)	0.80	1.24	14.71	16.75
Alfalfa	0.34	1.26	8.67	10.27

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market.

SOURCE: Monke and Avalos (1986) op. cit..

Table 28.3 Sinaloa, Irrigation District 075: Net Difference in Transfers Between Ejidos and PrivateFarms, 1984-1985.

System	Tradables	Domestic factors		Net transfer difference
		Labor	Capital	
	Thousand Pesos/Cycle-Ha			
Corn	0.51	0.95	10.60	12.06
Wheat	4.81	0.95	10.24	16.00
Rice	2.17	0.95	11.59	14.71
Beans	1.09	0.95	9.56	11.6
Sorghum	0.39	0.95	9.96	11.30
Soybeans	1.67	0.95	11.09	13.71
Safflower	0.44	0.97	8.86	10.09
Sesame	0.34	0.95	10.07	11.36
Tomatoes-large(D) a/	7.92	2.25	118.63	128.80
Tomatoes-large(X) b/	7.92	2.25	118.63	128.8
Tomatoes-cherry(D)	7.92	2.25	110.22	120.39
Tomatoes-cherry(X)	7.92	2.25	110.22	120.39
Tomatoes-saladette(D	2.28	2.25	39.84	44.37
Tomatoes-saladette(X	2.28	2.25	39.84	44.37
Green peppers-bell(D	1.27	2.25	129.38	132.9
Green peppers-bell(X	1.27	2.25	129.28	132.9
Potatoes	2.16	0.95	54.53	57.64
Cotton(D)	0.99	1.40	15.84	18.23
Cotton(X)	0.99	1.40	15.84	18.23
Chick-peas(D)	1.13	0.95	10.85	12.93
Chick-peas(X)	1.13	0.95	10.85	12.93

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market

SOURCE: Monke and Avalos (1986) op. cit..

Table 28.4 Sinaloa, Irrigation District 010: Net Difference in Transfers Between Ejidos and Private Farms, 1984-1985.

System	Tradables	Domestic factors		Net transfer difference
		Labor	Capital	
	Thousand Pesos/Cycle-Ha			
Corn	0.51	1.22	13.18	14.91
Wheat	1.97	0.94	13.80	16.71
Rice	2.17	0.95	14.14	17.26
Beans	1.66	0.95	16.27	18.88
Sorghum	0.40	0.95	11.67	13.02
Soybeans	12.09	0.95	20.77	33.82
Safflower	0.54	0.97	12.25	13.76
Tomatoes-large(D) a/	7.92	2.25	163.66	173.83
Tomatoes-large(X) b/	7.92	2.25	123.61	133.78
Tomatoes-cherry(D)	7.92	2.25	115.2	125.37
Tomatoes-cherry(X)	7.92	2.25	151.56	161.73
Tomatoes-saladette(D	2.28	2.25	44.6	49.13
Tomatoes-saladette(X	2.28	2.25	44.6	49.13
Green peppers-bell(D	1.27	2.25	134.1	137.62
Green peppers-bell(X	1.27	2.25	134.1	137.62
Potatoes	2.16	0.95	58.82	61.93
Cotton(D)	0.99	1.40	19.44	21.86
Cotton(X)	0.99	1.40	19.44	21.83
Chick-peas(D)	1.14	0.95	13.30	15.39
Chick-peas(X)	1.14	0.95	13.30	15.39

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market

SOURCE: Monke and Avalos (1986) op. cit..

resources are used as intended thus increase. Per hectare differences in capital subsidies were highest in ID 037, where capital costs on water pumps for ejidatarios are reduced by interest rates of -15.85%, versus 3.08% for private farmers. Ejido-specific capital subsidies amounted to P46,000/cycle-ha for basic staples; P37,000 for oilseed crops; P77,000 for cotton; P43,000 for chick-peas; and P98,000 for alfalfaa. In reservoir-based irrigation districts ejido-specific capital subsidies averaged P13,000 for basic staples and oilseeds; P18,000 for cotton; P13,000 for basic staples and oilseeds; P9,000 for alfalfa; and P76,000 for vegetables.

Differences in output, tradable inputs, and labor transfers were not significant; they averaged less than P2,000/cycle-ha. This reflects the difficulties in limiting the effects of a price change to a specific group; i.e., preventing transfer leakages from ejidos to private farms through the resale of subsidized inputs by ejidatarios to private farmers, or of outputs at prices higher than those in the market by private farmers to ejidatarios.

The profitability of ejido agriculture was thus increased by government intervention relative to that of private farms; policy incremented excess profits in some cases, and prevented or reduced the magnitude of losses in others. Net transfer differences were largest in vegetable and cotton systems, because these crops present the highest

costs per hectare, to which given percent subsidies on capital are applied, and because, unlike private farmers, ejidatarios who produce vegetables are subject to the general interest rates that apply for low-income producers of other crops. Yet, the smaller share of surface that these crops have in ejidos compared with private farmers is indicative of only partial access to such transfers by ejidatarios. They decide not to produce such crops, because no institutional credit is available, and because they lack access to markets.

Ejido-specific transfers often resulted in a shift in the pattern of relative crop profitabilities. (See Tables 24 and 29.) In ID 037, they made corn relatively less profiltable, and increased the relative competitiveness of sorghum. In ID 041, they made alfalfa and green peppers for the domestic market relatively less profitable, and increased the relative competitiveness of wheat, beans, sorghum, safflower, and sesame. In ID 075, relative profitability of wheat, rice, sesame, tomatoes, green peppers, cotton and chick-peas for the domestic market was decreased, while that of sorghum, soybeans and potatoes was increased. In ID 010, the relative profitability of rice, sorghum, tomatoes, green peppers, cotton and chick-peas for the domestic market was decreased, while it was increased for soybeans and potatoes.

Table 29. Private Profitability of Agricultural Systems in Ejidos in Sonora and Sinaloa, 1984-1985.

System	Irrigation District: ID 037 Profitability: Private PCR	Rank	ID 041 Private PCR	Rank	ID 075 Private PCR	Rank	ID 010 Private PCR	Rank
Corn	2.21	11	0.43	6	0.40	8	0.35	7
Wheat	0.83	5	0.50	8	0.45	10	0.59	12
Rice	----		----		0.51	13	0.53	10
Beans	0.87	6	0.73	14	0.49	12	0.81	17
Sorghum	2.80	10	0.51	9	0.32	6	0.38	9
Soybeans	----		0.44	7	0.29	5	0.57	11
Safflower	1.28	9	0.42	4	0.46	11	1.17	19
Sesame	0.62	4	0.71	13	0.74	16	----	
Tomatoes-large(D) a/	----		0.61	12	0.92	20	0.61	13
Tomatoes-large(X) b/	----		0.21	3	0.35	7	0.22	2
Tomatoes-cherry(D)	----		----		0.61	15	0.79	15
Tomatoes-cherry(X)	----		----		0.24	3	0.31	5
Tomatoes-saladette(D)	----		----		0.81	17	0.77	14
Tomatoes-saladette(X)	----		----		0.22	2	0.21	1
Green peppers-bell(D)	----		0.58	11	0.91	19	0.91	18
Green peppers-bell(X)	----		0.13	1	0.29	5	0.29	4
Potatoes	----		----		0.43	9	0.34	6
Cotton(D)	0.49	3	0.42	5	0.56	14	0.81	16
Cotton(X)	0.21	1	0.20	2	0.25	4	0.36	8
Chick-peas(D)	0.99	7	0.73	14	0.86	18	1.22	20
Chick-peas(X)	0.24	2	0.20	2	0.18	1	0.23	3
Alfalfa	1.18	8	0.54	10	----		----	

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market; includes profits sales of residual and lower quality product sold in the domesti market.
SOURCE: Monke and Avalos (1986) op. cit..

When net profits per cycle-hectare are translated to a per-farm basis, the effectiveness of ejido-specific transfers in reducing the income gap between them and the private farmer is only slight, especially in systems that generate average or high levels of excess profits per hectare. This result occurs because private farms are, on average, more than three times larger than those of the ejidatarios. (See Tables 30.1 to 30.4) For example, in 1984-85, and ejidatario that produced corn in southern Sonora made a net income of P584,000 per cycle in his 9 hectare farm; he would have made P440,000 (19% less), without ejidatario-specific policies. The net imcome for the average private corn producer on his 27 hectare farm was P1,339,000 per cycle; more than twice that of the ejidatario. In the case of a large "family-owned" private farm of 100 hectares, net revenues amounted to P4,985,000 per cycle in corn production.

Data in Tables 30.1 to 30.4 show that the income made by the ejidatario who works his farm is often low enough to make the renting of his farm more attractive. This is especially the case when the ejidatario is faced with a lack of credit availability, is unable to participate in the markets for more profitable export crops, and when he has an off-farm employment alternative. The rent-and-work-for-others option may remain desirable even in cases when its expected income is substantally lower, because of the

Table 30.1 Sonora, Irrigation District 037: Farm Size, Income and Subsidies in Ejidos and Private Farms, 1984-1985.

	Ejidos	Private farms
Average farm size (Has):	5.74	29.82
Land rent (Pesos/cycle-ha):	30,000 for all crops except vegetables 50,000 for vegetables	
Agricultural labor wage (Pesos/8-hr day):	1,542.88	

	INCOME (Thousand Pesos/Cycle-Farm)					SUBSIDY TO EJIDATARIO
System	Ejidatario who works his land	Ejidatario who rents his land and works 50 days/ cycle	Ejidatario who rents his land and works 50 days/ cycle	Private farmer with average farm size	Private farmer with farm of 100 Has	
Corn	(265)	249	365	(2,910)	(9,759)	295
Wheat	129	249	365	(1,015)	(3,404)	329
Beans	53	249	365	(942)	(3,158)	234
Sorghum	(176)	249	365	(2,190)	(7,345)	245
Safflower	(75)	249	365	(1,565)	(5,249)	226
Sesame	235	249	365	145	486	207
Cotton(D) a/	471	249	365	28	93	466
Cotton(X) b/	471	249	365	28	93	466
Chick-peas(D)	6	249	365	(1,298)	(4,354)	256
Chick-peas(X)	1,255	249	365	5,188	17,399	256
Alfalfa	(162)	249	365	(3,821)	(12,815)	574

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market; includes profits from sales of residual and lower quality product sold in the domestic market, (except cotton, where profits are those from the sale of seed-cotton before ginning.)
SOURCE: -SARH-DGDUR (1979) op. cit..
-Table 28.1
-Monke and Avalos (1986) op. cit..

Table 30.2 Sonora, Irrigation District 041: Farm Size, Income, and Subsidies in Ejidos and Private Farms, 1984-1985.

	Ejidos	Private farms
Average farm size (Has):	8.82	26.86
Land rent (Pesos/cycle-ha):	30,000 for all crops except vegetables 50,000 for vegetables	
Agricultural labor wage (Pesos/8-hr day):	1,542.88	

	INCOME (Thousand Pesos/Cycle-Farm)					SUBSIDY TO EJIDATARIO
System	Ejidatario who works his land	Ejidatario who rents his land and works 50 days/ cycle	Ejidatario who rents his land and works 50 days/ cycle	Private farmer with average farm size	Private farmer with farm of 100 Has	
Corn	584	342	457	1,339	4,985	145
Wheat	721	342	457	1,739	6,473	150
Beans	139	342	457	(2)	(8)	13,962
Sorghum	391	342	457	779	2,900	135
Soybeans	539	342	457	1,256	4,676	136
Safflower	396	342	457	847	3,153	118
Sesame	150	342	457	36	134	138
Tomatoes-large(D) a/	3,395	518	634	8,337	31,037	657
Tomatoes-large(X) b/	10,933	518	634	31	116,510	657
Green peppers-bell(D)	2,819	518	634	6,953	25,885	536
Green peppers-bell(X)	12,558	518	634	36,610	136,300	537
Cotton(D)	868	342	457	2,052	7,641	194
Cotton(X)	868	342	457	2,052	7,641	194
Chick-peas(D)	169	342	457	62	230	149
Chick-peas(X)	1,541	342	457	4,240	15,784	148
Alfalfa	975	342	457	2,693	10,025	91

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market; includes profits from sales of residual and lower quality product sold in the domestic market, (except cotton, where profits are those from the sale of seed-cotton before ginning.)
SOURCE: -SARH-DGDUR (1979) op. cit..
-Table 28.1
-Monke and Avalos (1986) op. cit..

Table 30.3 Sinaloa, Irrigation District 075: Farm Size, Income, and Subsidies in Ejidos and Private Farms 1984-1985.

	Ejidos	Private farms
Average farm size (Has):	8.98	24.12
Land rent (Pesos/cycle-ha):	40,000 for all crops except vegetables 60,000 for vegetables	
Agricultural labor wage (Pesos/8-hr day):	1,361.84	

System	INCOME (Thousand Pesos/Cycle-Farm)					SUBSIDY TO EJIDATARIO
	Ejidatario who works his land	Ejidatario who rents his land and works 50 days/ cycle	Ejidatario who rents his land and works 50 days/ cycle	Private farmer with average farm size	Private farmer with farm of 100 Has	
Corn	501	427	529	1,056	4,738	108
Wheat	725	427	529	1,561	6,470	144
Rice	1,019	427	529	2,384	9,882	132
Beans	392	427	529	773	3,205	104
Sorghum	736	427	529	1,705	7,067	101
Soybeans	904	427	529	2,099	8,701	123
Safflower	329	427	529	642	2,660	91
Sesame	134	427	529	87	361	102
Tomatoes-large(D) a/	766	607	709	(1,050)	(4,352)	1,157
Tomatoes-large(X) b/	10,945	607	709	26,293	109,008	1,157
Tomatoes-cherry(D)	7,465	607	709	17,148	71,093	1,081
Tomatoes-cherry(X)	27,650	607	709	71,362	295,864	1,081
Tomatoes-saladette(D)	2,510	607	709	5,672	23,516	398
Tomatoes-saladette(X)	20,230	607	709	53,267	220,841	398
Green peppers-bell(D)	738	607	709	(1,224)	(5,075)	1,193
Green peppers-bell(X)	14,799	607	709	36,545	151,514	1,193
Potatoes	1,386	427	529	2,332	9,667	518
Cotton(D)	575	427	529	1,105	4,582	164
Cotton(X)	575	427	529	1,105	4,582	164
Chick-peas(D)	91	427	529	(68)	(283)	116
Chick-peas(X)	2,124	427	529	5,393	22,357	116

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market; includes profits from sales of residual and lower quality product sold in the domestic market, (except cotton, where profits are those from the sale of seed-cotton before ginning.)
SOURCE: -SARH-DGDUR (1979) op. cit..
-Table 28.1
-Monke and Avalos (1986) op. cit..

Table 30.4 Sinaloa, Irrigation District 010: Farm Size, Income, and Subsidies in Ejidos and Private Farms, 1984-1985.

	Ejidos	Private farms
Average farm size (Has):	7.38	20.29
Land rent (Pesos/cycle-ha):	40,000 for all crops except vegetables 60,000 for vegetables	
Agricultural labor wage (Pesos/8-hr day):	1,361.84	

	INCOME (Thousand Pesos/Cycle-Farm)					SUBSIDY TO EJIDATARIO
System	Ejidatario who works his land	Ejidatario who rents his land and works 50 days/ cycle	Ejidatario who rents his land and works 50 days/ cycle	Private farmer with average farm size	Private farmer with farm of 100 Has	
Corn	622	363	465	1,407	6,932	110
Wheat	346	363	465	611	3,012	123
Rice	777	363	465	1,786	8,804	127
Beans	72	363	465	(186)	(915)	139
Sorghum	498	363	465	1,104	5,441	96
Soybeans	241	363	465	(23)	(112)	250
Safflower	(34)	363	465	(373)	(1,839)	102
Tomatoes-large(D) a/	7,029	511	613	16,612	81,872	1,283
Tomatoes-large(X) b/	22,657	511	613	59,576	293,622	987
Tomatoes-cherry(D)	1,950	511	613	2,816	13,881	925
Tomatoes-cherry(X)	13,025	511	613	33,267	163,957	1,194
Tomatoes-saladette(D)	2,900	511	613	6,976	34,381	363
Tomatoes-saladette(X)	20,052	511	613	54,133	266,797	363
Green peppers-bell(D)	631	511	613	(1,057)	(5,209)	1,016
Green peppers-bell(X)	12,316	511	613	31,068	153,120	1,016
Potatoes	1,871	363	465	3,887	19,158	457
Cotton(D)	(0)	363	465	(443)	(2,183)	161
Cotton(X)	(0)	363	465	443	(2,183)	161
Chick-peas(D)	77	363	465	(524)	(2,582)	114
Chick-peas(X)	780	363	465	3,256	16,047	114

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market; includes profits from sales of residual and lower quality product sold in the domestic market, (except cotton, where profits are those from the sale of seed-cotton before ginning.)
SOURCE: -SARH-DGDUR (1979) op. cit..
-Table 28.1
-Monke and Avalos (1986) op. cit..

relatively lower risk associated with earned income. For example, the average ejidatario in southern Sonora probably found it more attractive to plant his land with corn instead of renting it and working for others if he expected to be employed 50 days per cycle (i.e. 100 days per year; the average employment level for jornaleros in Mexico); he would have earned only half the income in the latter case. But working his land, with the implied risks, was not so attractive if he had the opportunity to obtain full employment (125 days/cycle) in agriculture or in another sector; in this case he would have made at least 80% of the income expected from corn production. The strongest incentives to rent land and work as jornaleros (or in other sectors) arise with the basic staples, oilseeds, chick-peas for the domestic market, and alfalfa in ID 37; beans, sesame, and chick-peas for the domestic market in ID 41; wheat, beans, soybeans, safflower, cotton, and chick-peas for the domestic market in ID 10; and beans, safflower, sesame, and chick-peas for the domestic market in ID 75.

CHAPTER 6

CONCLUSIONS

The agricultural sector has been the basis of economic growth in Sonora and Sinaloa. Unlike Sinaloa, the relative share of the sector in Sonora has decreased. A five- fold difference in growth of irrigated land explains, to a large extent, the difference in agricultural growth among the two States. Nevertheless, both States continue to be important producers of basic staples, oilseeds, and export crops. Most of the output is produced on irrigated farms that use hired labor, modern inputs (improved seeds, fertilizers and pesticides), and machinery. These farms sell a large proportion of their output.

The agricultural sector has been heavily influenced by economic policy, particularly in the past decade. Recent ecomomic developments in Mexico may be characterized in two distinct periods. The years from 1978 to 1981 represented the "oil boom", with annual GDP growth rates of 8%, an abundance of financial resources that permitted the escalation of subsidies to producers and consumers, and a growing dependence on oil exports and food imports. The oil bonanza benefitted the agricultural sector in the form of the Mexican Food System (SAM). This program revitalized

lagging production and decreased dependence on food imports.

The SAM ended after one year with the fall in world oil prices. By the end of 1981 the government deficit represented 15% of GDP, foreign debt amounted to 80,000 million dollars, and annual inflation reached almost 70%. The post-SAM period (1981-present) was characterized by sharp reductions in subsidies to all sectors (including agriculture), a rationing of credit, a continuous devaluation of the Mexican peso, and currency exchange rate controls.

The devaluation of the Mexican peso increased the potential revenues for producers of export crops, basic staples and oilseeds. However, trade restrictions, currency exchange rate controls and domestic price policy have prevented the full transmission of the exchange rate effects. Agricultural systems that produce for export provided the highest private and social profitabilities in 1984-1985; profits were either augmented by policy or slightly reduced. The implementation of exchange rate controls imposed only a small tax on revenues of export crop producers -- official prices used for the calculation of export revenues to be sold to the Mexican banking system at the controlled rate were well below market price levels. Export taxes and input and factor subsidies in these systems were not significant.

Basic staple and oilseed systems were socially profitable, although less than systems that produce for export. They were not always privately profitable, because producers were usually taxed by policy. World price equivalents for basic staples and oilseeds were significantly higher than domestic guaranteed prices; export restrictions meant that guaranteed prices were a tax on producers. Substantial subsidies for tradable inputs and capital were more than offset by these output taxes. Such results suggest that even though expansion of staple and oilseed production may be a stated objective for the agricultural sector, some skepticism may be justified regarding the importance of these objectives.

However, the continuation of policies that support export crop production in irrigated agriculture in Sonora and Sinaloa at the expense of basic staples and oilseeds may be desirable in terms of creating employment; labor requirements for export crop production are more than three times those of basic staple and oilseed crops. Such policies may also be desirable in terms of the generation of foreign exchange. But if, at the same time, "food sovereignity" is to be pursued; that is, if imports of basic staples and oilseeds are to be maintained within specified limits, traditional agriculture in the region as well as agriculture in other regions will need to increase production. Specific subsidy packages would then be needed to replace current

policies that, in fact, tax producers.

Labor and capital costs of crop production represented approximately two thirds of total costs. Most agricultural systems reflected a relatively higher share of capital costs when valued in social terms. Yet, they presented a higher share of labor costs when valued in private terms, which indicates the presence of policies that decrease the capital/labor price ratio, and thereby promote the use of capital. The net subsidy on capital was substantial in most systems. Transfers are accounted for mainly by interest rate subsidies on short ant long term loans, on agricultural machinery prices, and on water retrieval and distribution costs. Labor was slighlty taxed, which reflects small social security taxes, and a market wage higher than the official minimum. The degree to which capital use would decrease in the absence of policy depends not only on relative factor prices, but also on the technical substitutability of one factor for the other. In order to fully evaluate policies that would enhance the use of labor, the magnitude of changes in the demands for labor and capital resulting from changes in private and social profitability would require consideration.

Ground water agricultural systems are much less profitable than reservoir-based agriculture due to high water retrieval costs in the former. In 1984-1985, production of most crops using ground water resulted in a

loss to producers and to the economy. In contrast, most reservoir-based systems contributed positively to national income, in spite of substantial costs associated with irrigation infrastructure. Water retrieval and distribution costs are subsidized by more than 90%, and in-field and conduction efficiencies are low. The underlying efficiency of reservoir-based agriculture suggests that such subsidies could be eliminated, while still maintaining private profitability, at least in those crops not subject to substantial output taxes. The consequent increases in efficiency in water use would increase the pace of settlement of new land.

Inequities in income distribution are pronounced in modern irrigated agriculture in Sonora and Sinaloa, in spite of specific policies intended to increase profitability of ejido agriculture. The main instrument has been interest rate subsidies. This reflects the difficulties in limiting the effects of output and tradable input price subisdies; the ejidatario, through the resale of subsidized outputs and inputs, can transmit the effect of such policies to private farmers.

Ejidos face a series of institutional and structural disadvantages relative to private farms. First, access to "cheap" credit has been limited because demand for credit has not been fulfilled. High transaction costs and credit quotas for Banrural and commercial banks discourage the

lending to small and new ejidatarios. Because the ejidatario does not own land and thus cannot use it as collateral, he has limited access to non-institutional credit. Limited access to credit by the ejidatario versus the private farmer may explain, to some extent, consistently lower yields in ejidos and the fact that relatively less profitable basic staple and oilseeds occupy a larger share of their total hectareage, and export crops a smaller share than in private land. Working capital requirements per hectare alone are almost three times greater for export crops than for basic staples and oilseeds.

Second, ejido farms are, on average, only one third the size of private farms. Therefore, even under the assumption of equal yields per hectare, when net profits per cycle-hectare are translated to a per-farm basis, the effectiveness of ejido-specific transfers in reducing the income gap between them and the private farmer is only slight, especially in systems that generate average or high profits per hectare.

The income made by the ejidatario who works his farm is often low enough to make the renting of his farm more attractive. This is especially the case when the ejidatario is faced with a lack of credit availability, is unable to participate in the markets for more profitable export crops, and when he has an off-farm employment alternative.

If the policies that prevailed during 1984-1985 were

to continue, export crops will tend to increase in importance, at the expense of basic staples and oilseeds. This will have net positive impacts on employment and the generation of foreign currency. But if food imports are to be kept within established limits, traditional agriculture in Sonora and Sinaloa, and agriculture in other regions will have to bear more of the weight of basic staple and oilseed production. This will require specific subsidy packages that replace current policies that tax producers.

The desirability of reductions in capital to promote the use of labor remains uncertain, due to limits in technical substitutability and to unknown magnitudes of effects on private and social profitabilities. But the underlying efficiency of reservoir-based agriculture suggests that large capital subsidies on irrigation infrastructure could be eliminated, while still maintaining private profitability, at least in those crops not subject to substantial output taxes.

Institutional and structural constraints have prevented the benefits of modern agriculture from spreading evenly among ejidos and private farms, in spite of policy efforts intended to increase profitability of ejido agriculture. Rationing of institutional credit and a lack of access to non-institutional credit bias the ejidatario's crop alternatives toward less costly, less profitable basic staples and oilseeds, versus more costly but highly

profitable export crops. Also, three-fold farm size differences between ejidos and private farms translate into almost the same magnitude of income differenctial; effects of ejido-specific subsidies are only slight. Furthermore, ejido agriculture is not always the most viable alternative; the income made by the ejidatario is often low enough to make the renting of his farm plus working as a jornalwro or in another sector more attractive. This situation is not likely to change very much in the near future. Economic austerity in the post-SAM years makes it difficult to foresee substantial increments in ejido transfers and credit. But the only politically viable alternative to land reform remains the continued reorientation of resources to further ejido access to credit, output markets, technology, and infrastructure.

APPENDIX A.1

LIST OF CROP BUDGETS FOR SONORA AND SINALOA, 1984-1985

The following is a list of the crop budgets constructed for the four irrigation districts considered in the present study, in the states of Sonora and Sinaloa, Mexico. Two budgets were constructed for each agricultural system; that is, for each of the crop-specific technologies considered; one for ejidos and one for private farmers.

Table A.1 Crop Budgets for Main Agricultural Systems in Four Irrigation Districts of Sonora and Sinaloa, 1984-1985.

System	Irrigation District			
	037	041	075	010
Corn	X	X	X	X
Wheat	X	X	X	X
Rice			X	X
Beans	X	X	X	X
Sorghum	X	X	X	X
Soybeans		X	X	X
Safflower	X	X	X	X
Sesame	X	X	X	
Tomatoes-large(D) a/		X	X	X
Tomatoes-large(X) b/		X	X	X
Tomatoes-cherry(D)			X	X
Tomatoes-cherry(X)			X	X
Tomatoes-saladette(D)			X	X
Tomatoes-saladette(X)			X	X
Green peppers-bell(D)		X	X	X
Green peppers-bell(X)		X	X	X
Potatoes			X	X
Cotton(D)	X	X	X	X
Cotton(X)	X	X	X	X
Chick-peas(D)	X	X	X	X
Chick-peas(X)	X	X	X	X
Alfalfa	X	X		

a/ D = Product sold in the domestic market.
b/ X = Product sold mainly in the export market.

APPENDIX A.2

LABOR REQUIREMENTS FOR CROP PRODUCTION ACTIVITIES

Table A.2 Sinaloa, Irrigation District 075: Labor Requirements of Main Agricultural Production Activities, 1984-1985.

ACTIVITIES / CROPS	CORN		WHEAT		RICE h/		BEANS		SORGHUM		SOYBEANS		SAFFLOWER		SESAME		TOMATOES (1 and chi) d/		TOMATOES (saladette)		GRE PEP
	T e/	L/T f/	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T
Mechanized: a/																					
Chopping	1	1.5																			
Bund and canal erasing			1	0.5			1	0.5	1	0.5	2	0.5	1	0.5	1	0.5	5	0.5	5	0.5	4
Subsoiling																	1	3.5	1	3.5	1
Plowing	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1
Harrowing	2	1.0	2	1.0	2	1.0	3	1.0	3	1.0	3	1.0	3	1.0	3	1.0	3	1.0	3	1.0	3
Levelling	1	1.0	1	0.8	1	0.8	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	2	0.8	2	0.8	2
Bunding	1	0.5	2	0.5	1	0.5	1	0.5	2	0.5	2	0.5	1	0.5	1	0.5	4	0.5	4	0.5	3
Ditching	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1
Furrowing	1	1.0					1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	6	1.0	6	1.0	6
Seeding	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0					
Fertilizing	1	0.8					1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1
Cultivating	2	1.0					1	1.0	1	1.0	2	1.0	2	1.0	1	1.0	4	1.0	4	1.0	5
Spraying															1	0.8	12	0.8	12	0.8	
Manual: b/																					
Plot finishing	1	2.0	2	2.0	1	2.0	1	2.0	2	2.0	2	2.0	1	2.0	1	2.0	4	2.0	4	2.0	3
Canal cleaning	1	6.1	1	5.1	1	6.1	1	5.1	1	5.8	1	6.1	1	5.1	1	6.1	2	5.3	1	5.1	2
Weeding	2	12.1					1	10.3	1	16.0	2	16.0	1	16.0	1	9.1	2	16.0	2	16.0	2
Cultivating							1	11.4							1	11.4	1	24.0	1	24.0	1
Planting and replanting																	1	128.0	1	128.0	1
Pruning																	4	60.0			
Fertilizing																	2	16.0	2	24.0	2
Pesticide application															1	4.1	1	24.0			6
Pest control			-- g/	15.4	--	40.0											--	64.0	--	64.0	--
Local transp. of materials																	--	86.4	--	30.4	--
Install. of stakes and sticks																	--	141.0			--
Install. of wire																	--	32.0			--
Install. of chord																	--	120.0			
Removal of crop support																	1	56.0			1
Irrigation design (SL)			1	1.0																	
Irrigating (SL)	5	8.6	5	7.3	4	16.7	3	7.7	4	10.9	6	8.5	2	8.3	2	9.8	17	12.0	16	12.0	17
Pre sowing							1	60.0							--	71.1	--	640.0	--	144.0	--
Labor supervision (SL)																	--	38.7	--	14.9	--
Field supervision (SL)		34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--
Custom services UL c/	--	0.4	--	0.5	--	0.7	--	0.4	--	0.5	--	0.5	--	0.4	--	0.4	--	0.6	--	0.5	--
SL	--	44.9	--	40.8	--	54.6	--	32.8	--	36.2	--	41.7	--	33.8	--	33.6	--	307.0	--	198.0	--

a Skilled labor (SL) is required for mechanized activities.
b/ Unskilled labor (UL) is required for manual activities, unless otherwise specified.
c/ Include those imputed to irrigation water distribution, maintenance and repair of machinery, labor and fertilizer transportation, aerial spraying and harvesting, entomological service, association fees, crop insurance, and greenhouse plant growing for vegetables.
d/ Large and cherry staked tomatoes.
e/ Number of times the activity is performed.
f/ Man-hours per hectare required per time.
g/ -- = Performed continuously throughout growing perio
h/ Irrigation water trap door instalation is done once,
i/ Seed treatment is done once, 32 Ulhs.
j/ "Desahije" (in-field seedling selection) is done onc

igation District 075: Labor
of Main Agricultural Production
984-1985.

RICE h/		BEANS		SORGHUM		SOYBEANS		SAFFLOWER		SESAME		TOMATOES (1 and ch) d/		TOMATOES (saladette)		GREEN PEPPERS		POTATOES i/		COTTON j/		CHICK-PEAS	
T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T
																		1	1.5	1	0.5		
		1	0.5	1	0.5	2	0.5	1	0.5	1	0.5	5	0.6	5	0.5	4	0.5	2	0.5	1	0.5		
												1	3.5	1	3.5	1	3.5						
1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5
2	1.0	3	1.0	3	1.0	3	1.0	3	1.0	3	1.0	3	1.0	3	1.0	3	1.0	3	1.0	2	1.0	2	1.0
1	0.8	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	2	0.8	2	0.8	2	0.8	1	1.0	1	0.8	1	0.8
1	0.5	1	0.5	2	0.5	2	0.5	1	0.5	1	0.5	4	0.5	4	0.5	3	0.5	2	0.5	1	0.5	1	0.5
1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5
		1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	6	1.0	6	1.0	6	1.0	1	1.0	1	1.0	1	1.0
1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0									1	1.0	1	1.0
		1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	2	0.8	1	0.8
		1	1.0	1	1.0	2	1.0	2	1.0	1	1.0	4	1.0	4	1.0	5	1.0	2	1.0	4	1.0	1	1.0
										1	0.8	12	0.8	12	0.8			3	0.8				
1	2.0	1	2.0	2	2.0	2	2.0	1	2.0	1	2.0	4	2.0	4	2.0	3	2.0	1	2.0	1	2.0	1	2.0
1	6.1	1	5.1	1	5.8	1	6.1	1	5.1	1	6.1	2	5.3	1	5.3	2	5.3	1	6.1	1	5.1	1	4.4
		1	10.3	1	16.0	2	16.0	1	16.0	1	9.1	2	16.0	2	16.0	2	12.0	2	8.6	3	24.0	1	10.5
		1	11.4							1	11.4	1	24.0	1	24.0	1	15.8						
												1	128.0	1	128.0	1	95.0	1	64.0				
												4	60.0										
												2	16.0	2	24.0	2	24.0						
										1	4.1	1	24.0			6	24.0						
--	40.0											--	64.0	--	64.0	--	24.8						
												--	86.4	--	30.4	--	92.0						
												--	141.0			--	120.0						
												--	32.0			--	64.0						
												--	120.0										
												1	56.0			1	40.0						
4	16.7	3	7.7	4	10.9	6	8.5	2	8.3	2	9.8	17	12.0	16	12.0	17	12.0	5	12.0	6	7.1	2	10.3
		1	60.0							--	71.1	--	640.0	--	144.0	--	559.0	1	211.8	1	120.0	1	75.0
												--	38.7	--	14.9	--	30.8	--	8.4				
--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0
--	0.7	--	0.4	--	0.5	--	0.5	--	0.4	--	0.4	--	0.6	--	0.5	--	0.6	--	0.5	--	0.6	--	0.3
--	54.6	--	32.8	--	36.2	--	41.7	--	33.8	--	33.6	--	307.0	--	198.0	--	395.8	--	58.7	--	59.5	--	35.6

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ion, maintenance
ation, aerial
tion fees,
bles.

d/ Large and cherry staked tomatoes.
e/ Number of times the activity is performed.
f/ Man-hours per hectare required per time.
g/ -- = Performed continuously throughout growing period.
h/ Irrigation water trap door instalation is done once, 8 ULhrs
i/ Seed treatment is done once, 32 ULhrs.
j/ "Desahije" (in-field seedling selection) is done once, 16 ULhrs.

Table A.3 Sinaloa, Irrigation District 010: Labor Requirments of Main Agricultural Production Activities, 1984-1985.

ACTIVITIES / CROPS	CORN		WHEAT		RICE h/		BEANS		SORGHUM		SOYBEANS		SAFFLOW	
	T e/	L/T f/	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/
Mechanized: a/														
Chopping	1	1.5												
Bund and canal erasing			1	0.5			1	0.5	1	0.5	2	0.5	1	0.
Subsoiling														
Plowing	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.
Harrowing	2	1.0	2	1.0	2	1.0	2	1.0	3	1.0	3	1.0	2	1.
Levelling	1	1.0	1	0.8	1	0.8	1	1.0	1	1.0	1	1.0	1	1.
Bunding	1	0.5	2	0.5	1	0.5	1	0.5	2	0.5	2	0.5	1	0.
Ditching	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.
Furrowing	1	1.0					1	1.0	1	1.0	1	1.0	1	1.
Sowing	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.
Fertilizing	1	0.8	1	0.8			1	0.8	1	0.8	1	0.8	1	0.
Cultivating	2	1.0					2	1.0	1	1.0	2	1.0	1	1.
Spraying														
Manual: b/														
Bund finishing	1	2.0	2	2.0	1	2.0	1	2.0	2	2.0	2	2.0	1	2.
Canal cleaning	1	6.1	1	5.5	1	6.1	1	5.5	1	5.8	1	8.1	1	7.
Weeding	2	12.1					2	9.9	1	16.0	3	8.1	1	6.
Cultivating							1	14.7						
Planting and replanting														
Prunning														
Fertilizing														
Pesticide application			1	11.4										
Bird control			-- g/	27.9	--	40.0								
In-field transp. of materials														
Install. of stakes and sticks														
Install. of wire														
Install. of chord														
Removal of crop support														
Irrigation design (SL)			1	1.0	1	1.0								
Irrigating (SL)	5	8.6	5	7.7	4	16.7	3	8.0	4	10.9	6	11.4		
Harvesting							1	60.0						
Labor supervision (SL)														
Field supervision (SL)	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.
Custom services UL c/	--	0.3	--	0.6	--	0.7	--	0.3	--	0.6	--	0.6	--	0.
SL	--	50.9	--	49.2	--	59.9	--	38.3	--	36.3	--	54.7	--	39.

a/ Skilled labor (SL) is required for mechanized activities.
b/ Unskilled labor (UL) is required for manual activities, unless otherwise specified.
c/ Include those imputed to irrigation water distribution, maintenance and repair of machinery, labor and fertilizer transportation, aerial spraying and harvesting, entomological service, association fees, crop insurance, and greenhouse plant growing for vegetables.
d/ Large
e/ Numbe
f/ Man-ho
g/ -- =
h/ Irrig
i/ Seed
j/ "Desa

Labor
luction

ORGHUM		SOYBEANS		SAFFLOWER	TOMATOES (1 and ch) d/		TOMATOES (saladette)		GREEN PEPPERS		POTATOES i/		COTTON j/		CHICK-PEAS	
L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T
													1	1.5		
0.5	2	0.5	1	0.5	5	0.5	5	0.5	4	0.5	2	0.5	1	0.5	1	0.5
					1	3.5	1	3.5	1	3.5						
2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5
1.0	3	1.0	2	1.0	3	1.0	3	1.0	3	1.0	3	1.0	2	1.0	2	1.0
1.0	1	1.0	1	1.0	2	0.8	2	0.8	2	0.8	1	1.0	1	0.8	1	0.8
0.5	2	0.5	1	0.5	4	0.5	4	0.5	3	0.5	2	0.5	1	0.5	1	0.5
0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5
1.0	1	1.0	1	1.0	6	1.0	6	1.0	6	1.0	1	1.0	1	1.0	1	1.0
1.0	1	1.0	1	1.0									1	1.0	1	1.0
0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	2	0.8	1	0.8
1.0	2	1.0	1	1.0	4	1.0	4	1.0	5	1.0	2	1.0	4	1.0	1	1.0
					12	0.8	12	0.8			3	0.8				
2.0	2	2.0	1	2.0	4	2.0	4	2.0	3	2.0	1	2.0	1	2.0	1	2.0
5.8	1	8.1	1	7.9	2	5.3	1	5.3	2	5.3	1	6.1	1	5.1	1	4.4
16.0	3	8.1	1	6.8	2	16.0	2	16.0	2	12.0	2	8.0	3	24.0	1	10.5
					1	24.0	1	24.0	1	15.8						
					1	128.0	1	128.0	1	96.0	1	64.0				
					4	40.0										
					2	16.0	2	24.0	2	24.0						
					1	24.0			6	24.0						
					--	64.0	--	64.0	--	24.8						
					--	86.4	--	30.4	--	92.0						
					--	141.0			--	120.0						
					--	32.0			--	64.0						
					--	120.0										
					1	56.0			1	40.0						
10.9	6	11.4			17	12.0	16	12.0	17	12.0	5	12.0	6	7.1	2	10.3
					--	688.0	--	144.0	--	550.0	1	250.0	--	120.0	1	76.0
					--	38.7	--	14.9	--	30.8	--	9.9				
34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0
0.6	--	0.6	--	0.3	--	1.1	--	0.9	--	1.0	--	0.6	--	0.6	--	0.4
36.3	--	54.7	--	39.1	--	314.9	--	204.7	--	397.4	--	59.4	--	65.4	--	41.6

d/ Large and cherry staked tomatoes.
e/ Number of times the activity is performed.
f/ Man-hours per hectare required per time.
g/ -- = Performed continuously throughout growing period.
h/ Irrigation water trap door instalation is done once, 8 ULhrs.
i/ Seed treatment is done once, 32 ULhrs.
j/ "Desahije" (in-field seedling selection) is done once, 16 ULhrs.

Table A.4 Sonora, Irrigation District 041: Labor Requirements of Main Agricultural Production Activities, 1984-1985.

ACTIVITIES / CROPS	CORN		WHEAT		BEANS		SORGHUM		SOYBEANS		SAFFLOWER		SESAME	
	T d/	L/T e/	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/
Mechanized: a/														
Chopping	1	1.5					1	1.5						
Bund and canal erasing			2	0.5	1	0.5	1	0.5	1	0.5				
Subsoiling														
Plowing	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.
Harrowing	3	1.0	3	1.0	3	1.0	2	1.0	2	1.0	3	1.0	2	1.
Levelling	1	1.0	1	0.8	1	1.0	1	1.0	1	1.0	1	1.0	1	1.
Bunding	1	0.5	2	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.
Ditching	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.
Furrowing	1	1.0			1	1.0	1	1.0	1	1.0	1	1.0	1	1.
Sowing	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.
Fertilizing	2	0.8	2	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.
Cultivating	2	1.0					2	1.0	3	1.0	2	1.0	2	1.
Spraying	1	0.8												
Manual: b/														
Bund finishing	1	2.0	2	2.0	1	2.0	1	2.0	1	2.0	1	2.0	1	2.
Canal cleaning	1	3.4	1	4.2	1	3.5	1	5.7	2	5.7	1	4.2	1	5.
Weeding	2	7.0			2	8.7	1	22.7	2	22.7	2	5.2	1	21.
Cultivating														
Planting and replanting														
Prunning														
Fertilizing														
Pesticide application					2	15.2								
Bird control														
In-field transp. of materials														
Install. of stakes and sticks														
Install. of wire														
Install. of chord														
Removal of crop support														
Irrigation design (SL)			1	1.0										
Irrigating (SL)	5	7.2	5	7.7	4	7.9	5	7.7	6	7.7	3	8.0	4	7.
Harvesting	1	34.8			1	13.9								
Labor supervision (SL)														
Field supervision (SL)	-- f/	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.
Custom services UL c/	--	0.9	--	0.8	--	0.8	--	0.9	--	1.0	--	1.0	--	0.
SL	--	41.7	--	43.6	--	32.3	--	38.4	--	42.2	--	33.6	--	35.

a/ Skilled labor (SL) is required for mechanized activities.
b/ Unskilled labor (UL) is required for manual activities, unless otherwise specified.
c/ Include those imputed to irrigation water distribution, maintenance and repair of machinery, labor and fertilizer transportation, aerial

d/ Number of times th
e/ Man-hours per hect
f/ -- = Performed con
g/ "Desahije" (in-fie
h/ Per year

)n

SAFFLOWER		SESAME		TOMATOES (large)		GREEN PEPPERS		COTTON g/		CHICK-PEAS		ALFALFA (1st year)		ALFALFA h/ (2nd to 7th yrs.)		
T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	
								1	1.5							
				1	0.5	1	0.1	1	0.5							
				1	3.5	1	3.5					1	3.5			
1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5			
3	1.0	2	1.0	4	1.0	4	1.0	3	1.0	2	1.0	2	1.0			
1	1.0	1	1.0	1	0.8	1	0.8	1	0.8	1	1.0	1	0.8			
1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	2	0.5			
1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5			
1	1.0	1	1.0	4	1.0	4	1.0	1	1.0	1	1.0					
1	1.0	1	1.0					1	1.0	1	1.0	1	0.8			
1	0.8	1	0.8	5	0.8	3	0.8	1	0.8	1	0.8	1	0.8			
2	1.0	2	1.0	4	1.0	3	1.0	6	1.0	1	1.0	1	0.8	5	0.8	Mowing
								3	0.8			1	0.4	5	0.4	Raking
												1	0.8	5	0.8	Baling
1	2.0	1	2.0	1	2.0	1	2.0	1	2.0	1	2.0	2	2.0			
1	4.2	1	5.7	1	4.2	1	4.2	1	5.7	1	4.2	1	2.1	1	4.2	
2	5.2	1	21.0	1	59.1			2	22.7	1	10.4					
						1	34.8									
				1	27.8	1	19.4									
				1	34.8			1	5.7							
														2	4.8	
										--	4.4					
				--	49.6											
												1	1.0			
3	8.0	4	7.2	6	7.2	6	7.2	6	7.7	4	6.6	7	7.2	10	7.3	
				--	299.1	--	104.4			1	13.9					
				--	10.0	--	3.0									
--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	
--	1.0	--	0.7	--	0.9	--	0.9	--	1.0	--	0.6	--	2.7	--	2.1	
--	33.6	--	35.7	--	85.0	--	56.6	--	83.5	--	33.8	--	44.5	--	22.6	

/ Number of times the activity is performed.
/ Man-hours per hectare required per time.
/ -- = Performed continuously throughout growing period.
/ "Desahije" (in-field seedling selection) is done once, 16 ULhrs.
/ Per year

Table A.5 Sonora, Irrigation District 037: Labor Requirements of Main Agricultural Production Activities, 1984-1985.

ACTIVITIES / CROPS	CORN		WHEAT		BEANS		SORGHUM		SAFFLOWER		SESAME		COTTON g
	T d/	L/T e/	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T L/
Mechanized: a/													
Chopping	1	1.5											1 1.
Bund and canal erasing			2	0.5					1	0.5			1 0.
Subsoiling													
Plowing	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1 2.
Harrowing	3	1.0	2	1.0	2	1.0	2	1.0	2	1.0	2	1.0	2 1.
Levelling	1	1.0	1	0.8	1	1.0	1	1.0	1	1.0	1	1.0	1 0.
Bunding	1	0.5	2	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1 0.
Ditching	1	0.5	1	0.5	1	0.5	1	1.0	1	0.5	1	0.5	1 0.
Furrowing	1	1.0			1	1.0	1	1.0	1	1.0	1	1.0	1 1.
Sowing	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1 1.
Fertilizing	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1 0.
Cultivating	2	1.0			2	1.0	1	1.0	2	1.0	3	1.0	3 1.
Spraying							2	0.8					1 0.
Manual: b/													
Bund finishing	1	2.0	1	2.0	1	2.0	1	2.0	1	2.0	1	2.0	1 2.
Weeding	1	41.4			2	41.6	1	14.6	1	17.4	1	14.6	2 24.
Cultivating													
Planting and replanting													
Fertilizing													
Pesticide application	1	16.0											
Bird control													
Irrigation design (SL)			1	1.0									
Irrigating (SL)	5	7.9	6	6.6	4	7.8	5	7.0	6	6.6	5	7.0	7 7.
Harvesting					1	13.9					1	27.8	
Field supervision (SL)	-- f/	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	-- 34.
Custom services UL c/	--	11.3	--	11.4	--	11.4	--	11.3	--	11.4	--	11.4	-- 11.
SL	--	113.9	--	115.4	--	90.9	--	95.9	--	95.2	--	86.8	-- 187.

a/ Skilled labor (SL) is required for mechanized activities.
b/ Unskilled labor (UL) is required for manual activities, unless otherwise specified.
c/ Include those imputed to irrigation water distribution, maintenance and repair of machinery, labor and fertilizer transportation, aerial

d/ Number of times the activi
e/ Man-hours per hectare rec
f/ -- = Performed continuousl
g/ "Desahije" (in-field seed
h/ Per year

District 037: Labor
Agricultural Production

	BEANS		SORGHUM		SAFFLOWER		SESAME		COTTON g/		CHICK-PEAS		ALFALFA (1st year)		ALFALFA h/ (2nd to 7th yrs.)		
	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	T	L/T	
									1	1.5							
					1	0.5			1	0.5							
													1	3.5			
	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5	1	2.5			
	2	1.0	2	1.0	2	1.0	2	1.0	2	1.0	2	1.0	2	1.0			
	1	1.0	1	1.0	1	1.0	1	1.0	1	0.8	1	1.0	1	0.8			
	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	1	0.5	2	0.5			
	1	0.5	1	1.0	1	0.5	1	0.5	1	0.5	1	0.5	1	5.0			
	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0					
	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0					
	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	1	0.8	2	0.8	3	0.8	
	2	1.0	1	1.0	2	1.0	3	1.0	3	1.0	1	1.0	1	0.8	7	0.8	Mowing
			2	0.8					1	0.8			1	0.4	7	0.4	Raking
													1	8.0	7	0.8	Baling
	1	2.0	1	2.0	1	2.0	1	2.0	1	2.0	1	2.0	1	2.0			
	2	41.6	1	14.6	1	17.4	1	14.6	2	24.4	1	10.4					
											--	4.4					
													1	1.0			
	4	7.8	5	7.0	6	6.6	5	7.0	7	7.0	4	6.6	7	7.2	7	6.3	
	1	13.9					1	27.8			1	13.9					
	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	--	34.0	
	--	11.4	--	11.3	--	11.4	--	11.4	--	11.4	--	11.4					
	--	90.9	--	95.9	--	95.2	--	86.8	--	187.2	--	100.9	--	346.1	--	277.5	

ctivities.
vities, unless otherwise

bution, maintenance
portation, aerial

d/ Number of times the activity is performed.
e/ Man-hours per hectare recquired per time.
f/ -- = Performed continuously during growing period.
g/ "Desahije" (in-field seedling selection) is done once, 22.6 ULhrs.
h/ Per year

APPENDIX B

REFERENCE TABLES FOR OUTPUT PRICE AND TRANSFERS CALCULATION

Table B.1Calculation of Output Transfers by CONASUPO for Basic Staples and Oilseeds, 1975-1985.

Crops	YEARS 1975	1976	1977	1978	1979	1980	1981
					Real Pesos/Mt a/		
I Basic Staples							
CORN							
World price b/	3,363	2,696	2,944	2,913	2,886	2,728	2,018
(2)+5% tr. and hl. c/	3,531	2,831	3,091	3,059	3,030	2,864	2,119
(2)+10% st., tr., and hl. d/	3,699	2,966	3,238	3,204	3,175	3,001	2,220
Guaranteed price e/	3,333	3,546	3,408	2,900	2,944	2,981	3,428
Wholesale price f/	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Transfer to producers g/	(198)	715	317	(159)	(86)	117	1,309
As percent of price	-6%	25%	10%	-5%	-3%	4%	62%
Transfer to consumers h/							
As percent of price							
WHEAT							
World price	4,371	3,731	2,610	3,173	3,397	3,049	2,440
(3)+5% tr. and hl.	4,590	3,918	2,741	3,332	3,567	3,201	2,562
(3)+10% st., tr., and hl.	4,808	4,104	2,871	3,490	3,737	3,354	2,684
Guaranteed price	3,070	3,106	2,409	2,600	2,538	3,081	3,297
Wholesale price	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Transfer to producers	(1,520)	(812)	(332)	(732)	(1,029)	(120)	735
As percent of price	-33%	-21%	-12%	-22%	-29%	-4%	29%
Transfer to consumers							
As percent of price							
WHITE RICE							
World price	10,956	15,596	9,565	14,141	5,145	6,443	5,489
(3)+5% tr. and hl.	11,504	16,376	10,043	14,848	5,402	6,765	5,763
(3)+10% st., tr., and hl.	12,052	17,156	10,522	15,555	5,660	7,087	6,038
Guaranteed price i/	7,974	6,314	5,920	4,697	4,230	4,567	5,153
Wholesale price	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Transfer to producers	(3,530)	(10,062)	(4,123)	(10,151)	(1,172)	(2,198)	(610)
As percent of price	-31%	-61%	-41%	-68%	-22%	-32%	-11%
Transfer to consumers							
As percent of price							

ıt Transfers by CONASUPO for
ilseeds, 1975-1985.

1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
				YEARS					
				Real Pesos/Mt a/					
2,696	2,944	2,913	2,886	2,728	2,018	3,043	3,316	2,742	3,325
2,831	3,091	3,059	3,030	2,864	2,119	3,195	3,482	2,879	3,491
2,966	3,238	3,204	3,175	3,001	2,220	3,347	3,648	3,016	3,658
3,546	3,408	2,900	2,944	2,981	3,428	2,915	3,133	2,907	2,469
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2,536	1,728	1,694	2,241
715	317	(159)	(86)	117	1,309	(280)	(349)	28	(1,022)
25%	10%	-5%	-3%	4%	62%	-9%	-10%	1%	-29%
						811	1,920	1,322	1,417
						24%	53%	44%	39%
3,731	2,610	3,173	3,397	3,049	2,440	4,113	3,461	2,197	3,408
3,918	2,741	3,332	3,567	3,201	2,562	4,319	3,634	2,307	3,578
4,104	2,871	3,490	3,737	3,354	2,684	4,524	3,807	2,417	3,749
3,106	2,409	2,600	2,538	3,081	3,297	2,512	2,970	2,692	2,018
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2,284	2,013	1,570
(812)	(332)	(732)	(1,029)	(120)	735	(1,807)	(664)	385	(1,560)
-21%	-12%	-22%	-29%	-4%	29%	-42%	-18%	17%	-44%
							1,523	404	2,179
							40%	17%	58%
15,596	9,565	14,141	5,145	6,443	5,489	4,161	11,090	4,610	4,969
16,376	10,043	14,848	5,402	6,765	5,763	4,369	11,645	4,841	5,217
17,156	10,522	15,555	5,660	7,087	6,038	4,577	12,199	5,071	5,466
6,314	5,920	4,697	4,230	4,567	5,153	4,691	5,191	4,744	3,400
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3,982	3,767	5,306
10,062)	(4,123)	(10,151)	(1,172)	(2,198)	(610)	322	(6,454)	(97)	(1,817)
-61%	-41%	-68%	-22%	-32%	-11%	7%	-55%	-2%	-35%
							8,217	1,304	160
							67%	26%	3%

(continues)

(Table B.1 continued)

Crops	1975	1976	1977	1978	1979	1980	1981
					YEARS		
					Real Pesos/Mt a/		
BEANS							
World price	9,061	11,466	15,038	13,565	10,426	11,396	8,936
(3)+5% tr. and hl.	9,514	12,039	15,790	14,243	10,947	11,966	9,383
(3)+10% st., tr., and hl.	9,967	12,613	16,542	14,922	11,469	12,536	9,830
Guaranteed price	10,526	7,576	5,582	6,000	6,345	8,038	8,373
Wholesale price	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Transfer to producers	1,012	(4,463)	(10,208)	(8,243)	(4,602)	(3,928)	(1,010)
As percent of price	11%	-37%	-65%	-58%	-42%	-33%	-11%
Transfer to consumers							
As percent of price							
SORGHUM							
World price	2,918	2,926	2,783	2,537	2,488	2,364	1,938
(3)+5% tr. and hl.	3,064	3,072	2,922	2,664	2,612	2,482	2,035
(3)+10% st., tr., and hl.	3,210	3,219	3,061	2,791	2,737	2,600	2,132
Guaranteed price	2,807	2,667	2,385	2,030	1,976	1,942	2,057
Wholesale price	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Transfer to producers	(257)	(405)	(537)	(634)	(636)	(540)	22
As percent of price	-8%	-13%	-18%	-24%	-24%	-22%	1%
Transfer to consumers							
As percent of price							
Averages for Basic Staples							
Transfer to producers	(898)	(3,005)	(2,977)	(3,984)	(1,505)	(1,334)	89
As percent of price	-13%	-21%	-25%	-35%	-24%	-17%	14%
Transfer to consumers							
As percent of price							

1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
				YEARS					
				Real Pesos/Mt a/					
11,466	15,038	13,565	10,426	11,396	8,936	6,207	9,553	7,899	9,666
12,039	15,790	14,243	10,947	11,966	9,383	6,517	10,031	8,294	10,149
12,613	16,542	14,922	11,469	12,536	9,830	6,828	10,508	8,689	10,633
7,576	5,582	6,000	6,345	8,038	8,373	6,950	5,384	4,578	3,852
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	7675	3,802	2,298	3,721
(4,463)	(10,208)	(8,243)	(4,602)	(3,928)	(1,010)	433	(4,647)	(3,716)	(6,297)
-37%	-65%	-58%	-42%	-33%	-11%	7%	-46%	-45%	-62%
						(847)	6,706	6,391	6,912
						-12%	64%	74%	65%
2,926	2,783	2,537	2,488	2,364	1,938	2,426	3,763	2,789	3,098
3,072	2,922	2,664	2,612	2,482	2,035	2,547	3,951	2,928	3,253
3,219	3,061	2,791	2,737	2,600	2,132	2,669	4,139	3,068	3,408
2,667	2,385	2,030	1,976	1,942	2,057	1,713	2,056	2,268	1,602
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1,699	2,761	2,279
(405)	(537)	(634)	(636)	(540)	22	(834)	(1,895)	(660)	(1,651)
-13%	-18%	-24%	-24%	-22%	1%	-33%	-48%	-23%	-51%
							2,440	307	1,129
							59%	10%	33%
(3,005)	(2,977)	(3,984)	(1,505)	(1,334)	89	(433)	(2,802)	(812)	(2,470)
-21%	-25%	-35%	-24%	-17%	14%	-14%	-36%	-10%	-44%
						(18)	4,161	1,946	2,359
						6%	57%	34%	40%

(continues)

(Table B.1 continued)

Crops	1975	1976	1977	1978	1979	1980	1981
					YEARS		
					Real Pesos/Mt a/		
II Oilseeds							
SOYBEANS							
World price	7,367	7,688	7,877	5,823	5,730	4,258	4,103
(3)+5% tr. and hl.	7,735	8,072	8,271	6,114	6,017	4,471	4,308
(3)+10% st., tr., and hl.	8,104	8,457	8,665	6,405	6,303	4,684	4,513
Guaranteed price	6,140	6,061	4,700	5,500	5,415	5,358	5,652
Wholesale price	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	4,161
Transfer to producers	(1,595)	(2,011)	(3,571)	(614)	(602)	887	1,344
As percent of price	-21%	-25%	-43%	-10%	-10%	20%	31%
Transfer to consumers							352
As percent of price							8%
SESAME							
World price	16,?70	15,818	18,009	18,249	16,250	14,833	18,854
(3)+5% tr. and hl.	17,084	16,609	18,909	19,161	17,063	15,575	19,797
(3)+10% st., tr., and hl.	17,897	17,400	19,810	20,074	17,875	16,316	20,739
Guaranteed price	10,526	10,000	7,756	7,540	7,657	6,062	8,124
Wholesale price	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	4,690
Transfer to producers	(6,558)	(6,609)	(11,153)	(11,621)	(9,406)	(9,513)	(11,673)
As percent of price	-38%	-40%	-59%	-61%	-55%	-61%	-59%
Transfer to consumers							16,049
As percent of price							77%
Averages for Oilseeds							
Transfer to producers	(4,076)	(4,310)	(7,362)	(6,118)	(5,004)	(4,313)	(5,164)
As percent of price	-30%	-32%	-51%	-35%	-33%	-21%	-14%
Transfer to consumers							8,201
As percent of price							0

YEARS									
1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Real Pesos/Mt a/									
7,688	7,877	5,823	5,730	4,258	4,103	5,670	5,973	5,609	6,007
8,072	8,271	6,114	6,017	4,471	4,308	5,954	6,272	5,889	6,307
8,457	8,665	6,405	6,303	4,684	4,513	6,237	6,570	6,170	6,608
6,061	4,700	5,500	5,415	5,358	5,652	5,040	5,058	5,522	5,022
n.a.	n.a.	n.a.	n.a.	n.a.	4,161	4,064	3,560	3,607	3,874
(2,011)	(3,571)	(614)	(602)	887	1,344	(914)	(1,214)	(367)	(1,285)
-25%	-43%	-10%	-10%	20%	31%	-15%	-19%	-6%	-20%
					352	2,173	3,010	2,563	2,734
					8%	35%	46%	42%	41%
15,818	18,009	18,249	16,250	14,833	18,854	19,253	24,616	14,234	16,484
16,609	18,909	19,161	17,063	15,575	19,797	20,216	25,847	14,946	17,308
17,400	19,810	20,074	17,875	16,316	20,739	21,178	27,078	15,657	18,132
10,000	7,756	7,540	7,657	6,062	8,124	6,884	8,158	10,847	9,417
n.a.	n.a.	n.a.	n.a.	n.a.	4,690	8,561	6,444	8,628	6,906
(6,609)	(11,153)	(11,621)	(9,406)	(9,513)	(11,673)	(13,332)	(17,689)	(4,099)	(7,891)
-40%	-59%	-61%	-55%	-61%	-59%	-66%	-68%	-27%	-46%
					16,049	12,617	20,634	7,029	11,226
					77%	60%	76%	45%	62%
(4,310)	(7,362)	(6,118)	(5,004)	(4,313)	(5,164)	(7,123)	(9,451)	(2,233)	(4,588)
-32%	-51%	-35%	-33%	-21%	-14%	-41%	-44%	-17%	-33%
					8,201	7,395	11,822	4,796	6,980
					0	0	1	0	1

(continues)

(Table B.1 continued)

Crops	YEARS 1975	1976	1977	1978	1979	1980	1981
					Real Pesos/Mt a/		
Averages for all Crops							
To producers	(1,806)	(3,378)	(4,230)	(4,593)	(2,505)	(2,185)	(1,412)
As percent of price	-18%	-25%	-33%	-35%	-26%	-18%	6%
Transfer to consumers							8,201
As percent of price							43%

a/ Deflated with general CPI for Mexico, 1978=100.(See table B.2)
b/ Cif(fob) for potential and actual imports(exports). Converted to Mexican pesos at free market exchange rates for the respective years.(See table B.3)
c/ Transportation and handling costs from(to) port of entry(exit) to (from) farm location.
d/ Storage,transportation and handling costs from moment of purchase by CONASUPO, to moment of sale.
e/ Annual average of prices paid by CONASUPO to farmers.
f/ Annual average CONASUPO sales price to private industry, retailers, and household consumers.
g/ (e)-(c). Negative transfers = taxes.
h/ (d)-(f). Negative transfers = taxes.
i/ Paddy rice price was converted to white rice price equivalent, using a 0.66 factor.

SOURCES: For world prices: -FAO (1977-84) Production and Trade Yearbooks Rome, Italy.
-World Bank (1985) Commodity Trade and Price Trends. Baltimore, U.S.A.
For guaranteed and wholesale prices: -CONASUPO (1986) internal documents (mimeographed) Mexico.

	Y E A R S								
1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Real Pesos/Mt a/									
) (3,378)	(4,230)	(4,593)	(2,505)	(2,185)	(1,412)	(2,345)	(4,702)	(1,218)	(3,075)
-25%	-33%	-35%	-26%	-18%	6%	-22%	-38%	-12%	-41%
					8,201	3,689	6,350	2,760	3,679
					43%	27%	58%	37%	43%

.co, 1978=100.(See table B.2)
imports(exports).
market exchange rates for the

from(to) port of entry(exit) to

g costs from moment of purchase by

ONASUPO to farmers.
e to private industry, retailers,

s.
s.
white rice price equivalent, using

84) Production and Trade Yearbooks
y.
(1985) Commodity Trade and Price Trends.
U.S.A.
prices: -CONASUPO (1986) internal documents
(mimeographed) Mexico.

Table B.2Evolution of General Consumer Price Index for Mexico (1978=100), 1970-1985.

YEAR	CPI
1970	32.2
1971	34.0
1972	35.7
1973	40.0
1974	49.5
1975	57.0
1976	66.0
1977	85.1
1978	100.0
1979	118.0
1980	149.3
1981	191.1
1982	303.6
1983	612.9
1984	1,014.1
1985 a/	1,592.9

a/ Estimate

SOURCES: -Banco de Mexico (1985) Indicadores Economicos Mexico, D.F.
-Banamex (1985) Resumen de la Situacion Economica de Mexico. Mexico, D.F..

Table B.3 Evolution of Market and Controlled Exchange Rates in Mexico, 1970-1985.

YEARS	MARKET RATE	CONTROLLED RATE a/
1970	12.50	
1971	12.50	
1972	12.50	
1973	12.50	
1974	12.50	
1975	12.49	
1976	15.44	
1977	22.58	
1978	22.77	
1979	22.81	
1980	22.95	
1981	24.51	
1982	57.18	57.44
1983	150.29	120.77
1984	185.19	167277
1985 b/	319.77	265.79

a/ Established since August 1982.
b/ Estimate
SOURCES: -Banco de Mexico, op. cit..
-Banamex, op. cit..

Table B.4 Evolution of Domestic Production and Trade of Basic Staples and Oilseeds, 1975-1984.

Crops	YEARS 1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
	Thousands of Metric Tons									
I Basic Staples										
CORN										
Production	8459	8,017	10,024	9,616	8,124	12,383	14,766	10,030	13,061	14,050
Imports	2637	912	1,755	1,352	744	3,713	2,844	233	4,687	2,498
Exports	4	0	0	0	0	0	1	1	21	5
Consumption a/	11,092	8,929	11,779	10,968	8,868	16,096	17,609	10,262	17,727	16,543
Share of Imports in Consumption	23.77%	10.21%	14.90%	12.33%	8.39%	23.07%	16.15%	2.27%	26.44%	15.10%
WHEAT										
Production	2798	3,363	2,454	2,643	2,339	2,785	3,189	4,468	3,460	4,262
Imports	87	2	476	469	1,148	823	1,028	40	42	35
Exports	37	13	23	14	14	23	23	0	0	0
Consumption	2,848	3,352	2,907	3,098	3,473	3,585	4,194	4,508	3,502	4,297
Share of Imports in Consumption	3.05%	0.06%	16.37%	15.14%	33.05%	22.96%	24.51%	0.89%	1.20%	0.81%
WHITE RICE b/										
Production	473	306	360	262	330	301	425	337	275	419
Imports	0	0	0	0	36	93	74	22	0	103
Exports	0	0	3	54	3	0	0	0	0	0
Consumption	473	306	357	208	363	394	499	359	275	522
Share of Imports in Consumption	0.00%	0.00%	0.00%	0.00%	9.92%	23.60%	14.83%	6.13%	0.00%	19.73%
BEANS										
Production	1027	740	741	940	601	971	1,469	1,093	1,282	1,270
Imports	104	0	29	1	7	443	490	621	218	75
Exports	0	43	130	0	1	0	0	0	0	32
Consumption	1,131	697	640	941	607	1,414	1,959	1,714	1,500	1,313
Share of Imports in Consumption	9.20%	0.00%	4.53%	0.11%	1.15%	31.33%	25.01%	36.23%	14.53%	5.71%

(continues)

(Table B.4 continued)

Crops	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
					YEARS					
					Thousands of Metric Tons					
SORGHUM										
Production	2843	4,027	4,071	4,185	3,917	4,812	6,296	4,720	4,846	6,729
Imports	0	44	703	809	1,266	2,255	2,509	4,188	4,165	2,387
Exports	0	0	0	0	0	0	0	0	0	0
Consumption	2,843	4,071	4,774	4,994	5,183	7,067	8,805	8,908	9,011	9,116
Share of Imports in Consumption	0.00%	1.08%	14.73%	16.20%	24.43%	31.91%	28.50%	47.01%	46.22%	26.18%
II Oilseeds										
SOYBEANS										
Production	699	302	507	324	719	312	712	648	686	789
Imports	22	348	525	681	578	522	1,177	518	894	1,313
Exports	0	0	0	0	0	0	0	0	0	0
Consumption	721	650	1,032	1,005	1,297	834	1,889	1,166	1,580	2,102
Share of Imports in Consumption	3.05%	53.54%	50.87%	67.76%	44.56%	62.59%	62.31%	44.43%	56.58%	62.46%
SESAME										
Production	111	85	123	134	173	176	86	46	87	92
Imports	0	0	0	0	0	0	0	0	0	0
Exports	12	20	12	28	106	52	49	28	25	62
Consumption	99	65	111	106	67	124	37	18	62	30
Share of Imports in Consumption	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

a/ Apparent consumption = Production+imports-exports. Differs from actual consumption inasmuch no allowances are made for year-to-year changes in stocks.
b/ White rice, 1 MT= 1Mt of paddy rice/0.66.
SOURCES: -FAO (1977-1984) Production and Trade Yearbooks, Rome.
-Urencio,C. (1983) "Sector Externo y Desarrollo en un Contexto Inflacionario." In: Inflacion, Devaluacion y Desarrollo Rural en Mexico. Mexico
-Taddei, C. (1986) Influencia del Mercado Internacional en la Agricultura Sonorense, 1960-1984. Thesis. Universidad de Sonora. Mexico.

APPENDIX C

CALCULATION OF SOCIAL PRICE OF SAFFLOWER AND COTTON SEED, AND REFERENCE TABLES FOR ESTIMATION OF INPUT AND FACTOR PRICES

Calculation of Social Price of Safflower

The Social price of safflower was calculated using the folowing formulas and price data sources:

A = B/1.096*

B = (C)(0.52)**

C = (D)(1.352)(MUV index for 1985)***

where:

A = FOB Mexico expected current 1985 price of safflower.
B = FOB Mexico expected current 1985 price of safflower meal.
C = FOB Mexico expected current 1985 price of soybean meal.
D = Long-run (1990) constant f(1983=100) World Bank estimate of soybean meal price.

* Calculated from time series of A and B, obtained from various issues of FAO Trade Yearbook.

** Protein content pf safflower meal (23%), is 52% of protein content of soybean meal (44%).

*** Conversion factor from FOB Mexico current soybean meal prices to FOB Mexico soybean prices; here assumed to be applicable for conversion of safflower meal prices to safflower prices. Calculated from time series obtained from various issues of FAO Trade Yearbook and from World Bank Commodity and Trade Price Trends, 1985.

Calculation of Social Price of Cotton Seed

The social price of cotton seed was calculated using the following formulas and price data sources:

A = (B)(0.76)*

B = (C)(1.035)(MUV index for 1985)**

where:

A= FOB Mexico expected current 1985 price of cotton seed.
B = FOB Mexico expected current 1985 price of soybeans.
C = Long-run (1990) constant (1983=100) World Bank estimate of soybean price.

* Calculated from time series of A and B, obtained from various issues of FAO Trade Yearbook

** Calculated from time series of B and C, obtained from various issues of FAO Trade Yearbook and from World Bank Commodity Trade and Price Trends, 1985.

Table C.1 Intermediate Input Catalogue, Sonora, 1985.

ITEM CODE	DESCRIPTION	UNIT OF MEASURE	PRICE/UNIT (Pesos)		
			Ejidos	Private Property	Social
SEEDS (S)					
OSCr	Corn:H503,H507,H509, H412,H419,H524	Kg	115.00	115.00	149.50
OSA	Alfalfa:Mesa sirsa,Sonora EXA5080	Kg	800.00	850.00	1,105.00
OSSa	Safflower:Gila,Kino76	Kg	100.00	108.00	140.40
OSSy	Soybeans:Yaqui80,Mayo80 Cajeme,Davis Tetabiate	Kg	190.00	200.00	260.00
OSSr	Sorghum:NK127,DobleTX, NK180,D50,D42, Asgrow,Dorado, RB3030,RB3006, DekalbC42A,Pure-pecha,Oromex149, Papago	Kg	175.00	200.00	260.00
OSSe	Sesame:Teras,Yori,Pachequeno, Eva	Kg	270.00	280.00	364.00
OSB	Beans:Azufrado,Canario101-107,Pinto Americano 111-114	Kg	110.00	115.00	149.50
OSW	Wheat:Tonich81,Ures,SeriM82 Glennson,Genaro, Sonoyta81,NacozariM76, PavonF76,TorimF73, Ciano75,Yavaros,Caborca, Cananea,Ures81	Kg	75.00	85.00	110.50
OSCt	Cotton:Stoneville213,Delta-pine80,Delta-pine90	Kg	140.00	150.00	195.00
OSCh	Chick-peas:Surutato77,Macarena Sonora80	Kg	115.00	120.00	156.00
OSGP	Green peppers(bell):California wonder	Plant	1.09	1.09	1.17
OST	Tomatoes:Culiacan No.1	Plant	1.21	1.21	1.30

(continues)

(Table C.1 continued)

ITEM CODE	DESCRIPTION	UNIT OF MEASURE	PRICE/UNIT (Pesos)		
			Ejidos	Private Property	Social
WATER (W)					
OW37	Irrigation district 037	Cycle/Ha	8789.71	8789.71	8789.71
	ground, all crops	Year/Ha	17,579.00	17,579.00	17,579.00
OW41	Irrigation district 041 dam, all crops	MM3	480.00	480.00	3,210.29
FERTILIZERS and INOCULANTS (F)					
OF1	Urea gr 46-00-00	MT	27,500.00	27,500.00	62,500.00
OF2	Calcium triple superphosphate gr 00-46-00	MT	32,000.00	32,000.00	58,824.00
OF3	Anhidrous ammonia gas 82-00-00	MT	19,000.00	19,000.00	73,077.00
OF4	Aquamonia lc 20.5-00-00	MT	8,740.00	9,200.00	28,750.00
OF5	Potassium sulfate gr 00-00-50	MT	44,300.00	44,300.00	54,691.00
OF5	gr 17-17-17	MT	39,100.00	39,100.00	71,524.00
OF6	lc 10-34-00	MT	69,920.00	69,920.00	149,789.00
OF7	Leaf fertilizer S+Zn wp	Kg	600.00	600.00	600.00
OF8	Nitragin-soybeans wsp	Kg	660.00	660.00	660.00
OF9	Nitrazan-soybeans wsp	Kg	759.00	759.00	759.00
OF10	Nitrobacter pwd	Kg	390.00	390.00	390.00
OF11	Nitragin-chick-peas wsp	Kg	325.00	325.00	325.00
OF12	Calcium nitrate gr 15.5-00-00	MT	14,710.00	14,710.00	45,969.00
OF13	Amonium sulphate gr 50-00-00	MT	10,200.00	10,200.00	31,875.00
PESTICIDES-INSECTICIDES (I)					
OI1	Methyl-parathion 72% ec	Lt	800.00	844.00	906.02
OI2	Methyl-gusathion 50% wp	Kg	2,019.70	2,126.00	2,269.85
OI3	Belmark 30% ec	Lt	664.25	701.50	754.43
OI4	Nuvacron 60% ec	Lt	3,628.05	3,819.00	4,070.92
OI5	Endrin192 19.5% ec	Lt	1,388.00	1,388.00	1,484.75
OI7	Bolstar 90% ec	Lt	3,491.25	3,675.00	3,917.73
OI8	Folimat1200 83.7% lc	Lt	4,538.15	4,777.00	5,090.07
OI9	Lannate90 90% wsp	Kg	7,302.65	7,687.00	8,185.81

(continues)

(Table C.1 continued)

ITEM CODE	DESCRIPTION	UNIT OF MEASURE	PRICE/UNIT (Pesos)		
			Ejidos	Private Property	Social
OI10	Permevin300 30% lc	Lt	1,467.75	1,545.00	1,651.77
OI11	Lorsban480-E 48% ec	Lt	2,375.00	2,500.00	2,667.83
OI12	Tamaron600 50% ec	Lt	2,460.50	2,590.00	2,763.47
OI13	Ambush340 34% wp	Kg	7,815.65	8,227.00	8,760.28
OI14	Sevin 5% gr	Kg	122.00	122.00	137.94
OI15	Malathion1000 84% ec	Lt	1,511.45	1,591.00	1,700.71
OI16	Decis 0.25% ec	Lt	577.10	6,018.00	6,410.26
OI17	Azodrin 56% ec	Lt	3,144.50	3,310.00	3,529.43
OI18	Dimethoate40 38.2% ec	Lt	1,099.00	1,099.00	1,177.30
OI19	Volaton 50% ec	Lt	1,860.00	1,860.00	1,986.88
OI21	Sevin80 80% wp	Kg	1,524.75	1,605.00	1,715.60
OI22	Roxion40 40% ec	Lt	885.00	1,286.00	1,376.24
PESTICIDES-FUNGICIDES (U)					
OU1	Captan 75% wp	Kg	1,910.00	1,910.00	2,040.07
OU2	Captan 50% ws	Kg	1,780.00	1,780.00	1,901.77
OU3	PCNB 20% wp	Kg	400.00	400.00	433.68
OU4	Manzati-D 90% wp	Kg	1,780.00	1,780.00	1,901.77
OU5	Copper sulfate 53.5% wp	Kg	715.00	715.00	768.79
OU6	Bayleton 25% ec	Lt	7,455.00	7,455.00	7,939.00
PESTICIDES-HERBICIDES,DEFOLIANTS,and DESICCANTS (H)					
OH1	Gramoxone 24% as	Lt	1,757.50	1,850.00	1,976.24
OH2	Defolia 90% ec	Lt	1,440.00	1,600.00	1,710.28
OH3	Bravo500 80% wp	Kg	818.00	818.00	878.37
OH4	Cotoran80 80% wp	Kg	2,955.45	3,111.00	3,317.73
OH5	Faena 412% ec	Lt	3,790.00	3,940.00	4,199.64
OH6	Carbyne24 24% ec	Lt	3,022.90	3,182.00	3,393.26
OH7	Dacamine 50% ec	Lt	1,050.00	1,050.00	1,125.17
OH8	Sencor 70% wp	Kg	7,757.00	7,757.00	8,260.28
OH9	Mataven 18% ec	Lt	2,597.00	2,597.00	2,770.92
OH10	Banvel 48% ec	Lt	4,029.00	4,242.00	4,520.92
OH11	Estamine4 35.3% ec	Lt	837.90	882.00	946.45
OH12	Finaven 25% ec	Lt	2,838.00	2,838.00	3,027.30

(continues)

(Table C.1 continued)

ITEM CODE	DESCRIPTION	UNIT OF MEASURE	PRICE/UNIT (Pesos)		
			Ejidos	Private Property	Social
OH13	2-4 D Amina4 46.16% ec	Lt	939.75	989.20	1,060.49
OH14	Prefar480E 80% wp	Kg	1,747.00	1,747.00	1,866.66
OH15	Treflan 47.5% ec	Lt	1,027.00	1,027.00	1,094.41
OH16	Eptam 72% ec	Lt	756.40	756.40	812.83
GASOLINE (G)					
OG1	Pemex Diesel	Lt	30.00	30.00	90.19
ELECTRICITY (E)					
OE1	Used by electric motor 150HP (95.16KW/Hr at P0.95/K.W.H.)	Hr	90.40	90.40	1,397.25
OTHERS (T)					
OT1	Baling wire	Roll	4,147.00	4,147.00	4,147.00
OT2	Staking wire#10 2yrs	Kg	69.58	69.58	69.58
OT3	Staking chord#1100 1yr	Kg	241.5	241.5	241.50
OT4	Harvesting boxes	Piece	100.00	100.00	100.00
OT5	Stakes 3yrs	Piece	6.00	6.00	6.00
OT7	Fireworks bird control	Bag	625.00	625.00	625.00

Key to abbreviations: wsp=water-soluble powder;pwd=powder;lc=liquid-concentrate ec=emulsifiable concentrate;gr=granules;Kg=kilograms;Lt=liters;MT=metric tons;Hr=hour;MM3=thousand cubic meters;Ha=hectare; as=aqueous solution;K.W.H=kilowatt-hour.

SOURCES: -Various retail fertilizer and pesticide business establishments in Cd. Obregon, Sonora.
-Fertimex (1985) Oficial Fertilizer Prices. Mexico.
-Pronase (1985) Oficial Seed Prices. Mexico

Table C.2 Intermediate Input Catalogue, Sinaloa, 1985.

ITEM CODE	DESCRIPTION	UNIT OF MEASURE	PRICE/UNIT (Pesos)		
			Ejidos	Private Property	Social
SEEDS (S)					
ISCr	Corn:H45,H450,H421,Blanco-dentado2,Costeno Culiacan	Kg	109.00	118.00	153.40
ISSa	Safflower:Gila,Saffoca200, Humaya365,Kino76	Kg	98.00	105.00	136.50
ISSy	Soybeans:Bragg,Cajeme,Davis, Tamazula,Rosales, Tetabiate	Kg	162.00	175.00	227.50
ISSr	Sorghum:Cromex904,Oro,Asgrow-emerald,Master gold, Tegma,NK180	Kg	239.44	252.05	327.67
ISSe	Sesame:Pachequeno,Coladeborreg Padilla,Canasta	Kg	258.00	280.00	364.00
ISB	Beans:Azufrado200,Canario78, Flor de mayo,Canario107, Azufrado pimono,Canario72, Maycoba,Ahome CIAS72, Culiacan200	Kg	106.00	115.00	149.50
ISW	Wheat:Thuris T79,Ciano T79, Tesia F79,Yecorato F77, Jarvara F77,Glennson M81, Ures,Genaro,Tonichi,Comondu, Sonoita	Kg	63.00	68.00	88.40
ISCt	Cotton:Stoneville213,Delta-pine80, Coker310	Kg	138.00	150.00	195.00
ISCh	Chick-peas:Macarena	Kg	120.00	130.00	169.00
ISR	Rice:Cica4,Cica6,Bamoa A75, Navolato71,Sinaloa A78, Sinaloa A80,Culiacan A82	Kg	115.00	125.00	162.50
ISP	Potatoes:Alpha,White rose	Kg	65.00	65.00	84.50
ISGP	Green peppers:Californiawonder	Kg	14,000.00	14,000.00	16,842.00
ISTs	Tomatoes-staked (vine-ripe and green):Floradel,Contessa, Pole-roy,Mayolip,Duke,XIH674, Hayslip	Kg	140,860.00	140,860.00	169,456.00

(continues)

(Table C.2 continued)

ITEM CODE	DESCRIPTION	UNIT OF MEASURE	PRICE/UNIT (Pesos)		
			Ejidos	Private Property	Social
ISTg	Tomatoes-ground(saladette): UC82A,Roma,Napoli	Kg	10,600.00	10,600.00	13,780.00
ISTsc	Tomatoes-staked (cherry):Large	Kg	11,870.00	11,870.00	14,280.00
WATER (W)					
IW75Lw	Irrigation district 075 dam,(sesame,safflower,beans, chick-peas,corn)	Cycle/Ha MM3	1,250.00	1,250.00	3,210.29
IW75Md	Irrigation district 075 dam,(potatoes,sorghum, soybeans, ground tomatoes, wheat)	Cycle/Ha MM3	1,550.00	1,550.00	3,210.29
IW75Hi	Irrigation district 075 dam,(cotton,green peppers, staked tomatoes)	Cycle/Ha MM3	2,000.00	2,000.00	3,210.29
IW75Sp	Irrigation district 075 dam,(rice)	Cycle/Ha MM3	2,250.00	2,250.00	3,210.29
IW10Lw	Irrigation district 010 dam,(sesame,safflower,beans, chick-peas,corn)	Cycle/Ha MM3	1,000.00	1,000.00	3,210.29
IW10Md	Irrigation district 010 dam,(potatoes,sorghum, soybeans,wheat,cotton)	Cycle/Ha MM3	2,100.00	2,100.00	3,210.29
IW10H1	Irrigation district 010 dam,(ground tomatoes)	Cycle/Ha MM3	3,000.00	3,000.00	3,210.29
IW10H2	Irrigation district 010 dam,(staked tomatoes)	Cycle/Ha MM3	3,700.00	3,700.00	3,210.29
IW10H3	Irrigation district 010 dam,(green peppers)	Cycle/Ha MM3	3,500.00	3,500.00	3,210.29
IW10Sp	Irrigation district 010 dam,(rice)	Cycle/Ha MM3	2,500.00	2,500.00	3,210.29
FERTILIZERS and INOCULANTS (F)					
IF1	Urea gr 46-00-00	MT	27,500.00	27,500.00	72,368.00
IF2	Calcium triple superphosphate gr 00-46-00	MT	32,000.00	32,000.00	74,419.00

(continues)

(Table C.2 continued)

ITEM CODE	DESCRIPTION	UNIT OF MEASURE	PRICE/UNIT (Pesos)		
			Ejidos	Private Property	Social
IF3	Anhidrous ammonia gas 82-00-00	MT	19,000.00	19,000.00	82,609.00
IF4	Aquamonia lc 20.5-00-00	MT	8,740.00	9,200.00	32,857.00
IF5	Potassium sulfate gr 00-00-50	MT	44,300.00	44,300.00	54,691.00
IF5	gr 17-17-17	MT	39,100.00	39,100.00	77,171.00
IF6	lc 10-34-00	MT	69,920.00	69,920.00	176,606.00
IF7	Leaf fertilizer S+Zn wsp	Kg	600.00	600.00	600.00
IF8	Nitragin-soybeans wsp	Kg	660.00	660.00	660.00
IF9	Nitrazan-soybeans wsp	Kg	759.00	759.00	759.00
IF10	Nitrobacter pwd	Kg	390.00	390.00	390.00
IF11	Nitragin-chick-peas wsp	Kg	450.00	450.00	450.00
IF12	Calcium nitrate gr 15.5-00-00	MT	14,710.00	14,710.00	52,536.00
IF13	Amonium sulphate gr 50-00-00	MT	10,200.00	10,200.00	36,429.00
IF14	8-24-00 gr	MT	67,647.00	67,647.00	172,349.00
IF15	Nutrafer pwd 20-30-10	Kg	276.00	276.00	623.00
PESTICIDES-INSECTICIDES (I)					
II1	Methyl-parathion 72% ec	Lt	712.50	750.00	816.88
II2	GusathionH20 20% wp	Kg	936.70	986.00	1,067.85
II3	Belmark 30% ec	Lt	675.09	710.00	774.33
II4	Diazinon25E 25% ec	Lt	1,322.40	1,392.00	1,499.86
II5	Salvadrin 1.5% gr	Kg	84.93	89.40	114.12
II6	Temik15 15% gr	Kg	1,606.45	1,691.00	1,817.95
II7	Sevimol300 30% ec	Lt	735.30	774.00	842.42
II8	Folimat1200 83.7% lc	Lt	3,557.75	3,745.00	4,003.05
II9	Lannate 90% wsp	Kg	6,226.30	6,554.00	6,991.35
II10	Permevin300 30% lc	Lt	1,320.50	1,390.00	1,497.74
II11	Lorsban480E 40% ec	Lt	1,952.25	2,055.00	2,205.18
II12	Tamaron600 50% ec	Lt	2,406.35	2,533.00	2,713.69
II13	Ambush340 34% wp	Kg	7,815.65	8,227.00	8,771.14
II14	Sevin 5% gr	Kg	116.85	123.00	149.86
II15	Toxaphene 80% ec	Lt	246.05	259.00	294.54
II16	Azodrin 56% ec	Lt	2,588.75	2,725.00	2,917.95
II17	Dimethoate40 38.2% ec	Lt	546.25	575.00	630.71
II18	Sevin80 80% wp	Kg	1,415.50	1,490.00	1,604.12

(continues)

(Table C.2 continued)

ITEM CODE	DESCRIPTION	UNIT OF MEASURE	PRICE/UNIT (Pesos)		
			Ejidos	Private Property	Social
PESTICIDES-FUNGICIDES (U)					
IU1	Benlate 90% wp	Kg	4,000.00	4,000.00	4,274.33
IU2	Bayleton 25% wp	Kg	7,004.35	7,373.00	7,862.63
IU3	PCNB 20% wp	Kg	380.00	400.00	444.54
IU4	ManzatiD 80% wp	Kg	806.55	849.00	922.20
IU5	Manzati200 20% wp	Kg	735.30	774.00	842.42
IU6	Daconil2787W75 75% wp	Kg	2,686.60	2,828.00	3,027.52
IU7	Hidroxil 4% pwd	Kg	798.95	841.00	913.69
IU8	Maneb 80% wp	Kg	825.55	869.00	943.48
IU9	RidomilMZ58 58% wp	Kg	3,055.20	3,216.00	3,440.29
IU10	Trioxil ?% pwd	Kg	719.15	757.00	824.33
IU11	Tecto60 60% wp	Kg	5,779.80	6,084.00	6,491.35
IU12	Zineb 80% pwd	Kg	826.50	870.00	944.54
PESTICIDES-HERBICIDES,DEFOLIANTS,AND DESICCANTS (H)					
IH1	Gramoxone 24% as	Lt	1,757.50	1,850.00	1,987.10
IH2	Tretox 44.5% ec	Lt	1,601.70	1,686.00	1,812.63
IH3	STAM-LV-10 30% ec	Lt	1,599.84	1,684.00	1,810.50
IH4	Karmex 80% wp	Kg	1,575.10	1,658.00	1,782.84
IH5	Illoxan 28% ec	Lt	3,727.80	3,924.00	4,193.48
IH6	DMA4-Amina ?% ec	Lt	1,092.50	1,150.00	1,242.42
IH7	Prefar480E 80% wp	Kg	1,617.85	1,703.00	1,830.71
IH8	Sencor 70% wp	Kg	7,388.15	7,777.00	8,292.42
IH9	2-4-D Amina6 72% ec	Lt	1,119.85	1,178.80	1,273.05
GASOLINE (G)					
IG1	Pemex Diesel	Lt	30.00	30.00	90.19
OTHERS (T)					
IT1	Baling wire	Roll	4,147.00	4,147.00	4,147.00
IT2	Staking wire#10 2yrs	Kg	69.58	69.58	69.58
IT3	Staking chord#1100 1yr	Kg	241.50	241.50	241.50

(continues)

(Table C.2 continued)

ITEM CODE	DESCRIPTION	UNIT OF MEASURE	PRICE/UNIT (Pesos)		
			Ejidos	Private Property	Social
IT4	Harvesting boxes	Piece	100.00	100.00	100.00
IT5	Stakes 3yrs	Piece	6.00	6.00	6.00
IT7	Fireworks bird control	Gruesa	1,500.00	1,500.00	1,500.00
IT8	Support sticks 3yrs	Piece	1.67	1.67	1.67
IT9	Potato sacks	Piece	20.00	20.00	20.00
IT10	Water trap-doors 2yrs	Piece	290.00	290.00	290.00

Key to abbreviations: wsp=water-soluble powder;pwd=powder;lc=liquid-concentrate;ec=emulsifiable concentrate;gr=granules;ac=aqueous solution; MT=metric tons;Hr=hour;MM3=thousand cubic meters;Ha=hectare;Kg=kilograms Lt=liters;K.W.H.=Kilowatts-hour.

SOURCES: -Various retail fertilizer and pesticide business establishments in Los Mochis, Sinaloa.
-Fertimex (1985) Official Fertilizer Prices. Mexico.
-Pronase (1985) Official Seed Prices. Mexico.

Table C.3 Sonora and Sinaloa: Acquisition Value of Agricultural Machinery in Private and Social Prices, 1985.

Machinery	Private	Social
	Pesos/Unit	
Tractor 150 HP	9,300,000	12,935,824
Tractor 80 HP	4,800,000	6,742,959
Subsoiler 3 shanks	430,000	678,594
Disc plow 5 discs	1,200,000	1,932,130
Double 28 disc harrow	1,500,000	1,955,399
"Tablon" 24'x 12'	300,000	473,438
Land plane 45'x 12'	2,000,000	2,406,015
Lister 5 shanks	340,000	536,563
Hiller 6 discs	340,000	536,563
Ditcher	120,000	189,375
Unit planter 4 row	600,000	946,875
Grain drill	1,350,000	1,624,060
Veritical cultivator	340,000	536,563
Sprayer(Asperjet)	400,000	631,250
High clearance sprayer	3,000,000	3,609,023
Fertilizer spreader	220,000	347,188
Terrace blade	250,000	394,531
Rotary cutter	430,000	678,594
Mower	287,714	454,049
Raker	282,286	445,483
Baler	745,714	1,176,830
Electric pump 150 HP a/	18,265,400	18,265,400

a/ Includes perforation and additional electric equipment. See Appendix C, Table C.4 for description.

SOURCE:-For private prices:
-FIRA (1985) Hermosillo, Son.
-John Deere Distributors (1985) Los Mochis, Sin. and Hermosillo, Son.
-DANSA and Sonora Agricola Distributors (1985) Cd. Obregon, Son.
-For social prices:
-Hathorn, Scott (1985) 1985 Farm Machinery Costs. Tucson, Az..

Table C.4 Acquisition Cost, Salvalge Value, and Useful Life of Irrigation Pump and Related Installations, 1985.

Item	Acquisition Value (Pesos)	Salvage Value (Pesos)	Useful Life (Years)
Perforation	6,800,000	0	15
Pump (150 lt/sec)	5,332,000	1,066,400	8
Electic motor 150 HP	2,806,600	1,226,680	8
Transformer 150 KVA	1,429,100	285,820	8
Starter 150 HP	797,600	159,520	8
Power substation	725,800	145,160	8
Power line	374,300	74,860	8
Total	18,265,400	2,958,400	11 a/

a/ Weighted Average

The Calculation of Share of Annual Use of Agricultural Machinery

The share of annual use of tractors and agricultural machinery was calculated for each irrigation district, with the following formula:

$$\text{Share of annual use/cycle} = \frac{\text{Hours of use/cycle/Ha}}{\text{Hours of use/year}}$$

where,

$$\text{Hours of use/cycle/Ha} = {}_{i}\, X_i Y_i$$

where,

X_i = hours/hectare required for a particular activity.
Y_i = number of times per cycle the activity is performed.

and where,

$$\text{Hours of use/year} = (\text{Hours of use/cycle/Ha})(2)^{*}(\text{Has/implement})$$

* since at least two crop cycles per year are assumed.

where,

$$\text{Hectares/implement} = \frac{\text{Total cultivated hectares in irrigation district (ID)}}{\text{Number of implements in ID}}$$

Since a complete data set for implement populations was not available for each ID, a ratio of number of implements to number of tractors was calculated for each implement, based on implement population data for ID 41.(See table C.5, below) This ratio was used as standard to estimate implement populations for the remaining IDs, based

on their corresponding tractor populations. (See table C.6, below, for cultivated surface and tractor populations per ID.) Adjustments in cultivated surface data were made for crop-specific implements; subsoiler, mower, raker, baler, and high clearance sprayer.

Table C.5Number of Implements per Tractor in Irrigation District 041, 1984.

Implement	Number of Implements per Tractor
Subsoiler	0.15
Disc plow	0.35
Disc harrow	0.49
"Tablon"	0.40
Land plane	0.40
Lister	0.38
Hiller	0.22
Ditcher	0.17
Unit planter	0.42
Grain drill	0.42
Vertical cultivator	0.38
Sprayer	0.24
Fertilizer spreader	0.24
Terrace blade	0.12
Rotary cutter	0.14
Mower	0.02
Raker	0.01
Baler	0.02

SOURCE: SARH-DGDUR (1985) Form EM-1 for Irrigation District 041, (mimeographed), Mexico, D.F.

Table C.6 Total Cultivated Surface and Tractor Populations in Four Irrigation Districts, 1984.

Irrigation District	Cultivated Hectareage	Number of Tractors
SONORA		
ID 037	52,413	1,050
ID041	326,536	6,168
SINALOA		
ID 075	308,373	4,309
ID 010	314,958	6,560

SOURCE: SARH-DGDUR, (1985) Form EM-1 for Irrigation Districts 037, 041, 075, and 010. (mimeographed) Mexico, D.F.

The share of annual use for the irrigation pump was calculated assuming 2000 hours of use per year, and a 5.56 hour/MM^3 pumping rate, therefore:

$$\text{Share of annual use} = \frac{5.56\ \text{Hr}/MM^3)(MM^3\ \text{required for specific crop})}{2{,}000\ \text{Hours/year}}$$

The Calculation of Maintenance and Repair Costs of Agricultural Machinery

Maintenance and repair costs were calculated based on the following formula:*

$$R = (0.75\ M)(\text{Hours of use/cycle/Ha})$$
$$L = (M - R)(\text{Hours of use/cycle/Ha})$$
$$M = (0.9)(Pa)/(n)(h)$$

where,

R = Cost of parts and lubricants/cycle/Ha
L = Cost of labor/cycle/Ha
M = Total maintenance cost per hour of use
Pa = Acquisition price
n = Years of useful life
h = hours of use/year

* Obtained from Hernandez, L. and Flores. D., op. cit..

Table C.7Sonora and Sinaloa: Working Capital Investment Schedules for Crop Production.

CROPS/STATE IRRIGATION DISTRICT	MONTHS OF CROP CYCLE 1		2		3		4		5		6		7		8		9	
	PERCENT OF INVESTMENT AND NUMBER OF MONTHS TO MATURITY OF LOAN																	
	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	
CORN																		
Sonora																		
37	0.25	9.00	0.02	8.00	0.20	7.00	0.18	6.00	0.11	5.00	0.03	4.00	0.03	3.00	0.05	2.00	0.13	1.
41	0.09	4.00	0.08	3.00	0.11	2.00					0.07	10.00	0.29	9.00	0.17	8.00	0.11	7.
Sinaloa																		
75	0.07	1.00							0.34	7.00	0.19	6.00	0.19	5.00	0.07	4.00	0.07	3.
10	0.07	1.00							0.34	7.00	0.19	6.00	0.19	5.00	0.07	4.00	0.07	3.
WHEAT																		
Sonora																		
37	0.16	8.00	0.04	7.00	0.16	6.00	0.09	5.00	0.10	4.00	0.04	3.00					0.05	12.
41	0.07	5.00	0.02	4.00	0.01	3.00	0.08	2.00	0.08	1.00			0.01	11.00	0.02	10.00	0.12	9
Sinaloa																		
75	0.35	5.00	0.16	4.00	0.01	3.00	0.11	2.00	0.08	1.00								
10	0.14	5.00	0.10	4.00	0.04	3.00	0.09	2.00	0.09	1.00								
RICE																		
Sinaloa																		
75	0.22	7.00	0.19	6.00	0.07	5.00	0.20	4.00	0.11	3.00	0.01	2.00	0.20	1.00				
10	0.22	7.00	0.19	6.00	0.07	5.00	0.20	4.00	0.11	3.00	0.01	2.00	0.20	1.00				
BEANS																		
Sonora																		
37	0.14	7.00	0.52	6.00	0.10	5.00	0.20	4.00	0.04	3.00								
41	0.57	7.00	0.17	6.00	0.10	5.00	0.09	4.00	0.02	3.00	0.05	2.00						
Sinaloa																		
75	0.09	3.00	0.15	2.00	0.11	1.00											0.22	7
10	0.02	3.00	0.10	2.00	0.05	1.00									0.27	8.00	0.32	7
SORGHUM																		
Sonora																		
37	0.17	8.00	0.23	7.00	0.18	6.00	0.12	5.00	0.11	4.00	0.07	3.00	0.12	2.00				
41	0.23	8.00	0.23	7.00	0.20	6.00	0.06	5.00	0.03	4.00	0.04	3.00	0.11	2.00	0.10	1.00		

.oa: Working Capital Investment
rop Production.

MONTHS OF CROP CYCLE																			
3		4		5		6		7		8		9		10		11		12	
PERCENT OF INVESTMENT AND NUMBER OF MONTHS TO MATURITY OF LOAN																			
%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M
0.20	7.00	0.18	6.00	0.11	5.00	0.03	4.00	0.03	3.00	0.05	2.00	0.13	1.00						
0.11	2.00					0.07	10.00	0.29	9.00	0.17	8.00	0.11	7.00	0.06	6.00	0.02	5.00		
				0.34	7.00	0.19	6.00	0.19	5.00	0.07	4.00	0.07	3.00	0.07	2.00				
				0.34	7.00	0.19	6.00	0.19	5.00	0.07	4.00	0.07	3.00	0.07	2.00				
0.16	6.00	0.09	5.00	0.10	4.00	0.04	3.00					0.05	12.00	0.25	11.00	0.07	10.00	0.04	9.00
0.01	3.00	0.08	2.00	0.08	1.00			0.01	11.00	0.02	10.00	0.12	9.00	0.37	8.00	0.05	7.00	0.17	6.00
0.01	3.00	0.11	2.00	0.08	1.00									0.13	8.00	0.08	7.00	0.08	6.00
0.04	3.00	0.09	2.00	0.09	1.00									0.14	8.00	0.23	7.00	0.17	6.00
0.07	5.00	0.20	4.00	0.11	3.00	0.01	2.00	0.20	1.00										
0.07	5.00	0.20	4.00	0.11	3.00	0.01	2.00	0.20	1.00										
0.10	5.00	0.20	4.00	0.04	3.00														
0.10	5.00	0.09	4.00	0.02	3.00	0.05	2.00												
0.11	1.00											0.22	7.00	0.18	6.00	0.14	5.00	0.11	4.00
0.05	1.00									0.27	8.00	0.32	7.00	0.07	6.00	0.12	5.00	0.05	4.00
0.18	6.00	0.12	5.00	0.11	4.00	0.07	3.00	0.12	2.00										
0.20	6.00	0.06	5.00	0.03	4.00	0.04	3.00	0.11	2.00	0.10	1.00								

(continues)

(Table C.7 continued)

CROPS/STATE IRRIGATION DISTRICT	MONTHS OF CROP CYCLE 1		2		3		4		5		6		7		8		9	
	PERCENT OF INVESTMENT AND NUMBER OF MONTHS TO MATURITY OF LOAN																	
	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	
Sinaloa																		
75	0.13	8.00	0.33	7.00	0.20	6.00	0.03	5.00	0.08	4.00	0.07	3.00	0.05	2.00	0.11	1.00		
10	0.13	8.00	0.33	7.00	0.20	3.00	0.03	5.00	0.08	4.00	0.07	3.00	0.05	2.00	0.11	1.00		
SOYBEANS																		
Sonora																		
41	0.25	8.00	0.30	7.00	0.11	6.00	0.12	5.00	0.07	4.00	0.02	3.00	0.04	2.00	0.09	1.00		
Sinaloa																		
75	0.53	6.00	0.09	5.00	0.12	4.00	0.07	3.00	0.06	2.00	0.13	1.00						
10	0.09	8.00	0.30	7.00	0.20	6.00	0.11	5.00	0.09	4.00	0.07	3.00	0.11	2.00	0.03	1.00		
SAFFLOWER																		
Sonora																		
37	0.14	8.00	0.06	7.00	0.11	6.00	0.06	5.00	0.06	4.00	0.06	3.00	0.09	2.00	0.13	1.00		
41	0.04	6.00	0.05	5.00	0.03	4.00	0.01	3.00			0.20	2.00					0.22	10
Sinaloa																		
75	0.02	5.00	0.06	4.00	0.08	3.00	0.09	2.00	0.16	1.00								
10	0.13	5.00	0.08	4.00	0.02	3.00			0.16	1.00							0.09	9
SESAME																		
Sonora																		
37	0.20	9.00	0.25	8.00	0.13	7.00	0.20	6.00	0.12	5.00	0.07	4.00	0.02	3.00				
41	0.35	10.00	0.01	9.00	0.11	8.00	0.11	7.00	0.17	6.00	0.08	5.00			0.02	4.00	0.03	3
Sinaloa																		
75	0.30	1.00											0.46	7.00	0.06	6.00	0.06	5
TOMATOES (staked)																		
Sonora																		
41	0.04	4.00	0.01	3.00									0.22	10.00	0.12	9.00	0.09	8
Sinaloa																		
10	0.06	4.00	0.06	3.00			0.06	1.00							0.28	9.00	0.01	8
75	0.06	4.00	0.06	3.00			0.06	1.00							0.28	9.00	0.01	8

MONTHS OF CROP CYCLE																			
3		4		5		6		7		8		9		10		11		12	
PERCENT OF INVESTMENT AND NUMBER OF MONTHS TO MATURITY OF LOAN																			
%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M
0.20	6.00	0.03	5.00	0.08	4.00	0.07	3.00	0.05	2.00	0.11	1.00								
0.20	3.00	0.03	5.00	0.08	4.00	0.07	3.00	0.05	2.00	0.11	1.00								
0.11	6.00	0.12	5.00	0.07	4.00	0.02	3.00	0.04	2.00	0.09	1.00								
0.12	4.00	0.07	3.00	0.06	2.00	0.13	1.00												
0.20	6.00	0.11	5.00	0.09	4.00	0.07	3.00	0.11	2.00	0.03	1.00								
0.11	6.00	0.06	5.00	0.06	4.00	0.06	3.00	0.09	2.00	0.13	1.00			0.04	11.00	0.04	10.00	0.19	9.00
0.03	4.00	0.01	3.00			0.20	2.00					0.22	10.00	0.11	9.00	0.20	8.00	0.14	7.00
0.06	3.00	0.09	2.00	0.16	1.00									0.28	8.00	0.19	7.00	0.12	6.00
0.02	3.00			0.16	1.00							0.09	9.00	0.27	8.00	0.21	7.00	0.04	6.00
0.13	7.00	0.20	6.00	0.12	5.00	0.07	4.00	0.02	3.00										
0.11	8.00	0.11	7.00	0.17	6.00	0.08	5.00			0.02	4.00	0.03	3.00	0.10	2.00	0.02	1.00		
								0.46	7.00	0.06	6.00	0.06	5.00			0.06	3.00	0.06	2.00
								0.22	10.00	0.12	9.00	0.09	8.00	0.15	7.00	0.17	6.00	0.20	5.00
		0.06	1.00							0.28	9.00	0.01	8.00	0.03	7.00	0.18	6.00	0.23	5.00
		0.06	1.00							0.28	9.00	0.01	8.00	0.03	7.00	0.18	6.00	0.23	5.00

(continues)

(Table C.7 continued)

CROPS/STATE IRRIGATION DISTRICT	MONTHS OF CROP CYCLE: 1		2		3		4		5		6		7		8		9	
	PERCENT OF INVESTMENT AND NUMBER OF MONTHS TO MATURITY OF LOAN																	
	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	
TOMATOES (ground)																		
Sinaloa																		
10	0.19	5.00	0.14	4.00	0.08	3.00	0.01	2.00	0.18	1.00	0.18	1.00						
75	0.19	5.00	0.14	4.00	0.08	3.00	0.01	2.00	0.18	1.00	0.18	1.00						
GREEN PEPPERS																		
Sonora																		
41	0.03	5.00	0.02	4.00									0.53	11.00	0.03	10.00	0.09	
Sinaloa																		
75	0.04	4.00	0.04	3.00			0.04	1.00							0.62	9.00	0.04	
10	0.04	4.00	0.04	3.00			0.04	1.00							0.62	9.00	0.04	
POTATOES																		
Sinaloa																		
75	0.30	8.00	0.08	7.00	0.02	6.00	0.02	5.00	0.02	4.00	0.02	3.00	0.14	2.00	0.40	1.00		
10	0.30	8.00	0.08	7.00	0.02	6.00	0.02	5.00	0.02	4.00	0.02	3.00	0.14	2.00	0.40	1.00		
COTTON																		
Sonora																		
37	0.03	14.00	0.09	13.00	0.11	12.00	0.04	11.00	0.12	10.00	0.08	9.00	0.15	8.00	0.15	7.00	0.15	
41	0.20	9.00	0.18	8.00	0.06	7.00	0.11	6.00	0.06	5.00	0.02	4.00	0.10	3.00	0.17	2.00	0.10	
Sinaloa																		
75	0.07	6.00	0.14	5.00	0.09	4.00	0.10	3.00	0.21	2.00	0.10	1.00						
10	0.15	7.00	0.07	6.00	0.12	5.00	0.05	4.00	0.08	3.00	0.18	2.00	0.10	1.00				
CHICK-PEAS																		
Sonora																		
37	0.02	11.00	0.12	10.00	0.21	9.00	0.23	8.00	0.04	7.00	0.03	6.00	0.12	5.00	0.07	4.00	0.02	
41	0.12	5.00	0.07	4.00	0.02	3.00	0.14	2.00					0.02	11.00	0.12	10.00	0.21	
Sinaloa																		
10	0.13	4.00	0.01	3.00	0.06	2.00	0.15	1.00									0.33	
75	0.13	4.00	0.01	3.00	0.06	2.00	0.15	1.00									0.33	
ALFALFA																		
Sonora																		
37	0.07	7.00	0.02	6.00	0.01	5.00	0.01	4.00	0.01	3.00	0.01	2.00	0.01	1.00	0.09	11.00	0.15	1
41	0.15	6.00	0.05	5.00	0.05	4.00	0.05	3.00	0.07	2.00	0.13	1.00						

SOURCE: Various crop-budget source documents (1985).

MONTHS OF CROP CYCLE																			
3		4		5		6		7		8		9		10		11		12	
PERCENT OF INVESTMENT AND NUMBER OF MONTHS TO MATURITY OF LOAN																			
%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M	%	M
0.08	3.00	0.01	2.00	0.18	1.00	0.18	1.00							0.04	8.00	0.09	7.00	0.09	6.00
0.08	3.00	0.01	2.00	0.18	1.00	0.18	1.00							0.04	8.00	0.09	7.00	0.09	6.00
								0.53	11.00	0.03	10.00	0.09	9.00	0.18	8.00	0.13	7.00	0.07	6.00
		0.04	1.00							0.62	9.00	0.04	8.00	0.02	7.00	0.02	6.00	0.09	5.00
		0.04	1.00							0.62	9.00	0.04	8.00	0.02	7.00	0.02	6.00	0.09	5.00
0.02	6.00	0.02	5.00	0.02	4.00	0.02	3.00	0.14	2.00	0.40	1.00								
0.02	6.00	0.02	5.00	0.02	4.00	0.02	3.00	0.14	2.00	0.40	1.00								
0.11	12.00	0.04	11.00	0.12	10.00	0.08	9.00	0.15	8.00	0.15	7.00	0.15	6.00	0.06	5.00	0.01	4.00	0.01	3.00
0.06	7.00	0.11	6.00	0.06	5.00	0.02	4.00	0.10	3.00	0.17	2.00	0.10	1.00						
0.09	4.00	0.10	3.00	0.21	2.00	0.10	1.00							0.12	9.00	0.14	8.00	0.03	7.00
0.12	5.00	0.05	4.00	0.08	3.00	0.18	2.00	0.10	1.00					0.14	10.00	0.06	9.00	0.05	8.00
0.21	9.00	0.23	8.00	0.04	7.00	0.03	6.00	0.12	5.00	0.07	4.00	0.02	3.00	0.14	2.00				
0.02	3.00	0.14	2.00					0.02	11.00	0.12	10.00	0.21	9.00	0.23	8.00	0.04	7.00	0.03	6.00
0.06	2.00	0.15	1.00									0.33	7.00	0.27	6.00	0.05	5.00		
0.06	2.00	0.15	1.00									0.33	7.00	0.27	6.00	0.05	5.00		
0.01	5.00	0.01	4.00	0.01	3.00	0.01	2.00	0.01	1.00	0.09	11.00	0.15	10.00	0.32	9.00	0.15	8.00	0.15	12.00
0.05	4.00	0.05	3.00	0.07	2.00	0.13	1.00							0.04	9.00	0.01	8.00	0.45	7.00

Table C.8 Sonora and Sinaloa: Private Prices of Custom Aereal Spraying and Mechanical Harvesting, 1985.

Activity	State	
	Sonora	Sinaloa
	Pesos/Time/Ha	
Spraying:	2,760	3,000
Harvesting:		
corn	16,500	15,425
wheat	12,000	10,500
rice	--	16,000
beans	11,000	4,020
sorghum	12,000	12,285
soybeans	15,000	13,000
safflower	10,000	7,500
sesame	11,400	10,385
cotton	45,000	--
chick-peas	11,000	5,600

SOURCE: Various crop budget source documents.

Table C.9 Private and Social Transportation Costs in Sonora and Sinaloa, 1985.

	Transport Routes					
	Sonora (local)	Sinaloa (local)	Sonora-Mexico City	Sinaloa-Mexico City	Sonora-Nogales	Sinaloa-Nogales
Distance (km)	50	50	2,068	1,500	376	944
Diesel consumption (lt) a/	1.67	1.67	69.00	50.00	13.00	32.00
Private price of diesel (pesos/lt)	30.00	30.00	30.00	30.00	30.00	30.00
Social price of diesel (pesos/lt)	90.19	90.19	90.19	90.19	90.19	90.19
Private cost (pesos/ton-km)	39.12	37.92	6.06	6.06	19.60	19.00
Private cost (total)	1,956	1,896	12,532	9,090	7,370	17,936
Social cost (pesos/ton-km)	41.13	39.93	8.07	8.07	21.68	20.14
Social cost (total)	2,057	1,997	16,689	12,105	8,152	19,012
Subsidy	5%	5%	25%	25%	10%	6%

a/ A 30 km per liter diesel consumption was considered.
SOURCE: -Asocialcion de Agricultores del Rio Fuerte Sur (1985) Los Mochis, Sinaloa.
-Hernandez, L. and Flores, D. op.cit.

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GLOSSARY

AARFS Asociacion de Agricultores del Rio Fuerte Sur

AARC Asociacion de Agricultores del Rio Culiacan

AAS Analisis de ls Agricultura Sinaloense

AMB Asociacion Mexicana de Banqueros

AMS Agricultural Marketing Service, USDA

ANAGSA Aseguradora Nacional Agricola y Ganadera

AOANS Asociacion de Organismos de Agricultores del Norte de Sonora

AOASS Asociacion de Organismos de Agricultores del Sur de Sonora

BANCOMEX Banco Nacional de Comercio Exterior

BANRURAL Banco Nacional de Credito Rural

BANXICO Banco de Mexico

CAADES Confederacion de Asociaciones Agricolas del Estado de Sinaloa

CIF Cost, Insurance, Freight

CNC Confederacion Nacional Campesina

CEESTEM Centro de Estudios del Tercer Mundo

CEPAL Comision Economica para America Latina

CFE Comicion Federal de Electricidad

CNSM Comision Nacional de Salarios Minimos

CGDA Coordinacion General de Desarrollo Agroindustrial

CNPH Comision Nacional del Plan Hidraulico

CONASUPO Compania Nacional de Subsistencias Populares

CP Colegio de Postgraduados

CPP Costo Porcentual Promedio

DGEA Direccion General de Economia Agricola, SARH

DGDUR Direccion General de Distritos y Unidades de Riego, SARH

DGE Direccion General de Estadistica, SIC

DGIES Direccion General de Informacion y Estadistica Sectorial, SARH

DGPEA Direccion General de Produccion y Extension Agricola, SARH

ERS Economic Research Service, USDA

FAO Food And Agriculture Organization, UN

FAS Foreign Agricultural Service, USDA

FERTIMEX Fertilizantes Mexicanos

FOB Free on Board

FIRA Fideicomisos Instituidos en Relacion con la Agricultura, BANXICO

GDP Gross Domestic Product

IIS Instituto de Investigaciones Sociales, UNAM

IMF International Monetary Fund

IVA Impuesto al Valor Agregado