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**AGRICULTURA DE CONTRATO EN LOS PAÍSES EN DESARROLLO: ASPECTOS
TEÓRICOS Y ANÁLISIS DE ALGUNOS EJEMPLOS EN MÉXICO**

**(Contract Farming in Developing Countries: Theoretical aspects and analysis
Of some Mexican Cases
by David Runsten and Nigel Key)**

Documento preparado por David Runsten y Nigel Key, consultores de la Unidad de Desarrollo Agrícola de la División de Desarrollo Productivo y Empresarial, en el marco del proyecto sobre Promoción de la integración social y económica de los pequeños y medianos agricultores a la agroindustria, conforme al convenio de cooperación suscrito entre la CEPAL, la Organización de las Naciones Unidas para la Agricultura y la Alimentación (FAO) y la Sociedad Alemana de Cooperación Técnica (GTZ), en representación del Gobierno de la República Federal de Alemania. Las opiniones expresadas en este trabajo son de la exclusiva responsabilidad de los autores y pueden no coincidir con las de la Organización.

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I.1. Introduction

Contract farming has been used in the more developed countries for a long time. Perishable crops destined for processing, such as sugar beets or cling peaches, were contracted in the United States in the 19th Century. Problems of monopsony or oligopsony by food processors and marketers were also apparent by the late 19th century, and efforts were begun to organize farmers to provide a united bargaining front (Bunje 1980). The Capper-Volstead Act of 1922 exempted agricultural cooperatives from anti-trust laws, which led to a great increase in cooperative bargaining associations in the 1920s. The sugar act of 1934 established farmer bargaining associations for sugar beet growers. The Agricultural Marketing Act of 1937, the Agricultural Fair Practices Act of 1967, the Uniform Business Code, the Perishable Agricultural Commodities Control Act, all provide a legal framework in which to resolve disputes over contracts, to bargain over prices and contract terms, or for the farmers themselves cooperatively to process the agricultural products.¹

As multinational food processors set up operations in Latin America behind Import Substitution Industrialization (ISI) regimes after World War II, they often adopted contract farming as the best raw product supply mechanism, particularly where there were controls on land ownership. In Mexico, for example, the strawberry freezers and fruit and vegetable canners in the BajPo had already adopted such practices in the 1940s and 1950s (Rama and Vigorito 1979; Morrissy 1974). And some of the firms that had maintained plantations, such as the banana producers, adopted contracting as a means of defusing nationalistic criticism of their operations (Glover 1983).

In the 1970s, in line with a general concern with the growing influence of multinational firms in developing countries, a number of studies of agricultural contracting were carried out in a variety of countries of Latin America.² In Mexico, studies such as Feder's (1977) of the strawberry industry or Rama and Vigorito's (1978) of fruit and vegetable processing in general were so suspicious of foreign capital and tried so hard to show ill effects that they lost sight of the real effects on incomes and investments in rural areas, and they neglected the economic motivations that determine the behavior of the firms, particularly the issue of institutional and market failure that drives much contract farming.

One strand of concern about contract farming has been the question of whether it was a means to transfer technology to smallholders and raise their incomes, or was a sophisticated form of the "putting out" system that would tie them through a form of indentured servitude and extract all surplus from their work: "workers for capital working at home."³ Unfortunately, the first strand has been associated with a pro-

¹Concerns about contract farming abuses spawned an enormous literature in the United States. See Roy (1972).

²For example, see the collection of articles assembled by G. Arroyo in CODAI (1981).

³For example, Kostas Vergopoulos: "Los campesinos que trabajan en los campos deben ser considerados como *asalariados a destajo o a domicilio...*" (Vergopoulos 1975). See also A. Bartra (1979), Roseberry (1978). The notion that peasants were disguised proletarians seems not very useful in retrospect, since it leaves little room for organization, exit, accumulation, or social differentiation. A more flexible argument was that of Zamosc (1979) or Giarracca (1985), that peasants were indirectly "subordinated" to capital, often in a relationship in which they lacked much power, but where agency was still possible.

business group who appear to assume that contract farming must benefit the growers (Goldberg 1974; Austin 1981; Morrissy 1974; Williams and Karen 1985), and the second with critics who assume that it cannot. The truth lies somewhere in between, and the growing number of experiences suggest that there are crops and situations appropriate to smallholder participation, and that there are crops and situations that are almost certainly doomed to fail. The success of very small vegetable producers in the Guatemalan highlands (Von Braun, et al. 1989; Glover and Kusterer 1990) has to be weighed against the many failures that can be found in every country.

This paper explores the economic motivations of the agroindustrial firm to contract with smallholders, the economic motivations of smallholders to participate, and some of the problems which arise in the course of the venture. One thing that is very clear is that there are many reasons why a firm might *not* want to contract with small-scale producers. Despite the rhetoric that the peasantry was being subordinated to large producers, the reality was often that the peasantry was largely marginal to such lucrative enterprises as export fruit and vegetable production, and often shut out of or discriminated against in domestic supply systems as well (so-called *mercados controlados*). It was not so much that they were being exploited, but that they were excluded from the most profitable activities--not so much that they were victims of capital, but that capital had studiously avoided dealing with them. Here we attempt to develop some theoretical explanations for this reality -- and for such observed phenomena as price discrimination when peasants do participate -- and to show how they have worked in some concrete situations in Mexico.

Contracting is of course not confined to agriculture. There is an increasing tendency to subcontract out specific production tasks in an array of industries, such as garments, electronics, construction, or janitorial services, and many of these involve contractual relations between larger marketing organizations and smaller producing firms. Contract farming therefore must be viewed in a broader theoretical context that includes "make or buy" decisions, transaction costs, market failures, and risk considerations dealt with by all economic actors. It is in this sense that we attempt in the following sections to organize some of the economic factors that influence the choice to contract, the type of contract, and the type of contractee.

I.2. Contract farming, vertical integration and markets

An important branch of development economics views the formation of institutions as a response to missing markets in an environment of pervasive risks, incomplete markets, and information asymmetry.⁴ This work has demonstrated how observed class structures, labor and tenancy relations, and agrarian institutions can be the outcomes of rational economic behavior in the context of missing or imperfect markets. The unifying principle of this school of thought is that there are important costs not just in production, but also (due to imperfect markets) in transactions. In this paper we analyze contract farming from this neo-institutional perspective, illustrating how firms use contracting to cope with market failures and transaction costs.

There is a variety of institutional arrangements that firms can employ to obtain a supply of raw product for

⁴For a review of this literature, see Bardhan (1989).

their processing or marketing needs. These arrangements vary by the extent to which the successive stages of production and/or distribution are combined under the ownership and/or control of the firms. Four basic stages of the food production process include:

- 1) input supply - seeds, agro-chemicals, machinery
- 2) production - farm labor, land
- 3) processing - grading, storage, packaging
- 4) marketing - transport, market search, distribution.

In this paper we focus on the processing or marketing firm's decision to become involved in the input supply and production stages. Contract farming is viewed as one means by which firms can exert control over these processes in order to reduce production and transaction costs.

The involvement of firms in the input supply and production stages varies significantly in practice. At one extreme, non-integrated food processors rely completely on spot markets to supply crops for their processing and marketing requirements. For reasons we discuss later, non-integrated food processors tend to be concentrated in industries that process staple crops. Examples in Mexico include such large firms as MASECA, making corn tortilla flour, or the producers of balanced animal feeds. At the other extreme, fully integrated plantation-style operations completely manage production and hire in labor to cultivate on land controlled by the firm. Large, vertically-integrated banana plantations operated by United Brands, Castle and Cooke, or Del Monte in Central and South America were typical historical examples, but there are frozen vegetable processors in the Mexican BajPo that operate in a fully-integrated fashion by leasing up to 3,000 ha. of land.

Contract farming is an organizational arrangement that allows firms to participate in and exert control over the production process without owning or operating the farms: cultivation is performed by independent growers. Following Minot (1986), contracts can be classified into three, not mutually exclusive categories: 1) market-specification, 2) resource providing, and 3) production management. *Market specification* contracts are pre-harvest agreements that bind the firm and grower to a particular set of conditions governing the sale of the crop. These conditions often specify price, quality and timing. *Resource providing* contracts oblige the processor to supply crop inputs, extension, or credit, in exchange for a marketing agreement. *Production management* contracts bind the farmer to follow a particular production method or input regimen, usually in exchange for a marketing agreement or resource provision. In various combinations, these contract forms permit firms to influence the production technology and respond to missing markets without having to operate their own plantations. Contract farming has become an increasingly popular means of product supply in many developing countries, where the land tenure rules or political realities would not permit such large-scale farming.

In section II of this paper we discuss the market failures that characterize the economies of developing countries: missing or imperfect markets for credit, insurance, information, factors of production. We examine the conditions under which contract farming or plantation agriculture is likely to arise and illustrate how and why these market failures are likely to influence a firm's organizational strategy. In section III we explore the firm's contract design problem focusing on the factors influencing optimal contract farmer

characteristics from the firm's perspective.

II. Market imperfections and transaction costs.

II.1. Missing or imperfect markets for credit

II.1.1. *Credit constraints and credit transaction costs*

As illustrated in Table 1, non-traditional crops, such as those purchased by agro-industrial contractors, are generally much more costly to produce per hectare than traditional crops. While traditional crops can often be cultivated using a level of input intensity appropriate to the financial resources of the household, cash crops often require a strict and intensive input regimen and necessitate large labor inputs for harvest and planting that cannot be met with family labor alone.

Most *ejidatarios* and *minifundistas* are badly undercapitalized, as are most small businesses throughout the world. This undercapitalization presents a major barrier for transition from basic grains to higher value crops. Average per-hectare out-of-pocket expenses as shown in Table 1 were U.S.\$223 per hectare for rainfed maize, whereas average out-of-pocket expenses for the cash crops listed in Table 1 range from U.S.\$661 per hectare for sugar to U.S.\$10,379 per hectare for strawberries -- more than the annual incomes of most campesinos.⁵ In mid-1995 total maize costs were less than N\$2,500 per hectare, while broccoli cost N\$9,000, potatoes N\$14,000, strawberries N\$30,000 and the estimated cost of establishing a blackberry patch was N\$40,000 to 70,000 per hectare (Marsh and Runsten 1995). The costs for *ejidatarios* may be less because of reliance on family labor, less intensive planting and lower use of inputs than recommended, but often with negative yield and quality outcomes.

As most farm households in developing countries have limited financial resources, access to credit is often crucial in determining who will be able to cultivate high value crops. In Mexico, small farmers are restricted in their access to formal loans by their inability to satisfy lender collateral requirements. Banks in Mexico now usually require collateral valued at two to three times the loan principal. Assets that can be used as collateral are unevenly distributed among the population, and titles for these assets are often expensive or difficult to obtain.⁶ A 1994 survey of the ejidal sector in Mexico revealed that only 6.9 percent of such producers received credit from commercial banks or the rural development bank, Banrural.⁷ Borrowers unable to meet their credit needs from formal sources must resort to the informal sector with rates of interest three to four times that of the formal sector (SRA 1994).

⁵While some crops have been cultivated in units of less than one hectare (strawberries in Mexico, snow peas in Guatemala, basil and tomatoes in the Del Cabo cooperative in Baja California Sur) fixed costs of production and marketing often raise the minimum economically efficient scale of production to at least one hectare.

⁶Land or land usufruct as collateral requires documentable land ownership - something not yet available to most *ejidatarios*. While progress is being made in the land titling process initiated with the reform to article 17 of the constitution in 1991, the majority of *ejidatarios* do not yet have a land title.

⁷While 30.7 percent of all producers received some form of credit, 59.2 percent of these recipients borrowed small amounts from the government agency, PRONASOL. The principal of these no-interest PRONASOL loans averaged only U.S.\$336, making them too small to finance non-traditional cash crop production on any significant scale (SRA 1994).

In Table 1, returns to household assets and the costs of production are illustrated for traditional and non-traditional crops. Returns for non-traditional crops are often much higher than for traditional crops even when formal sector transaction costs or informal lending rates are included. With missing credit markets, there will likely exist farmers who would prefer to cultivate high-profit crops but cannot because they lack sufficient financial resources. These credit-constrained producers would be willing to pay a premium for access to credit or inputs, or equivalently, they would be willing to sell their product at a lower price, in exchange for credit. Particularly in countries such as Mexico, where official subsidized credit has been drastically reduced, there is an opportunity for agroindustrial contractors to fill this void.

Even when collateral does not restrict access to formal credit, transaction costs associated with acquiring bank loans may significantly raise the total cost of borrowing from the formal sector, especially for small loans. Borrower transaction costs include costs in excess of interest costs, such as application fees, notary and legal service fees, collateral titling costs, bribes, forced purchase of other goods or services from the lender or loan intermediary, costs resulting from loan delays, travel costs to and from the loan agent, and the opportunity cost of time spent applying for the loan. Table 2 illustrates some of the transaction costs associated with formal credit borrowing in Mexico (CIDE-UCB 1995). Because many transactions costs associated with obtaining a loan are fixed costs, small-scale borrowers with the same transaction costs as large borrowers pay significantly more per unit of credit.⁸

⁸Cuevas and Graham (1985) note that for the four Latin American countries they studied (Ecuador, Honduras, Panama, and Peru), transaction costs averaged between 4.0 and 46.4 percent of the explicit interest cost. Transactions costs were a much higher percentage of the interest cost for small loans compared to large loans. Ladman (1984) compared the total costs of borrowing from money lenders and from the official agricultural bank in Bolivia. He found that even though the nominal interest rates charged by the money lenders were much higher than the agricultural bank (48 percent vs. 13 percent) the total borrower transaction costs per loan were considerably higher for the bank (\$4.35 vs. \$135.95), resulting in higher total borrowing costs at the bank for many borrowers. Adams and Nehman (1979) note a study of borrower transaction costs in Brazil showing interest charges to make up between 29 percent and 76 percent of the total cost of borrowing on six month formal loans, depending on the size of the loan. They also summarize another study done in Colombia, showing that interest payments made up only 30 percent of the cost of borrowing from formal loans.

Table 1
Costs and returns per hectare for traditional and non-traditional crops in Mexican ejidos (1992-93)

Category (U.S.\$)	corn - rainfed	corn - irrigated	rice	bean	sugar	tobacco	broccoli	tomato	strawberry
fertilizer	79	89	20	67	210	265	246	133	241
pesticides	45	148	62	52	94	420	234	202	263
seed or seedling	90	65	116	133	59	201	286	94	2333
labor	109	219	190	352	368	465	619	1109	5219
machinery	55	55	177	137	88	401	574	663	651
other costs	0	170	81	60	26	204	137	811	2194
hired labor (%)	.13	.22	.13	.17	.50	.85	.66	.29	.90
cash expenses-out of pocket costs	223	575	481	508	661	1,887	1,886	2,226	10,379
revenue	931	1287	1150	1467	1867	2936	2676	6,193	18,667
return	709	712	1069	958	1206	1049	791	3,967	8,288

Crop production costs refer to the following state, geographic zone, season, and technology:

corn - rainfed: Michoacan, Tierra Caliente, spring-summer, rainfed

corn - irrigated: Michoacan, Tierra Caliente, spring-summer, irrigated

rice: Nayarit, Santiago, spring-summer, irrigated

bean: Michoacan, Bajio, fall-winter, irrigated

sugar: Michoacan, Meseta, perennial, irrigated

tobacco: Nayarit, Santiago, fall-winter, irrigated

broccoli: Guanajuato, fall-winter, region 1,2,3, irrigated

tomato (red): Guanajuato, spring-summer, region 1,2,3, irrigated

strawberry: Guanajuato, semi-perennial, region 3, irrigated

Variable definitions

other costs: include use of water, electricity, assorted materials, miscellaneous costs

hired labor: average share of total labor hired by household (Davis)

cash expenses: all purchased inputs (not including land, family labor, credit and insurance)

revenue: total expected revenue

return: return to land, family labor and capital

Note: All values in U.S dollars.

Source: All figures from Matus Gardea (1994) except share hired labor from Davis (1995).

Table 2
Loan characteristics and transaction costs for formal and informal
positive-interest and no-interest loans in Mexico, 1994.

Loan characteristic	Formal		Informal	
	positive interest (n=122)	no interest (n=224)	positive interest (n=57)	no interest (n=30)
principal (US\$)	6,734	441	4,287	1,898
annual interest rate (%) *	21.2	0	69.6	0
loan arrived late (%)	28.7	50.8	0	0
weeks late	2.0	4.5	0	0
credit constrained (%) ***	32.1	100.0	na	na
distance to lender (km)	15.2	10.0	**	**
number of visits to lender	5.9	6.0	1.8	0.8
administrative costs (US\$)	721	0	0	0

* Annual interest rate does not include cost of crop insurance, if required for loan.

** Some informal lenders did not live in state or country.

*** Borrowers who would have borrowed more at the same interest rate if it were available.

Source: Data for principal, annual interest rate, per cent late, and weeks late from SRA (1994) and CIDE-UCB (1995). Data for per cent constrained, distance to lender, number of visits to lender, and administrative costs from CIDE-UCB only.

II.1.2. Contract farming and financial intermediation

Compared to banks, agroindustrial firms often have a superior ability to monitor and enforce credit contracts. The firm's business relationship to the grower lowers its risk of default, allowing the firm to lend to growers unable to obtain credit from commercial banks. The risk of default is lower for the firm because: 1) loans are usually distributed in kind or in the form of vouchers, thereby constraining the fungibility of the credit; 2) firms often monitor the use of inputs, so that inputs purchased on credit cannot be easily resold; 3) alternative markets for the product are often very thin, inclining the grower to sell his crop to the firm; 4) unlike a commercial bank, the firm can extract the grower's debt directly from the crop revenue before the grower receives his payment; 5) defaulting on a loan from a firm means that not only will the delinquent borrower sacrifice future credit, he will also likely sacrifice future business with the firm.⁹

The relationship between the firm and grower can also reduce transaction costs for both the lender and borrower. Lower transaction costs means the firm can offer credit to growers below the market cost. Lower transaction costs result because: 1) the credit contract can be transacted at the same time as the farming contract and does not require any trips to a bank; administrative costs are minimized for the firm and time and transportation costs are minimized for the borrower; 2) collateral requirements are eliminated or reduced for the reasons discussed above, so the borrower can avoid notary and other collateral titling fees; 3) improved repayment rates lower default costs.

With missing credit markets and the relatively high profits associated with cash crops, there will often exist credit-constrained growers willing to pay a premium for access to credit. As discussed above, formal sector transaction costs can significantly raise the total costs of production, especially for small-scale growers. Likewise, producers utilizing the informal credit markets pay very high costs for credit. If agribusinesses are able to act as financial intermediaries for growers and offer credit at a total cost below what producers would otherwise pay, they could earn, via resource-providing contracts, the premium farmers are willing to pay for access to credit, or equivalently they can obtain the raw agricultural product below the spot market price. Since many large firms can borrow funds on international markets at prime rates, the potential profit to the firm is significant, assuming it can control transaction costs.

II.2. Missing or imperfect markets for insurance

⁹Of course all of these are problematic for the firm to some degree, and we discuss moral hazard and monitoring problems below.

The non-traditional crops purchased by agro-industrial contractors tend to be riskier than traditional crops. The higher costs associated with non-traditional crops impose a greater income risk on producers, even when these crops have the same, or somewhat less, variability in profits as traditional crops. In fact, non-traditional crops grown in Mexico tend to have more variable profits than traditional crops because 1) they have more variable yields and 2) they have more variable prices.¹⁰

Yields are more variable because non-traditional crops are more susceptible to pest and climatological hazards. Non-traditional crops tend to be genetic hybrids, with seeds often developed to resist the pest and weather stresses specific to the places they are bred (such as the United States or Japan), rather than the Mexican environment. Production of such crops with current chemical pest and disease controls often leads to mounting problems that require integrated pest management techniques and site-specific research to control. The lack of such techniques and research support in many areas of Latin America have caused a wide variety of non-traditional cropping projects to fail or relocate (Murray 1995; Glover and Kusterer 1990).

Prices tend to be more variable for non-traditional crops because: 1) the higher variability in non-traditional crop yields increases the variability of market supply; 2) many markets for such crops are thin, exaggerating the price effects of supply change; 3) the government does not regulate the price of non-traditional crops - unlike some traditional staples; 4) non-traditional crops have a less developed market infrastructure, meaning that a surplus production in one region of the country can less easily compensate for deficit production in another region - leading to greater regional price swings; 5) non-traditional crops are often perishable, restricting the ability of producers to store these crops to cope with price fluctuations.

Farmers can avoid risk through a number of institutional strategies. Growers can use formal credit markets to borrow in bad years, purchase insurance against crop failures, or reduce price risk by trading in commodity futures markets. Often in developing countries, especially for lower income producers, these institutional avenues are either not available or transaction costs associated with their use make them undesirable. In Mexico, insurance for fruit and vegetable crops is not available, nor are there developed future markets.¹¹

Non-institutional methods of coping with risk that are available to low income farmers are often costly and inefficient. As discussed above, informal credit is usually much more expensive than formal credit, making it prohibitively expensive for most insurance purposes. Households constrained in their ability to borrow may attempt to smooth consumption through the accumulation and deaccumulation of productive assets, which can detrimentally

¹⁰While there has been an on-going debate as to the relative riskiness of high-yielding varieties versus traditional varieties *of the same crop*, cash crops will almost always present a greater risk than a traditional food crop (Hazell, Pomareda and Valdés, 1986).

¹¹A recent survey of the ejido sector in Mexico revealed that only 2.9 percent of all producers had any crop insurance (SRA 1994). The Mexican government's crop insurance program, ANAGSA, was limited to basic field crops, but it was so subject to fraudulent claims of losses, that it was eliminated.

affect productive efficiency (Rosenzweig and Wolpin, 1993). Similarly, liquidity-constrained households may choose strategies to lower the variability of household income, and these strategies can have negative effects on productive efficiency. These "risk management" techniques include: choosing crops with a lower yield or price variability, diversifying crops (increasing the number of varieties), scattering plots, seeking off-farm employment, migrating, and sharecropping (Alderman and Paxson 1992; Morduch 1992; Walker and Jodha 1986).

Empirical evidence suggests that farmers, like most economic agents, are averse to risk and are willing to pay a premium for a reduction in the riskiness of their income (Binswanger 1980; Hazell 1982). Thought of another way, risk-averse producers are willing to accept a lower income in exchange for less risk so that in the case of forward contracts, risk-averse farmers are willing to accept a guaranteed future price for their crops that is lower *on average* than what they would have received on the open market.¹²

Contracting firms are often in a position to insure growers against income fluctuations. 1) Firms are better able to diversify their production sources geographically so that covariant variations in yields caused by weather, pest infestations, flooding, livestock invasions, etc. "cancel" each other, making a firm's *total* variation in yield lower than for any individual grower. 2) Additionally, as mentioned above, firms often have access to inexpensive financial resources with which to smooth fluctuation in profits. 3) Firms can avoid some of the moral hazard problems associated with crop insurance via their intimate association with the production process.

Agro-industrial firms that insure producers against price risk can earn the risk premium that farmers are willing to pay to reduce their risk. By providing forward contracts to producers, i.e. by setting prices in advance of planting, firms can reduce growers' price risk. Firms can also insure producers to some extent against yield risk using contingency contracts that forgive (at least some) debt in case of crop failure. By acting in these ways as insurance providers, firms can obtain, via contracts, products at prices below the average spot market price.

II.3. Missing or imperfect markets for information

II.3.1. The production process - technology, timing, and quality

Efficient production requires that producers have information about the optimal cultivation techniques -- when and how to apply chemicals, when to water, weed, rotate crops, etc. Efficient production also requires that growers have information about the needs of the firm -- when it requires a supply of raw product; what chemicals are permitted in the production to

¹²That is, $E(\text{market price}) > \text{contract price}$. Numerous studies of contract farming in the United States have emphasized risk reduction as a principal incentive for producers to enter into contracts (e.g. Roy 1972; Covey and Stennis 1985; Dornbush and Boehlje 1988; Herbert and Jacobs 1988; Lawrence and Kaylen 1990).

meet export standards; the desired crop characteristics, such as texture, shape, flavor, color, variety, etc.

Missing markets for information can slow adjustments on the part of growers and result in costly crop supply and quality shortfalls for firms that rely on spot markets for their product supply. Product and factor markets transfer information about supply and demand via prices, but prices can be a relatively inefficient means of transferring complex and rapidly changing information. Firms may require a precisely timed supply of crops, or have complex quality needs that can not be efficiently communicated via product and factor markets. While firms may have access to the latest production technology, growers may be reluctant or unable to adopt these innovations, raising the product price for firms.

Firms can cope with missing markets for information, and efficiently communicate product and technology information to growers, by internalizing the production process or by utilizing production management contracts. When production is information intensive and growers lack the resources to acquire this information themselves, contracts often involve the use of firm-employed extension agents who both communicate the firm's needs and monitor the behavior of growers.

Under certain conditions, missing markets for information can cause product markets to break down completely (Akerlof 1970). This situation can occur when there is asymmetric information between the buyer and seller regarding the quality of product. An important example for contract farming results from the regulation of pesticides on fruits and vegetables exported from Mexico to the United States. While it is possible for exporting firms to test and detect the level and types of chemical pesticides used in production, it is usually prohibitively costly to do so. At the same time, it is often profitable for growers to over-apply or misuse pesticides in production. When it is too expensive for processors to detect pesticides, and growers have an incentive to violate pesticide regulations, the market fails. Firms can overcome this market failure and assure product quality by producing the crop themselves or by employing production management contracts that allow the firm to monitor production.¹³ One outcome of this situation in Mexico has been a tendency to discriminate against smaller growers who are believed to be more prone to misuse pesticides.

II.3.2. Work effort and labor supervision

The cost of labor supervision is a fundamental determinant of the firm's organizational strategy and has been used to explain agricultural land tenancy contracts (Eswaran and Kotwal 1985), agricultural labor contracts (Vandeman, Sadoulet and de Janvry 1991), and crop contracts (Androkovich, 1989). Models of labor supervision assume that hired workers offer some amount of effort which is a function of the amount of supervision applied. Effort is defined as a measure of the quality of labor -- how hard or carefully work is performed. Hourly wage

¹³A third method of overcoming the market failure would be for producers to hire an outside agent to certify food quality. This method is currently used in the United States to certify organic foods.

labor must be supervised because workers have an incentive to shirk and because it is impossible to observe perfectly the individual labor effort levels, *ex post*. That is, without constant supervision it is impossible to know exactly the level of effort applied by a laborer working alone or in a team. More supervision is required when the incentive to shirk is greater, or when the quality of work is more important -- for example, when the work is particularly unpleasant, or when low effort can damage crops or machinery.

Household labor used on family farms or labor paid on a piece-rate basis does not require supervision because these workers receive the product of their labor rather than a fixed wage.

Hence, plantation-style agriculture, which relies on supervision to motivate wage labor, is potentially less efficient than land cultivated by self-supervised laborers who receive the product of their labor. A firm can take advantage of the self-supervising ability of family farms by purchasing the product on the market or by contract farming.

II.4. Missing or imperfect markets for factors of production

II.4.1. Specialized inputs and market power

Often the markets for the inputs or services needed in the production of non-traditional crops are thin or missing. This is particularly common in developing countries, where specialized planting, spraying and harvesting machinery, certain seeds, fertilizers, or pesticides, and sophisticated irrigation and soil-monitoring equipment are often unavailable or costly. Firms that would like to locate a processing plant in a particular region to take advantage of that region's climate or cheap labor must devise ways of transferring specialized technology to growers. Resource-providing/production-management contracts and vertical integration are two means by which the firm can relatively quickly initiate production in a new area.

Once production has begun, firms can use vertical integration and contract farming to maintain monopoly power over the provision of specialized inputs, (and monopsony power in the product market as discussed in II.5). When factor markets are missing, the firm may have monopoly control over specialized knowledge (extension), specialized equipment, or specialized agro-chemicals and seeds. By rationing these inputs, firms can restrict cultivation to only those growers with whom the firm has a marketing agreement. Unless other firms enter the region to supply growers with inputs, the firm can extract rents through its exercise of market power.

II.4.2. Factors controlled by farm households - family labor

When markets for factors controlled by the household, such as family labor, land, managerial skill or animal labor, are missing or imperfect, growers will attempt to compensate by trading in the markets that do exist.¹⁴ Consider, for example, family labor, which often accounts for a

¹⁴For a discussion of the role of managerial skill and animal labor see Reid (1976) and Rosenzweig and Wolpin (1993), respectively.

significant share of total labor in production, yet for which for cultural and other reasons there is no market. When family labor is non-tradable, households with larger endowments of family labor will attempt to compensate for the missing market by renting in more land, or producing more labor intensive crops than would otherwise identical households with smaller endowments (Bell 1989; de Janvry, Fafchamps, and Sadoulet 1991).

In an environment of imperfect markets, households will be unable to adjust completely to missing factor markets. Households with large endowments of family labor that are unable to rent in land, because of imperfect land markets or lack of financial resources, will "under-employ" their family labor. Since these households have a lower opportunity cost of labor, they will be willing to accept a lower product price for a cash crop that utilizes their under-employed labor. Analogously, a plantation operated by a food processor, without access to family labor, would be at a production cost disadvantage relative to farms using family labor. The firm would not be able to utilize the "cheap" family labor available to the individual growers.¹⁵ Hence there exists an incentive for the firm to obtain products using spot markets or via contracts, rather than by producing the good itself.

Land is another important input for which markets are often imperfect, and this is especially true in Mexico. Only recently have ejidatarios in Mexico been able legally to rent or sell their land, and foreign companies (but not foreign individuals) have just regained the right to own agricultural land. Additionally, Mexico has also had a long history of government expropriation of land from large property owners. Poorly defined property rights and legal systems that do not function as they should are a significant disincentive to vertical integration for firms.

II.5. Missing or imperfect product markets

Many agro-industrial firms, and especially those that are foreign owned, process crops for which there is a shallow or missing local market. Examples of such crops in Mexico include broccoli, cauliflower, specialty melons, and Kabota squash. Shallow or non-existent product markets imply that firms must produce the crop themselves or contract with growers to meet their product supply needs.

As discussed in section 4.1, limited factor or product markets may permit firms to use their market power to extract rents from the growers with whom they contract. When there is only one firm operating in an area, it may behave as a monopsonist, keeping the product price just above the point at which growers would switch to an alternative crop. Monopsony power does not always imply monopsonistic behavior, nor unreasonable profits on the part of firms. Case study experience indicates that firms that initiate production in a region often lose money

¹⁵In addition to potential salary savings, using family labor saves on a variety of transaction costs necessary in agricultural labor markets, such as the cost of bookkeeping, payroll, transport costs for the workers, etc.

during their beginning years, despite being the sole purchasers of a crop. The firms lose money because they have high start-up and learning costs and, at the same time, must pay a price to farmers sufficiently high to induce them to switch from growing their traditional crops to the riskier and less certain contract crop. Monopsonistic rents earned by agro-industrial firms after several years of losses could be viewed, in this context, analogously to the royalties earned by a mineral extracting firm that first invested in exploration.

Successful contract farming arrangements can be mimicked by competing agro-industrial firms in a region, leading to oligopsonistic, or competitive product market structures. As more firms enter a market, growers gain the ability to choose among contracts, and firms must compete to give the best contract "package" -- including inputs, credit, extension, and product price. At a certain point, a quasi-spot market may develop where some growers (usually the larger ones) sell their product directly to the processing firms without using resource providing or production management contracts. The need for a steady supply of the crop often maintains the incentive for firms to acquire some of its crop supply via contracts or by producing itself, even after a shallow spot market develops.

II.6. Transaction costs

Transaction cost economics maintains that the organizational structures of firms are chosen, in part, to minimize the costs associated with business transactions (Williamson 1975). Important costs for a firm associated with *contract* transactions include: 1) search for clients; 2) screening of potential clients; 3) negotiation of contracts; 4) transfer of goods, services, or property rights; 5) monitoring behavior for breach of contract; and 6) the enforcement of the contract terms. High transaction costs associated with contracting create an incentive for the firm to utilize markets or internalize the production process (Jaffee 1991).

Transaction costs are caused by imperfect information, the need to allocate goods, and the need to enforce contracts. Imperfect information about trading opportunities and partners results in search and screening costs, and imperfect information about a trading partner's willingness to pay for goods or services results in negotiating and bargaining costs. Monitoring costs result from imperfect information about whether the contractors are abiding by the terms of the agreement, and enforcement costs result from the need to assure compliance with the contract terms.

Transaction costs are influenced by the degree of asset specificity, uncertainty and market structure. Asset specificity is the degree to which an asset is specialized for a particular product or trade. In agriculture, specialized assets include tree crops, livestock structures, crop processing facilities, and certain machinery. Owners of specialized assets incur high bargaining and enforcement costs because they are "tied" into a particular activity, which reduces their opportunities for trade and bargaining power. Uncertainty is a measure of missing information which, as mentioned above, can affect search, screening, negotiation,

bargaining, and monitoring costs. Market structure, or the number of potential alternative transaction partners, can affect bargaining and enforcement costs. From the firm's perspective, a more competitive market with more potential crop suppliers, strengthens the firm's bargaining power, which reduces its costs of bargaining and enforcement.

As Jaffee summarizes:

"Transaction costs are thus resource expenditures associated with information imperfections, the allocation and enforcement of property rights, and the 'frictions' of distance and time separating transactors. The tangible forms which transaction costs may take are numerous, including: personnel time, travel costs, communications costs, insurance costs, advertising and promotion costs, transport and storage costs, market research and consulting costs, arbitration, legal, and auditing costs, the costs of credit rating check and product inspection services, costs incurred in safeguarding property and in regulating trading practices, etc." (Jaffee 1991:10-11)

Recent work has taken a transaction costs approach to explain the organization of agricultural transactions (Masten, 1991; Jaffee, 1991). The literature asserts that a food processor's organizational structure will evolve to minimize the sum of production and transaction costs within an environment defined by asset specificity, uncertainty, and market structure. Vertical integration, via plantations or contract farming, is most likely to emerge under conditions of high asset specificity, high uncertainty, or a non-competitive market structure.

III. Contract farming: optimal contracts and contract design

III.1. The firm's contract design problem

In section II we examined some of the influences on a firm's decision to engage in contract farming. In this section we focus on how firms determine the terms and conditions of these contracts. Contracts vary greatly in detail and complexity. Within the broad categories of market-specification, resource-providing, and product-management contracts, firms must specify terms that include:

1. Marketing: How much of the product will be purchased, when, and at what price for what quality? Must the grower deliver all of his product, a share, or set amount.
2. Inputs and technical assistance: How will inputs and technical assistance be delivered, how much, and at what price and quantity?
3. Credit: Will the grower receive credit in cash or kind? How much will he receive, at what interest rate? What will be the collateral?
4. Production management: What technological procedures must the grower follow. How will the grower be monitored.
5. Delivery and grading: Who will transport the harvest to the processor and how will quality be graded?

An analysis of the firm's contract design problem should take into account 1) the interdependence of firm and household behavior and 2) the fact that grower behavior can only be imperfectly observed. Firms choose their organizational strategy, and the set of conditions defining that strategy, taking into account how households will respond. Figure 1 illustrates three potential organizational strategies for an agro-business and the associated responses of a representative household. Because the production process is costly to monitor and output is, to an extent, random, the firm cannot observe with certainty whether low yields resulted from bad luck (e.g., weather, pests), poor management, or from a contract violation by the grower.

Figure 1 here

This type of decision making, where information is asymmetric and where one individual designs a contract to evoke a desired behavior from another, is usually modeled as a principal-agent game. The principal-agent literature has been used extensively to describe land tenancy contracts, labor contracts, and credit contracts.¹⁶

In the principal-agent game, the principal, in this case the firm, defines the terms of the contract anticipating how the agent, in this case the farmer, will respond to each strategy it proposes. The firm maximizes profits subject to two constraints: 1) that the grower will accept the contract, and 2) that the grower will abide by the terms of the contract.

The grower will accept the contract if the contract offers him greater satisfaction than any alternative option available. That is, a firm can pay growers or workers just enough so that they do not "opt out." In a more competitive environment, where there are multiple firms competing for clients or product supply, the reservation utility of the growers will be bid up.

The second constraint will be satisfied if the utility that agents receive from abiding by the contract is greater than what they would receive from any alternative behavior. Firms may want growers to sell their crop only to the firm, repay their debts, or apply inputs in a particular manner. Firms can enforce the contract by rewarding good behavior or by threatening to punish bad behavior. The principal threats available to firms are to withhold future business or to pursue legal action. The threat of legal action is often not credible in many developing countries due to a poorly functioning legal infrastructure. This is certainly true in Mexico, where contracts are not usually notarized, as the firm sees little hope of legal recourse. Firms with significant monopsonistic market power are in a stronger position to enforce contract terms via the threat of withholding future contracts.

The firm's contract design problem will be altered significantly if growers negotiate contract terms collectively via organization. An organization's bargaining power will depend on the reservation utility of the growers, the ability of the firm to circumvent the organization, and the market structure of the food processing industry. A growers' organization that can monopolize supply could potentially extract profits from firms up to the point where the firms would leave the market. This has occurred in numerous cases in the United States, such as the fruit canneries in California. If both firms and grower organizations have market power, the outcome of this bargaining game is indeterminate. The potential for collective action on the part of growers provides an incentive for firms to integrate vertically or to seek alternative sources of supply.

III.2. Screening and optimal agent characteristics

An important aspect of a firm's contract design problem is the choice of with whom to contract. The selection of the clients can have important implications for social and economic

¹⁶For a review, see Binswanger and Rosenzweig (1984), Newberry and Stiglitz (1979).

differentiation in agriculture and rural society. The firm can control its clientele in two ways: 1) it can design a contract that only clients with the desired characteristics will accept, or 2) it can screen applicants and offer contracts only to the desirable candidates. In this section we discuss the economic influences that affect the optimal client characteristics from the perspective of the firm, and we examine how these characteristics are correlated with the size and income of growers.

It follows from the discussion in section II.1 that firms will have an incentive to contract with more credit-constrained producers or producers paying a relatively higher cost for credit. These producers have a more restricted access to financial resources, so that the firm can earn higher returns on the financial services that it provides to these producers. It is widely accepted that access to credit is correlated with landholding and wealth in developing countries.¹⁷ Poorer producers generally are less able to self-finance, are less able to meet collateral requirements, and have higher costs of credit. As lower-income producers are generally more credit constrained, firms will have an incentive to contract with smaller and poorer producers.¹⁸

From the discussion in section II.2. it can be argued that, to the extent that risk-neutral firms can insure growers, firms will find it more profitable to contract with more risk-averse farmers. More risk-averse producers are willing to accept a lower contract price in exchange for insurance. Risk aversion, or the willingness to pay to reduce income risk, is generally held to be negatively correlated with income (Hazell, Pomareda, and Valdés 1986). It is easy to imagine how an unexpected decline in income would have more severe effects on welfare and well-being at lower income levels. Fluctuations in income for poor peasant farmers can affect consumption of basic goods with possible health consequences. Severe fluctuations can lead to loss of assets including livestock and land. Since risk aversion is negatively correlated with income, and since the poorer producers are generally less able to utilize efficient means of coping with risk, there is an incentive for the firm to contract with lower income producers.

As we discussed in section II.2, the firm can insure growers against price risk via a forward contract, and against production risk via a contingent claim contract. Firms can relatively easily and costlessly eliminate price risk for growers. On the other hand, contracts that protect growers against production risk expose the firm to moral hazard, and require that the firm closely monitor grower behavior. The firm can reduce moral hazard and monitoring costs by requiring the grower to bear a significant share of the production risk. Consequently, when yield risk is important and producers must bear a share of this risk, the firm will have an incentive to contract with larger growers. Larger growers are better able to bear the risk and

¹⁷Eswaran and Kotwal (1986); Carter (1988); Braverman and Stiglitz (1989); for Mexico see SRA (1994).

¹⁸If financial intermediation is not profitable for the firm (due to subsidized government credit programs, government regulations, or excessive lender transaction costs) then the firm must contract only with producers able to find their own sources of finance. This will tend to favor larger growers to the extent that they have better access to financial resources.

require a smaller risk premium.

While there is no clear implication for optimal scale due to missing markets for information about the production process (section II.3.1), case studies demonstrate that larger producers are better educated and tend to be better informed about the latest production technologies, pesticide regulations, consumer quality preferences, etc. Larger producers have an advantage over smaller producers in that fixed cost associated with acquiring information can be subtracted from a larger revenue base. To the extent that firms rely on producers themselves to acquire information about the production process, larger producers will have an advantage over smaller ones.

In section II.3.2 we illustrated how plantation-style operations were at a disadvantage to family farms employing self-supervised family labor. Likewise, larger producers who hire in labor must incur supervision costs (and labor search costs), placing them at a disadvantage relative to small-scale, self-supervised producers. Hence, in terms of labor supervision, the optimal scale of production, and contractors, will be limited by the amount of land that can be cultivated by family labor. This assumes that there are no offsetting economies of scale in production, which obviously depends on the crop.

Specialized inputs to the production of non-traditional crops (discussed in section II.4.1), will tend to favor larger, wealthier producers. Often the farming systems transferred by multinational agro-industrial firms to developing countries were developed in more capital-intensive environments, taking into account the relative prices of labor and capital prevailing in such countries as the United States. The technology defining the U.S.-style farming systems, including machinery and certain agro-chemicals such as herbicides, is labor-saving and capital-intensive, which favors wealthier growers. Technology appropriate to labor abundant/capital scarce developing economies is often slow to evolve, placing small-scale peasant agriculture at a competitive disadvantage to large-scale operations, at least initially.

In section II.4.2 we argued that firms had an incentive to contract with households with under-utilized non-tradable factors such as family labor or land. Family labor is likely to be under-utilized in households with small land endowments that are constrained from renting in land because of imperfect land markets or lack of financial resources. Hence for labor-intensive crops the firm has an incentive to contract with smaller land holders with larger families. On the other hand, with land-intensive crops, where the cost of land is more important than the cost of labor, land will be under-utilized on large farms, and firms will have an incentive to contract with larger land holders.

It was asserted in section II.6 that a firm will choose its organizational strategy in part to minimize costs associated with its various business transactions. Transaction costs associated with distributing inputs, extension services, credit, etc., are often fixed costs that do not depend on the size of the agent with whom the firm is contracting. For example, a visit to a grower from a firm's extension agent may require the same amount of time regardless of the farm's size. The firm can minimize these types of transaction costs by minimizing the number

of agents with whom it contracts, or equivalently, raising the average size of agents. Minimizing contract transaction costs is a principal motive for firms to deal with larger-size clients. Small producers can offset this by internalizing such transaction costs via organization. In any case, knowledge of the cost of production alone is insufficient to judge the viability of a contracting scheme with many small producers.

IV. A Summary Table

Table 3 summarizes the major influences on a contracting firm's organizational strategy. The table includes: 1) whether the presence of the market failure or transaction cost will tend to increase (+) or decrease (-) the likelihood of observing that strategy, and 2) whether the market failure is likely to increase (+) or decrease (-) the scale of contracted farmers.

Table 3
Influence of market failures on processor organizational strategies
and scale of contract farmers

Market imperfections and transaction costs:	spot markets	contract farming	vertical integration	scale of contract farmer
A. missing or imperfect markets for:				
1. credit	-	+	+	-
2. insurance	-	+	+	- (mkt. risk) + (prod.risk)
3.1 information -production process	-	+	+	+
3.2 information - effort and labor supervision	+	+	-	-
4.1 farm inputs - specialized inputs	-	+	+	+
4.2 farm inputs - family labor & non-land factors	+	+	-	-
B. transaction costs associated with contracts	+	-	+	+

V. Case Studies in Mexico

V.1. Processing Tomatoes¹⁹

The processing tomato industry in Mexico was first developed in the early 1960s behind ISI barriers for the domestic market. The initial investments were made by foreign firms, such as H.J. Heinz and Elias Pando, the latter a Spanish-Mexican partnership. Toward the end of the 1960s, the Mexican firms Tomex and FESSA began operations in central Sinaloa. Of these firms, only FESSA remains as a small-scale producer of purees and salsas for the Mexican market.²⁰

In the first half of the 1970s, the first investments were made to export processed tomato products from Mexico to the United States. PRINSA and PAISA, financed principally by Mexicans, and Sinaloapasta and Alimentos Mexicanos Selectos, subsidiaries of Campbell Soup and Del Monte, respectively, were built in Sinaloa in this period.²¹ In 1982, a large plant was built (Productos Industrializados del Fuerte) as a joint Israeli-Mexican partnership, with marketing links to Hunt Foods in the United States; in 1990, the first paste plant was built in Sonora (Yavaros), and in 1991 the Mexican firm La CasteZa built a plant (Tomasi) in Los Mochis, Sinaloa.

In every case except the Campbell Soup plant, there are now large Mexican tomato growers as partners. They have seen these plants in part as a place to dump excess production of fresh-market tomatoes, but this idea is in contradiction with the efficient operation of a processing tomato plant, which is almost always run with contract farming schemes. As Glover and Kusterer note, "Processing plants which produce ketchup, tomato sauce and juices have large fixed costs and need an assured volume of throughput at predictable prices to run economically" (Glover and Kusterer 1990:113).

Moulton (1991) estimated the installed capacity of the 10 plants in Sinaloa and Sonora at 8,000 MT per 24 hours. The length of the processing season depends to a large extent on the weather and the price of tomatoes on the fresh market, but varies from 70 to 110 days. At 90 days, the installed capacity is over 700,000 MT. Assuming 70 percent efficiency, a feasible production level would be 500,000 MT of raw product in a year. The industry estimates that less than 400,000 MT of tomatoes were processed in 1990 and 1991, or a little over 50 percent of installed capacity.

The low capacity utilization is attributed to three problems (Moulton 1991:16):

¹⁹This section draws on the work of Kirby Moulton, University of California at Berkeley, and of Ing. Rigoberto Robles Soto, who worked for the CNPH in Culiacán. See Moulton (1984, 1991), Runsten and Moulton (1987), Cook, et al. (1991), Robles Soto (1982, 1990).

²⁰Heinz, for example, lost US\$17 million in 1972 in Mexico and abandoned the country (Morrissy 1974:106).

²¹Del Monte later sold their plant to Mexican growers.

1. difficulty coordinating planting schedules to assure an even flow of tomatoes into the plants;
2. competition with the fresh market;
3. low yields.

Each of these problems stems from the fundamental failure of the contract farming system to function properly in the region, a recurrent problem that has plagued the industry, though the situation has improved somewhat in recent years. It is this failure that interests us here.

The plants were built in Northwest Mexico because Sinaloa is the principal tomato-producing region of Mexico. Even though average yields have been relatively low in Sinaloa compared to U.S. regions, they are still 3-4 times higher than in other regions of Mexico.²² Sinaloa was thus seen as the only place to construct a processing tomato industry, where sufficient land and grower expertise could be found. However, trying to define a processing industry where there is also a highly variable but lucrative fresh market for the product has proven difficult.

Both fresh and industrial varieties of tomatoes produced in the region can be sold on either fresh or processing markets, for several reasons. First, all of the fresh tomatoes and most of the processing tomatoes are harvested by hand. The availability of relatively inexpensive migrant labor makes this feasible. Therefore, there is no quality distinction between harvests, unlike in California and other areas where mechanical harvesters are used for processing tomatoes and hand labor for fresh-market tomatoes. Machine-harvested tomatoes are uncompetitive in the fresh market because the bruising makes them unattractive and shortens their shelf life. It is not surprising that the foreign processors in Mexico have been pushing for mechanical harvesters, to create fixed costs for growers that would encourage them to deliver on their contracts, as the machine-harvested tomatoes could not be sold fresh. Also the unit cost of harvesting is estimated to be 25 percent less with the machine. But the machines have a minimum efficient scale of 100 ha. or more and represent a large investment, both deterrents to adoption. As a result only a small percentage of the processing tomatoes are now mechanically harvested.

Second, Mexican demand for fresh-market sales of industrial varieties of tomatoes has been high. Since most Mexicans use tomatoes to make salsa or for cooking, the high solids of industrial varieties are appreciated. In addition, they hold up well under difficult transport and handling conditions, and such "Roma"-type tomatoes are smaller and cheaper than "round" (*bola*) tomatoes, allowing poorer consumers to buy them in distant localities and in small quantities. From 1990-94, approximately 70 percent of roma tomatoes produced in Sinaloa were sold in the domestic market, as opposed to only 40 percent of the round tomatoes (Cook 1994).

²²Sinaloa yields were less than Florida yields, but the use of new extended shelf life varieties with plastic and drip technology is raising yields above those of Florida (Cook 1994). However, this trend refers to round tomatoes, not roma or industrial tomatoes.

Finally, contracts as legal documents are all but unenforceable in Mexico, leaving open the possibility that growers will sell contracted tomatoes on the open market, or at least sell a part of production to the fresh market, as monitoring of yields is very difficult for the processors. The low yields of processing tomatoes reported may therefore be in part fiction, and growers may simply be selling a portion of production on the fresh market.

As a result, when the price rises on the fresh market, industrial varieties are diverted to fresh markets, and the price that processors must pay rises; conversely, when the price on the fresh market falls and there is an oversupply, fresh market tomatoes are to some extent diverted to processing, and the processing price falls. For example, in 1990, when fresh export prices were high, prices for tomatoes to processors ranged from U.S.\$50 to U.S.\$100/MT, while in 1991 export prices fell and processing prices ranged from U.S.\$33 to U.S.\$62/MT.

A complicating factor is the climate and its relation to the seasonality of production. Fresh tomatoes are harvested in the area from January to June, but the main season ends in March and workers begin to move on. As the season progresses it becomes progressively hotter until the rains begin. Processing tomatoes, and surplus fresh tomatoes, are harvested from the beginning of March until it is no longer possible to continue, usually about 90 days. Processing tomatoes thus face a more difficult challenge in securing labor and in combatting the climate. Production is squeezed into a window that is difficult to extend.

The uncertainty of supply to the processors has prompted a variety of responses. First, most of the plants have been sold to large tomato growers, who have the ability to control the flow of tomatoes to the plants. Second, firms have contracted farther and farther north, away from the high opportunity costs in the Culiacán Valley, in an attempt to find growers who did not have ready marketing access to fresh tomato markets. An increasing proportion of processing tomatoes have been produced in Sonora, and a new plant was built there in 1990. For example, in 1986-87, the (UNPH) registered processing tomato acreage showed 1,048 ha. in Sinaloa and 2,118 ha. in Sonora. Many of these growers are ejidatarios. Third, several of the firms have diversified away from tomatoes into processing chiles, garbanzos, or sweet corn, to lower the risk represented by high raw tomato prices.

The uncertainty of firms' ability to secure supply through contracts has led to a reluctance to advance credit or supply extensive technical assistance. This has had a negative effect on the development of the industry, limiting its competitiveness. Though test plots show potential yields exceeding California's, actual yields are far below average U.S. yields. Growers have attempted to finance their own research jointly, a very different situation from the Bajío, where the frozen vegetable processors are promoting and financing research.

Conclusion

The industry in Mexico was set up in the 1960s to absorb excess fresh tomato production, and Robles Soto estimated in 1982 that there were 200,000 MT of wasted fresh tomatoes that could be processed. However, in the intervening years processing tomato production became

a highly specialized activity in California with the introduction of the mechanical tomato harvester. As that system has been refined and diffused throughout the world, with much higher yields and conversion rates (solids), it has become increasingly difficult to compete with a dual market strategy that includes fresh-market tomatoes with low solids and often high opportunity costs. This is exactly the opposite of what has occurred in strawberries, discussed below.

Ejidal producers have become more desirable contract subjects in the Mexican system because they have less access to fresh markets and less access to alternative credit. This is in contrast to the Honduran case discussed by Glover and Kusterer (1990), where large growers were unable to sell tomatoes on local fresh markets because the markets were too thin, and so were the more desirable contractees for the processor.

Glover and Kusterer also point out another problem with smallholder tomato production, namely their relative inability to rotate land properly and the consequent potential for nematode and virus problems in the soil. This is clearly a problem in many parts of Mexico and has forced small producers to halt tomato production due to low yields. The most promising response is to shift to organic production and focus on building up soil quality, as in the Del Cabo case discussed below.

V.2. Frozen vegetables

The Mexican frozen vegetable industry was one of the most dynamic sectors of Mexican agriculture in the 1980s. Based in the Bajío, especially in Guanajuato, and oriented almost entirely to export, from 1979 to 1989 the industry had an annual average rate of growth of 34 percent (Bivings and Runsten 1991). Because it has been such a dynamic sub-sector, because the Mexican government had relatively little to do with its growth, and because it operates in a region where ejidatarios control over one-half of the irrigated land, it provides an interesting case of what happens when the "market" is left to operate.

V.2.1 The Experience with Contracting

The industry was initiated by Birdseye, a U.S. firm, which converted a dehydrator on a farm north of Celaya, Guanajuato into a frozen vegetable plant in 1967. Because a group of U.S. canners (Del Monte, Heinz, Campbells) had earlier constructed plants in the same region to sell in the Mexican market, there was experience with contract vegetable farming (Morrissy 1974; Rama and Vigorito 1979). Birdseye contracted with many of the same farmers as the canners, who were, in fact, some of the largest growers in the region.

The U.S. firms chose to contract with these large growers for a variety of reasons, most related to transaction costs. First, vegetable production was seen as relatively risky in a

region that chiefly produced grains.²³ The processors looked for people who could bear the risk of crop loss and who also had some experience producing vegetables. Although all strata of farmers in the BajPo grew vegetables, the firms were introducing new crops (e.g. broccoli) into the local agronomic conditions, and this presented greater risks. Crop loss is not uncommon in the BajPo industry, whether due to freezes, hail, or disease, and there are several recent reports of new groups of producers losing their entire first crop of cauliflower (personal interviews; Dutronit and Oliveira 1991).

Second, the contracts themselves were viewed as legally unenforceable. To make the contracts into legal documents, both parties would have had to go to town and have them notarized. Then, too, foreign firms taking legal action against local farmers would not be viewed favorably in the region. As a result, the director of the Birdseye plant in 1986 said they just wrote off bad debts in the case of crop failure and nonpayment, or if the grower sold the product somewhere else (opportunism).²⁴ Their remedy would be not to contract with him again. These costs were seen as costs of screening, and they obviously encouraged the firm to screen initially so as to minimize the possibility of noncompliance with the terms of the contract. That is, the firm is making an unsecured loan and uses screening to minimize risk of default.

Third, large growers were available and willing to produce. Many of them saw it as an opportunity to develop their ability to produce vegetables for international markets, and, in fact, beginning in 1975 the largest growers built their own freezing plants and integrated forward. Subsequently, when other large growers wanted to build such plants, they would first enter into contracts with one of the U.S. firms to learn the technology. In contrast, efforts by U.S. frozen vegetable firms in Guatemala to contract with large-scale producers in that country initially failed, forcing them to expand supply systems with small-scale indigenous producers in the highlands (Glover and Kusterer 1990). However, over time it appears that there has been a tendency toward larger acreages in Guatemala as well (Glover and Kusterer 1990; Rosset 1992).

Fourth, dealing with small producers implied many additional costs. Not only did their numbers increase administrative costs, but they needed more services from the firm. For example: they needed more extension assistance; communication was costly as they often had no phones; they had to borrow or rent more specialized machinery (such as roto-tillers or high-pressure sprayers); they wanted to borrow operating capital in addition to receiving crop inputs; they made more numerous deliveries of smaller volume; they tried to get the firms to

²³In a survey of irrigated land in the Guanajuato BajPo conducted by Runsten in 1982-83, though 22 percent of growers produced some fruits and vegetables, those crops only occupied 12 percent of the land, while wheat, sorghum, and alfalfa together occupied 80 percent of the land.

²⁴Such opportunistic sales to other buyers are not a severe problem in the BajPo frozen vegetable industry, because growers are mainly producing broccoli and cauliflower, crops with limited alternative sales outlets in Mexico. It has been a serious problem in other areas, such as with strawberries in Zamora/Irapuato or processing tomatoes in Sinaloa/Sonora.

loan them money for tractors and other machinery; and they required more monitoring for pesticide violations. One U.S. firm was exasperated with the ejidatarios coming in for loans. The director said they did not want to be an investment bank, did not want to be the *patron*.

Fifth, contracting with ejidatarios until recently was fraught with the possibility that the State might intervene, as it had many times in the past. The example of the strawberry industry was close at hand.

Finally, one should not underestimate the hostility and contempt toward small ejidatarios among many in the agrarian bourgeoisie. This was particularly true in the 1970s, when the Mexican government channeled more and more resources toward the social sector. To the extent that the U.S. firms associated themselves with the large growers, they tended to reflect this bias. For example, the Birdseye plant was built on a large ranch, and the son of the ranch owner was the plant superintendent for many years. Interviewed in 1984, the director of agriculture for Birdseye--who, at the time, was from another Mexican farming family--expressed nothing but contempt for most ejidatarios. The only ejidatarios he would contract with, he said, were larger farmers who had purchased their own land.²⁵

When the Green Giant plant was built in Irapuato in 1983, they adopted a more inclusive strategy, knowing that they had to develop a large group of suppliers and not wanting to go to the same group of growers and bid up the price. They worked both in new regions as well as with groups of ejidatarios. As late as 1986, they reported having difficulty finding enough growers. However, after 1987 the profitability of grain production declined due to changes in government policies, and a queue formed of growers willing to produce vegetables for the freezers. This allowed Green Giant to cut back on their dealings with ejidatarios, trying instead to "maximize production per grower" to cut transaction costs.

Birdseye also contracted with ejidatarios in Aguascalientes during the boom years of the 1980s. Birdseye tried to contract with them in groups but never achieved it. The cost of transporting the product to the plant and the construction of new freezing plants in Aguascalientes and Zacatecas, however, led Birdseye to abandon contracting in Aguascalientes in favor of summer production with larger growers in new areas of northern Guanajuato. Subsequent contracts with ejidos in southern Guanajuato were also abandoned by the firm because "costs were too high."

Campbells began contracting with ejidatarios in Valle de Santiago because they needed small, pickling cucumbers and believed that the ejidos had the best access to the large amounts of labor the crop required (they needed to pick every other day). The firm was willing to bear

²⁵At certain times, the U.S. firms were more open-minded about contracting with groups of small producers. This was true of Campbell's, Birdseye, and Green Giant. However, this uniformly occurred when anglos were running agricultural operations, and when the firms were having difficulty securing sufficient supply. In the 1990s some of the Mexican-owned firms have been willing to contract with small producers, including Arteaga in Aguascalientes, ExpoHort in Quer taro, Fresport in Irapuato.

the costs of dealing with them because they had little alternative. This ejidal program was expanded to include other crops in the 1980s during the frozen vegetable boom for the same supply reasons as Green Giant. The crash of the market led Campbells to get out of freezing vegetables in Mexico altogether.

Birdseye, Green Giant, and Campbells all contracted with groups of small producers when they could not get sufficient product from large growers. When this situation changed, however, and more land was offered for production than they needed, they moved to cut transaction costs.

The rapid growth of the industry in Mexico has been due mostly to the construction of integrated freezing operations by large growers. Table 1 presents a list of all known plants in the industry in early 1992. Some estimates of numbers of growers involved in producing for the plants is included where this was known. Only the Stokely plant in Zacatecas (Mexicana Congelados) was set up to include a large numbers of producers, but ironically Stokely has withdrawn from the operation, claiming that the costs have been too high. A very large investment in plants has involved a relatively small number of producers.

V.2.2. Putting a Price on Transaction Costs

Although they are no longer in the frozen vegetable business, after the crisis set in during the 1980s and effective demand fell in the Mexican market, the Campbells Soup plant in Guanajuato began freezing vegetables for export. Building on their experience with pickles, they tried to contract with some groups of ejidatarios to

TABLE 4
MEXICAN FROZEN VEGETABLE PROCESSING CAPACITY, 1991

NAME OF FIRM	CITY	STATE	YEAR VEG START	EFFEC ANN. VEG. CAP. (million lbs)	EST. 1991 ANN. PROD VEG. (mill. lbs.)	Est. Num. of Growers
Birdseye de Mexico	Celaya	GTO	1967	60	44	110
La Huerta (Legumbres)	Aguascalientes	AGS	1976	33	25	90
Covemex/Alcosa	Celaya/Irapuato	GTO	1978	45	43	1
MarBran w/ Simplot line	Irapuato	GTO	1980	65	49	40
Productos Frugo	Salamanca	GTO	1982	30	10	1
Green Giant	Irapuato	GTO	1983	75	50	100
Cong. Don Jos� [Fox]	Le�n	GTO	1985	25	18	10
Expohort	Quer�taro	QTO	1986	30	25	75
Emp. Chapala	Zamora	MICH	1984	10	0	
FRUVEZSA	Zamora	MICH	1988	8	0	
Empacadora del Celio	Jacona	MICH	1985	8-10	2	30
Industrias Horticolas	Montemorelos	NL	1987	12-15	12	
Hortimex (Stokely)	Monterrey	NL	n.a.	25	0	
Legumbres Congeladas	Aguascalientes	AGS	n.a.	12	n.a.	
Mexicana Congelados	Luis Moya	ZAC	1990	20	14	300
Expor-San Antonio	Villagran	GTO	1990	60	28	50
Emp. de Hort. del BajPo	Jaral del Progreso	GTO	1990	20	n.a.	
CENSA (Simplot)	Morelia	MICH	1985	n.a.	n.a.	
Veg. Cong. de Irapuato	Irapuato	GTO	1987	15	10	own
FRESPOINT	Irapuato	GTO	1987	15	12.5	30
La Esperanza de Miranda	Dolores Hidalgo	GTO	1990	6	5	10
Ra�l Le�n	Irapuato	GTO	n.a.		3	
Frexport (Bimbo)	Zamora	MICH	1991	15	n.a.	
Agroindustrial Export. (Tlaloc)	Tlajomulco (Irapuato)	JAL (GTO)	1987	16	8	
Cong. HortPcola Sonorense	Cd. Obregon	SON	1990	10	7	1
	Chihuahua	CHIH	planned			

Source: Bivings and Runsten 1992

expand supply. Campbells was the only firm that seriously tried price discrimination with the small producers. Campbells offered seven different types of contracts, which enabled them to price services according to what producers wanted to use. In 1986, they offered a contract with complete services (including all operating capital, use of specialized machinery, seedlings, inputs, regular technical assistance, and some risk-sharing in the event of crop loss) that had a base price of 6.5 cents per pound of broccoli. At the other end of the spectrum, they bought broccoli on the spot market at the plant door for 13.5 cents per pound. The cost of all these services--transaction costs--was substantial.

The policy of the other contracting plants to have at most two contracts (one with some services, one without) did not really address the added costs of dealing with small producers. Most producers were relatively large and the only services they wanted were the chemical inputs (that the firms imported in bulk) and perhaps the use of some specialized machinery. As a result, most plants could not recover all of the costs of contracting with small producers because they were paying them too much for the product.

In fact, the director of agriculture at Campbells said he was pressured by the other plants not to price discriminate and to maintain prices at a common level. Therefore he was unable to pay the no-service growers a high enough price nor the full-service small producers a low enough price to account for all costs. Even his seven contracts were insufficient to recover all of the transaction costs involved with the ejidatarios.

The attempt of buyers to price transaction costs is one reason why it often appears that price received is correlated with size of producer, which Rosset (1992) laments in his data from Central American melons. It is a result not only of the weaker bargaining power of small producers but also of the real costs incurred in dealing with them, and any analysis of contract pricing must begin with estimates of transaction costs.

It is clearly possible to incur significant transaction costs in dealing with small producers, price those costs appropriately or organize one's dealings with them in an efficient manner, and still have a viable system. There are success stories. Dutrenit and Oliveira describe other cases of success and failure in broccoli contracts between a Mexican processor and groups of ejidatarios. It is clear that a great deal of the success depends on the sensitivity of the contractor to the needs of the small producers and on the careful transfer of technology appropriate to their situation. The future of such associations really depends on the effort the contracting firms put into this interface with the ejidatarios, or, as in the Los Pinos case in Guatemala, the effort a third party (in that case the Swiss) provides to support smallholders' participation. The reluctance or ability of many firms to deal with the transaction costs constitutes a significant barrier to ejidatario participation.

V.2.3 Frigorizados La Huerta, S.A. de C.V. and ejidatarios in Aguascalientes and Zacatecas²⁶

²⁶A similar example of a Mexican-owned frozen vegetable firm contracting with ejidatarios has been examined by Dutrenit and Oliveira in the case of ExpoHort in Quer taro. However, in that case FIRA played an important role and formal associations were created. Here the initiative is entirely private.

La Huerta is a frozen vegetable firm located just north of the city of Aguascalientes. It was the first vegetable freezer to be set up by a Mexican farm family (in 1976) and it continues to be family-owned. The family's ranches supply most of the product to the plant, but the firm also contracts with approximately 10 private producers and 70 ejidatarios in 7 ejidos in Aguascalientes and Zacatecas. The ejidatarios average 1 hectare of vegetable production for the firm apiece. The contracted growers produce mainly broccoli and cauliflower, though there is also production of snow peas, carrots, etc. The firm has contracted with some ejidos for as long as 12 years, beginning initially with the ejidos bordering the home ranch in Aguascalientes. Many of these ejidatarios and their children worked for the firm, and contracting with some for vegetable production was seen both as a means of tying labor to the ejido (and the ranch) and as an effort at "social development." The eventual success of ejidal production led the firm beyond social concerns to see such contracts as a viable means of expanding production in the region.

Collective production arrangements failed. Initial efforts to have the ejidatarios within an ejido work together in joint production failed due to discord among the ejidatarios over who was to do which work and over charges of misappropriation of funds. In addition, the bank loans to groups of producers were structured by the banks in such a way that the leadership of the group could not be changed. Thus the only solution was to dissolve the groups. Apparently joint production worked well and used labor more efficiently, but mistrust killed it. Now every ejidatario is contracted individually by La Huerta.

The firm provides credit. The ejidatarios have little access to formal credit, though a few who have collateral assets (such as a house outside of the ejido) receive credit from Banrural. La Huerta advances them seedlings, all chemicals, fertilizers if they want, and at times some other loans. For example, the normal advances to the Zacatecas ejidos are about 40 percent of variable cost, while the ejidatarios themselves put up land, labor, and 25 percent of variable cost for land preparation, water, and transportation. This puts out-of-pocket costs for the ejidatarios in the same range as costs to grow maize, if they are able to use family labor.

Migration impacts on profitability. The ejidos in the area are heavily impacted by migration to the United States. Most of the young men are gone and many of the ejidatarios are gone as well, renting their land to other producers. This limits the ejidatario's ability to use family labor and it drives up the price of hired labor. In one ejido in Zacatecas, all the participating ejidatarios said they had to hire labor in 1994 at 20-30 pesos a day, wages similar to those paid by large private farmers. The constraint of migration is an important one throughout rural Mexico.

Ejidatarios are good producers. La Huerta estimated in 1991 that the ejidatarios' per unit operating costs to produce broccoli were only 55 percent of their own. Why was this? First, they could often hire labor more cheaply within the ejido. This is partly from convention, but also reflects the cost of transport (including time) from the village to alternative employment and their neglect of paying any government benefits (social security, etc.). Second, they could use unremunerated family labor. Third, land rents (and implicit rents) were lower within the ejido because of the nominal illegality of renting

land; most of it was done on a sharecropping basis.²⁷ Fourth, they managed small acreages and could catch pest and disease problems sooner, thereby limiting their use of chemicals. Finally, La Huerta had calculated that the ejidatarios had higher average yields, perhaps 20 percent higher, in broccoli and cauliflower than the firm's own ranches. They attributed this to conscientious work on small pieces of land by the ejidatarios, but it could be due to a variety of factors (such as different soil qualities, cleaner ground, companion crops) requiring further study.

Transaction costs require management. The firm argued that contracting with ejidatarios was cost-effective because it cost them only the salaries of one agronomist and a bookkeeper. The ejidatarios were strung out in a line along the main highway and could be visited once a week by the agronomist, because their numbers and location were restricted. The contracted growers had to come get their own transplants and fertilizers from the firm's ranches. Chemical control decisions were made by the firm. The agronomist carried the pest control materials with him at all times, which allowed him to make a recommendation and distribute the materials in the same trip. By thus limiting the transaction costs, risks, and overhead of the contracting system, both the ejidatarios and the firm were satisfied. However, this clearly depends on the quality of the agronomist and the good faith of the firm, a condition that is not always satisfied in such arrangements.²⁸ In addition, large private producers willing to grow vegetables under contract are not as available in Aguascalientes as they are in the BajPo, so the firm has a distinct incentive to contract with ejidatarios.

V.2.4 Conclusion

The frozen vegetable case demonstrates a bias toward larger farmers. As in Guatemala, where an initial attempt to contract with larger growers failed, the frozen vegetable processors have had recourse to smallholders only when dictated by circumstance. ExpoHort, Bimbo, and Arteaga all reported undertaking contracts with ejidatarios as a form of social work (in fact ExpoHort allowed FIRA to finance the ejidatarios and pay for outside technical assistance), and the U.S. firms tried it only when they needed more supply. Both the Guatemalan and Mexican cases demonstrate that smallholders can adequately and profitably produce such crops, demonstrating again that *production is not the problem*.

Transaction costs, on the other hand, are a big problem. Some organization of small producers must occur if the firm is to deal with them. This can be done by the firm (La Huerta), by the government

²⁷Recent changes in Article 27 of the Mexican constitution have legalized the rental of ejidal land.

²⁸See the discussion of poor technical assistance in Dutrenit and Oliveira. Many growers have tried to produce broccoli and cauliflower under contract to various firms in the industry and have abandoned the crops because of poor technical assistance, crop losses, and the rejection of product. There is some turnover in the La Huerta contractees as well, and one former producer expressed his concern about yield variations and the difficulty of controlling diamondback moth, suggesting that the arrangement still has significant risks. For more discussion of this industry, see Moulton and Runsten (1986), Bivings and Runsten (1992).

(FIRA), by NGOs (the Swiss in Guatemala), or by the producers themselves. The real costs of all transactions should be made transparent and producers should pay these costs. The firm's ability to deliver credit, insurance, and inputs more cheaply in an environment of market failure would give it the ability to contract with smallholders and earn profits if it could charge all costs. As the Campbells case showed, this is difficult to do where there are competing firms and the costs are not well understood.

The frozen vegetable industry in the BajPo also demonstrates the advantages of competition. Birdseye had a monopsony in the area from 1967 until the mid-1970s. But success encourages entry and now there are many firms in the BajPo producing the same products and competing for the same growers. Though there are complaints about grading, they are minimal. And it would be difficult to argue that the foreign-owned firms operate vis-a-vis the growers in a manner distinctly different from the Mexican-owned firms: they are all competing.

V.3. Canned vegetables

In the late 1950s and 1960s a series of fruit and vegetable canneries were set up along the Pan American Highway in the BajPo region of central Mexico by both foreign and domestic firms. The intention was to produce for the Mexican domestic market behind ISI tariff barriers. Though some of the national firms would buy product on the open market or from intermediaries, the foreign firms contracted for all their raw product needs (Rama and Vigorito 1978).

Early analysts of this industry from the United States, e.g. Morrissy (1974), wanted to believe that canners were contracting with small producers, "transforming them from subsistence farmers to commercial growers" (Morrissy 1974:12), but it was not really true. His average contract from a survey of processors was for 15 ha. of fruits and vegetables, more land than any "subsistence" farmer owned. Williams and Karen showed that Del Monte had an average contract of 62 ha. of fruits and vegetables in 1983 (Williams and Karen 1985:130). Only in special cases, such as Campbells' contracts with the Rincón del Parangueo ejidatarios for pickling cucumbers, which required large amounts of labor every other day, were smallholders participating.

V.3.1. Del Monte Asparagus

Asparagus is an instructive example. Asparagus was an important reason for Del Monte to invest in a plant in Mexico, as they abandoned their white asparagus operations in California after the end of the Bracero Program led to much higher wages on their California asparagus farms. The first asparagus was planted in Guanajuato with a large Italian grower in 1965.

Del Monte provided the asparagus crowns, which they maintained in a nursery in Mexico. For almost 20 years, they gave them out for free and financed the establishment and initial years of non-production at low interest rates. However, they signed a contract with the grower that required that the acreage they financed would have to be sold to Del Monte for as long as it existed, likely 12-15 years in the BajPo. Therefore the grower had no alternative but to sell to Del Monte. Each year Del Monte would send out a letter informing the growers of the prices for asparagus.

The growers complained about the prices, about discounts, and about arbitrary grading standards that were under Del Monte's control. They formed an asparagus association but it never did anything, as the legal infrastructure for them to bargain with Del Monte did not exist, and they were under long-term contracts where they had accepted financing. However, despite all the complaining, the growers contracted by Del Monte ended up being some of the largest growers in the BajPo. As one said, "Mucha gente se hizo rico de Del Monte." They used their income from Del Monte to finance their own asparagus plantings, planting crowns imported from California. They began to export fresh asparagus to the United States and Europe, a highly profitable business.

The 1982 crisis in Mexico ruptured even this arrangement. Del Monte turned to operating their own asparagus ranches, and Williams and Karen reported in 1985 that Del Monte operated 6 ranches, 4 leased and 2 owned, that accounted for 25 percent of asparagus canned. They hoped to expand this to at least 50 percent. Del Monte raised the minimum contracted asparagus to 8 hectares per grower and said they preferred growers with hundreds of hectares, that the investment was too large to risk with small ejidatarios (Williams and Karen 1985:131).²⁹

The Del Monte case shows that contract farming did have the salutary effect on the growers that proponents claimed, financing their operations and teaching them how to grow the crop, but this opportunity was not extended to small ejidatarios. Where ejidal land was involved in asparagus, it was rented in large blocks from groups of ejidatarios for 15 years. One firm interviewed in 1983 had such contracts with three ejidos in Guanajuato, where the firm carried out the entire production process, providing all inputs, the crowns, the machinery, drilled the wells, and hired the ejidatarios at a daily wage. Profits were split after the firm figured its costs. This was the practice that recent changes in ejidal laws (reform of Article 27 and Asociaci.: n en participaci.: n) were meant to legalize.

Kusterer's evaluation of the USAID-funded ASAGRO asparagus operations in Peru found that Del Monte's fear of smallholder asparagus was perhaps not entirely unfounded (Glover and Kusterer 1990). Because the smallholders of the Santa Valley lacked any capital to invest, the firm financed 100 percent of start-up costs for the initial years. Subsequent low yields essentially made it impossible for the small growers to pay back their debts. In addition, the firm incurred very high transaction costs dealing with a dispersed group of small growers on a daily basis. The firm consequently shifted contracting to the Viru Valley, where there was a history of asparagus production, yields were better, farm sizes larger, and less financing was needed. At the time of the evaluation, much better results were being obtained.

V.3.2. JalapeZ os del Caribe, Chetumal, Quintana Roo

²⁹Del Monte exhibited a similar bias against smallholders in Kenya, according to Swainson (1980). When the local pineapple canning industry ran into financial difficulties and depressed markets in the early 1960s, Del Monte agreed to take over Kenya's canners. Shortly thereafter they complained of insufficient supply and low quality, convincing the government to buy and lease to them some large estates for pineapple plantations. When these plantations, on which Del Monte was able to grow high quality/high yielding pineapples, came into full bearing in the mid-1970s, Del Monte ceased to buy from the smallholders, thus eliminating the peasants' market.

Many of the chile canning facilities were set up in central Mexico. When new regions of chile production were created, such as the settlements in southern Quintana Roo near the Belize border, buyers for the firms, operating like fresh-market intermediaries, would purchase chiles and truck them across the country.

In 1994, a new chile processing plant was constructed in Chetumal, run by a lifelong chile buyer from Mexico City, in partnership with a fresh export firm from the Yucatan. Their idea was to export fresh chiles to the United States, and to can the rest.

The municipio where they are operating produces about 95 percent of the chiles in the state of Quintana Roo. There are campesinos that grow up to 50 ha. of chiles because they are so profitable. But most ejidatarios are only able to clear 2 ha. of land, and so grow 1 ha. of milpa and 1 ha. of chiles. Many campesinos came to Quintana Roo from Veracruz, and they knew how to grow chiles. The peak acreage in the area has been 5,000 ha. Chiles are usually harvested from September to December, four harvests.

In order to supply the fresh shipping requirements, they have organized three asociaciones en participaci.:n with local ejidos:³⁰ one group of 12 with 26 ha., one group of 9 with 30 ha., and one group of 36 with 50 ha. These acreages are compact, mechanized, irrigated lands that the government prepared for the ejidos in the past, giving them the machinery, the wells, etc. But most of them have not functioned for 10 years, as the ejidatarios lacked the funds to replace the pumps and maintain the investment. The firm will provide technical assistance, investment in rehabilitating the infrastructure, production credit, along with packing and marketing, and the campesinos will work as jornaleros.

Such associations can be for 5 to 20 years, and these are proposed for 15 years. The firm has acciones and the campesinos have acciones. They will sell chiles jalapeZos to the fresh export market and to the processing plant. Returns after costs are divided according to acciones. The campesinos are supposedly partners under such an arrangement, but the firm recognized how difficult it will be to get them to think this way, as documented by Dutrenit and Oliveira (1991).

In addition to these associations, the plant will also contract for supply. They have contracted with a large private grower for 90 ha. of chiles to protect themselves in case some of the ejidal arrangements do not work out. And they are contracting with local ejidatarios. They sign contracts to purchase all of the crop harvested. They fix a price in the contract, which can be adjusted according to the market. For example, they were signing contracts at 1,000 pesos per ton, but a local drought meant the price would be 1,300. They had contracted for 300 ha. of ejidal production at the time of the interviews.

There are plenty of buyers from other chile firms operating in the area. The largest firm (La CosteZa) takes out 8 trailers of 40 MT every day during the harvest. Local producers are used to selling to intermediaries, which is a problem for the plant. The plant acknowledged that they may have

³⁰For a discussion of asociaci.:n en participaci.:n in general, see section

difficulties getting producers to comply with the contracts if buyers come along and offer them more money. The contracts are set at the start of the season, and the price is set at an average of the national market. They are trying to convince the growers that they will earn more with the plant, because it will buy all production at the set price, while the intermediaries will only buy the initial harvests of large fruit, and then will pay little or nothing for later harvests.

They also have to contend with an organization that the ejidatarios have set up with the state government that essentially competes with the plant. They feel betrayed by the state, since the state encouraged the plant to locate in Chetumal and guaranteed the bank loan.

They have devised a scheme to set up a separate entity to finance production. This entity will borrow money from FIRA (at the low interest rates for Productores de Bajo Ingresos) and loan it to the growers. Out of these loans will be taken a certain amount that will be set aside in a guarantee fund, to cover defaults. This fund can also be used to insure the crops in a self-insurance scheme, but they will buy insurance for now. The entity will be repaid on sale of the crops, and FIRA will then be repaid. This scheme seeks to account for the bad habits many small producers have acquired of not repaying loans during many years of government finance.

Conclusion

This Chile case demonstrates the adaptations being made in Mexico as the government withdraws from agriculture. Combining ejidal lands in partnerships with private firms is one form of production that is sure to expand now that it is legal, but mainly because it is one of the only means for ejidatarios to access financing. Contract farming with small producers is also a viable strategy. Big stumbling blocks exhibited in this case are the opportunism of growers used to selling to the highest-bidding intermediary and the problem of securing repayment of loans. The absence of a properly-functioning legal infrastructure or a viable credit market for smallholders requires firms that want to contract with ejidatarios to devise novel institutional arrangements.

V.4. Strawberries and blackberries (zarzamora)

V.4.1. Strawberries

Strawberries were first produced in 1888 in Irapuato, Guanajuato, with French berries, so the industry has a considerable history. The first freezer was built in Irapuato in 1948 to export to the United States (Hopp, 1963). Fresh exports began in 1958, but the difficulty with handling and transportation meant that most export production was for processing (Ibid.). The industry was financed largely with U.S. capital, principally through a group of U.S. brokers who competed for the U.S. institutional processed strawberry market. The number of processing plants mushroomed as more U.S. players entered. By 1963, there were 10 plants, mostly around Irapuato (Ibid.). The industry then began to grow rapidly in the Zamora, Michoacan, area. By 1966, there were 17 plants in Mexico with a capacity of over 100 million pounds per year (Cook, 1966); by 1972 capacity was estimated at over 250 million pounds (Cook, 1972); and by 1974 there were 33 freezers (Feder, 1977). A considerable amount of the expansion in acreage had been accomplished through the use of small producers, many of whom were financed by processors, and the government had even constructed some plants in Zamora for the social

sector.

Crises of overproduction occurred in 1970 and 1974. The Mexican and U.S. governments agreed to limit total frozen strawberry exports from Mexico, and quotas were established to allocate production in Mexico. Control was ceded to the growers through the Union Nacional de Productores de Hortalizas, later the Confederacion (CNPH), which limited acreage. Loss of control discouraged foreign investment in the industry, and most larger growers exited, leaving strawberry production largely to groups of ejidatarios. Fresh production became increasingly oriented towards the Mexican market and freezer production declined.

Quotas on acreage, which were instituted after the overproduction crisis of the early 1970s, were finally removed in 1988. The Salinas government acted on June 28, 1990 to retake control over certificates of origin and make them available to independent producers who were not members of the local CNPH chapters. Up until that point, the CNPH had been able to collect a fee for every carton shipped, whether fresh or frozen. The 1990-91 season saw a continued struggle as the CNPH strawberry unions tried to maintain control, but the government followed through and granted certificates of origin to independent shippers. The government further resolved to streamline the process and reduce it to obtaining phytosanitary documents from the SARH.

Over the past 20 years, while the industry was under government control, relatively little was done to improve strawberry production in the BajPo. In many ways, the industry is reverting to its form in the 1960s, except that the past two decades weigh heavily on people's perceptions of the possibilities for the central Mexican industry.

There are several lessons to be learned from this industry. First, overproduction was exacerbated by the Mexican government's willingness to finance processing plants for ejidal groups in Michoacán, responding in part to charges that U.S. brokers controlled the industry (Feder 1977). Despite twenty years of nominal control by the CNPH, U.S. brokers still control the export industry, as that is the way the institutional strawberry market is structured in the United States.

Second, having intervened and given the local growers control over production, the government then did virtually nothing to improve production. In the meantime, growers in the United States developed and adopted significant new technology. One of the principal advantages that California possesses is the ability to harvest for long periods, typically six months or more, which, combined with intensive technology, has led to much higher yields than in other competing regions. Table 5 presents average yields in recent years for most of the North American strawberry regions. One can see the tremendous advantage which California has gained, the result of decades of breeding efforts, the use of methyl bromide/chloropicrin fumigation on an annual basis, and a heavily-researched system of cultural and pest control practices. The fumigation alone considerably increases yields (perhaps 15-20 percent), but costs over \$1,000 per acre.³¹ The availability of capital to invest is thus also an important advantage to California.

³¹Methyl bromide has been found to be an ozone depleter and is scheduled to be eliminated from the U.S. market in the next few years. Research is underway to compensate for this loss.

Most regions of the world now use California strawberry varieties or their derivatives. Mexico is no exception. Plants are imported from California, and in central Mexico they are then multiplied in nurseries owned by growers. This puts Mexico at an immediate disadvantage, since the plants were not bred for central Mexican latitudes. While

TABLE 5
STRAWBERRY PRODUCTION AND YIELD BY REGION

Region	Average Yield 1988-90 U.S. tons per acre	Avg. Production 1988-90 U.S. tons
California	23.5	450,157
Washington	3.6	7,433
Oregon	5.6	38,683
Florida	12.2	63,233
Michigan	2.7	6,450
Mexico	7.7	117,727
Guanajuato	7.0 *	n.a.
Michoacan	10.7	n!a.
Baja	12.8	8,219

* estimated

Source: California Processing Strawberry Advisory Board; SARH, Baja California; CNPH in the BajPo

production practices in northern Mexico are the same as in California, in central Mexico many traditional practices of dubious value are still used. For example, many growers in Michoacan flood their fields before planting. Irrigation or fertilizer applications are often not timed or quantified in any scientific manner, and sprays are often used after the point at which they could have the greatest effect.

The results of these technological differences are most evident in yield results. The Bajio has even lower yields than Florida, which has a shorter season.

Third, given the reality of a free trade agreement (and strawberry duties are to be eliminated by NAFTA), Mexican processors and U.S. brokers are trying to shake off the stagnation of 20 years and improve the productivity of the industry. Otherwise, they run the real risk not only of missing export opportunities but of losing most of the Mexican market to U.S. producers. Although the brokers have done a poor job of transferring technology (as compared, for example, to the frozen vegetable industry), California-style production systems have been tried in the Bajio a couple of times in the past 20 years, but inadequate technical support led to failure. Several large growers are now trying it once again, but most still lack the technical and research support that has been so important to California.³²

³² One large California firm is reportedly engaged in trials in the BajPo with the California production system. This firm has the resources and research capability to make it work, as they are engaged in long-term breeding and

The California system is costly, and requires large investments. The growers in central Mexico have not had access to sufficient capital, and banks and investors are wary of the industry after 20 years of stagnation and political infighting.

However, some of the casualties of this process will likely be many of the small producers who are not in a position to adopt expensive technology because they are self-financing production. Some larger growers who are linked to processing facilities are now renting increasing acreages of land and bypassing small producers altogether. The smallest growers, who use only family labor and sell their berries in local markets, will survive because their costs are low, but the middle may disappear. Only targeted projects oriented toward improving technology, providing credit, and seeking niche markets, such as organic production, are likely to retain most strawberry-producing ejidatarios.

Finally, one of the reasons small producers will probably not participate in a more productive strawberry system is the inability of the processors to enforce contracts. The situation is similar to the tomato case in Sinaloa. Because there is a viable fresh strawberry market in central Mexico, processors always face the likelihood that growers will sell strawberries in the fresh market if the price is better than what the processors can offer, and the processor price is heavily constrained by competition in the United States. Rama and Vigorito (1978) reported that processors often accepted that the growers would sell fresh part of the production that the processors had helped finance, and that this made possible lower processing prices. The processors they interviewed wanted to receive at least 60 percent of production.

However, the situation has deteriorated since that time, and now with larger growers able to produce as many hectares of strawberries as they want, processors are reluctant to extend credit of any kind to small producers. At most they would advance them the strawberry transplants and some chemicals. In general, strawberries grown by smallholders have come to be sold on daily spot markets, often to intermediaries who either send them to fresh markets in the cities or sell them to the plants. Given the history of the industry it would be very difficult to structure a supply based on contracted smallholders, as the following example illustrates.

V.4.2 Asociación Agrícola Local de Productores de Fresas y Hortalizas, Irapuato, Guanajuato

Background

As with some other fruit and vegetable crops controlled by the CNPH, strawberry representatives met every year to review expected demand for fresh and frozen strawberries in the various export markets, and so to apportion export quotas among producing regions. The Secretary of Agriculture (SARH) had given the CNPH control over certificates of origin, which were required for strawberry export. In fact, the CNPH also came to have effective control over the import of strawberry plants from the U.S. and the import of some other specialized inputs.

research. Their eventual decision to stay or not should be an indicator of the future viability of the industry.

After the government eliminated their control of the industry, the local CNPH associations in Zamora and Irapuato continued in much reduced forms. The Irapuato association had formed a cooperative and was trying to build a processing plant. The Zamora association had a freezing plant that the government had constructed, but it was deeply in debt.

The Subsequent Experience in Irapuato

The Irapuato association formed a cooperative in 1991 with 99 members, most of whom were ejidatarios, accounting for about one-half of local strawberry production at the time. The long-time head of the association, Henrique Barbosa Padilla, had been actively looking for a marketing partner for three years when he hooked up with a small vegetable processing firm in the state of Washington that was looking for frozen strawberries to market. He met them through a strawberry nursery in northern California.

Rather than finish the new plant, the U.S. firm financed the installation of a small plant in the association's warehouse to stem, wash, grade, sort, and pack strawberries, which were then frozen in a contracted plant south of Irapuato and shipped to the United States. The U.S. firm agreed to buy all acceptable product that crossed the border. The cooperative ran tests in 1992, had a bad year in 1993, hardly ran at all in 1994, and was subsequently forced out of the association's building because it couldn't pay the rent. The U.S. firm moved its equipment to another site and began operating on its own.

Issues

1. Credit is hard to find. The Irapuato cooperative tried for several years to secure bank financing in Mexico without success, even though they had a U.S. partner guaranteeing to buy what they produced. NAFINSA, BancoMex, and FIRA all directed them to find a commercial bank (primer piso) to administer the loan. Banamex, Bancomer, and other banks turned them down, reluctant to deal with a large group of producers who apparently were not able to provide sufficient collateral (since most of their ejidal land and houses had no value to the banks) or a third party with 50 percent of the loan amount liquid to guarantee payment. Though FIRA claimed to be anxious to loan the group money, there was no conduit for it.

Why might the commercial banks have been reluctant?

- A. There had been recent confrontations with well-known growers defaulting on loans in Irapuato, and the banks had banded together to put several in jail. Defaulted loans from agriculture are epidemic in Mexico.
- B. There were already eight plants processing strawberries in Irapuato, many more in Zamora, with a number of idle plants.
- C. The Zamora union's strawberry processing plant ended up owing about U.S.\$1 million to the banks by 1992. In addition, the Zamora union had several loads rejected at the border for chemical violations.

D. Mexican frozen strawberries had not been competitive with California production in recent years and profit margins were low at best (Bivings and Runsten 1992).

Thus one can understand the reluctance of the banks, but it points up the difficulty groups of ejidatarios face in securing credit, even when FIRA is willing. It may be that the Irapuato cooperative's experience in strawberries through the CNPH was especially damaging in light of the new free-market policies, which would be highly ironic and a waste of the resources invested in these strawberry growers over the past decades. However, private banks are not particularly interested in positive social externalities.³³

2. *Undercapitalization hurts volume.* Because the U.S. partner was unwilling to front operating capital, and the cooperative was unable to borrow, they lacked the ability to advance inputs and tie growers to the plant. Growers had to self-finance all costs of production or seek credit from other sources. The cooperative sold inputs at cost, but did not advance them. There was no money for technical assistance. As a result, the cooperative was not offering producers anything other than a (low-price) market, and 44 of 99 members had dropped out by early 1994. This reduced the volume of product potentially available for processing. The growers who remained delivered only small amounts of berries, saying they had long-standing commitments with other plants, or they shipped to the fresh market because the price was better.

As a result, in order to meet volume commitments to the U.S. buyer, they began to buy berries from intermediaries and anyone who would sell them. This of course caused the quality to deteriorate and they began to have pesticide problems, a downward spiral. Low volume also raised the unit costs of operating the plant.

3. *A dual-market strategy was needed.* Groups of small farmers in Mexico still dream of earning dollars, since they have seen this to be a road to wealth for decades. However, the peso was increasingly overvalued throughout the life of this cooperative, until the drastic devaluation at the end of 1994. As a result of overvaluation, prices in the Mexican domestic market were often higher than export prices for fruits and vegetables. In 1993, the Mexican fresh market price for strawberries was higher than the price the cooperative freezing plant could offer, severely constraining the cooperative's ability to function.

The elimination of the strawberry tariffs under NAFTA (14.5 percent on frozen strawberries to the United States) will help this business, but the cooperative really needed a dual-market strategy, where fresh berries are sold in both Mexico and the United States, and the surplus is frozen. This is how California operates (Runsten 1987). Unfortunately, the cooperative was not contemplated as a fresh marketing organization, since the growers had their own connections into the Mexican market.

4. *Chemicals are problematic for export production if controls are lax.* Because the cooperative lacked the funds to provide technical assistance and to advance the chemicals to the growers, it could only plead with the farmers to use EPA-approved pest control materials. In strawberries this is a

³³For a similar case of former CNPH growers, see the discussion below of melons in Apatzingan.

particular problem, because some of the the banned chemicals (e.g. Tamaron) are effective and cheap while some U.S.-approved chemicals (e.g. Avid/Agrimec) are difficult to use properly and are extremely expensive. As U.S. production has shifted to integrated pest management, it has distanced itself from strawberry production by small ejidatarios in Mexico, making poorly monitored cooperative arrangements like the Irapuato group problematic. As a result, the cooperative was reduced to testing deliveries of berries for residues and shipping those that failed into the Mexican market. This elevated the costs of operations.

Conclusion

Credit market failure, insurance market failure, input market failure, transaction costs, all of these could have been resolved by a properly functioning cooperative. But it is difficult to build an honest institution amidst the ashes of a stagnant 20 years. For the same reasons it is doubtful that private contract farming can work anytime soon with small strawberry growers in central Mexico.

V.4.3. Blackberries

The experience of strawberries in Michoacán has impacted the structure and functioning of production of blackberries in the region, which is growing rapidly. In mid-1995, there were approximately 250-300 ha. of blackberries in the Uruapan/Salvador Escalante/Los Reyes region, all of which had been planted since 1985.

The blackberry plants, once established, have a productive life of 15-20 years. Establishment by a large producer was estimated to cost N\$70,000 per ha. in July 1995, who also estimated that small ejidatarios could establish them for N\$40,000 per ha. using family labor, less intensive planting, and less fancy trellising. Ejidatarios in the region are typically obtaining only one-half the yields that the large private producers obtain. This cost of establishment is a significant hurdle, since there is no credit available for the purpose, and interest rates would anyway be too high to establish a perennial crop that does not bear immediately.³⁴

The blackberries are exported fresh to the United States via two brokers, who fly them from Guadalajara, and they are frozen for a variety of industrial purposes in Zamora freezing plants. The brokers contracted with the larger producers, who in turn would receive berries from the small ejidatarios. The price for fresh export quality fruit in the 1994-95 season was N\$7.00 per kg. What was not high enough quality to be shipped fresh was trucked to Zamora, where it was sold to several strawberry freezers for N\$2.-3.5 per kg.

At the time of our interviews, many months after the end of the season, the brokers had not paid the producers. One representative of a U.S. broker reportedly disappeared with the money. Another Mexican-owned brokerage went bankrupt because of the devaluation. This type of "marketing" risk is common in Mexico in fresh fruits and vegetables, and it exemplifies the problems with a lack of an

³⁴Some ejidatarios have secured financing from SEDESOL, which takes an equity position and offers no-interest financing. A local credit union has also financed some hectares, but at only N\$15,000 per ha.

adequate legal infrastructure, where contracts cannot be enforced.

In this case, smallholders are indirect victims of this risk, since they have not been able to secure contracts of their own. This is in part due to the lack of cooperation among them, since a minimum of 10 ha. is reportedly necessary to interest buyers, a consequence of transaction costs. The ejidatarios need to form cooperatives, combine production, secure their own trucks, and negotiate with buyers. Cooperative arrangements, as with the Del Cabo case study, would also allow for cost-effective employment of technical assistance.³⁵

A likely outlet for much ejidal production would be the Zamora freezers, where berries are purchased at the door, as with strawberries. The freezers have not financed any blackberry production, because, as with strawberries, they have no means to compel the producers to deliver the product.

The Government of Mexico (GOM) is reportedly investing in more ejidal blackberry production through SEDESOL. However, as is so often the case, there is no indication that any thought has been given to anything other than establishing production. Production alone is not a sufficient solution to the problems of Mexican agriculture.

V.5. Melons

Michoacán

The melon industry in Apatzingán, Michoacán, has experienced a transformation similar to the strawberry case with removal of CNPH control. According to Lois Stanford, once producers gained control of the industry in Apatzingán through the CNPH 25 years ago, there was a constant search by U.S. buyers to develop other regions of production. From 1970 to 1988, export production was developed in Colima and Guerrero with large-scale commercial producers, in contrast to the large associations of peasant producers in Michoacán (in the late 1980s there were over 2,000 melon growers in Apatzingán). U.S. buyers argued that they obtained higher yields and lower costs in these other regions.

Within Apatzingán itself, new entrants in the 1980s increased the supply of melons, despite attempts by the associations to control planting. The cumulative impact came in 1987-1988, when a glutted market caused prices to fall sharply and left almost 4,000 hectares of melons unharvested. Stanford reports that the peasant farmers then ignored their contracts and sold their melons to anyone who would pay cash. As a result, some local associations could not pay back crop advances to U.S. buyers, and so the buyers stopped financing peasant associations. With the removal of CNPH control in the 1990s, the buyers have been able to bypass small producers altogether and work with large commercial producers who rent land.

³⁵Of course such technical assistance would not be easy to find, as there is reportedly only one expert on blackberry production in Mexico, a professor at Chapingo.

The melon story exhibits many of the same features as strawberries. The government granted the producers the right to control production, but then failed to support the industry in a way that would keep it competitive. The industry began to suffer from its inability to control insects, viruses, and nematodes, and yields declined. When left to their own devices, buyers turned to other regions with fewer disease problems or to large-scale production to try to lower costs and improve productivity.

Quintana Roo

In the town of Morelos, Quintana Roo, there has developed a history of the production of watermelons for export to the United States. In the 1993-94 season, there were over 700 ha. of watermelons contracted by two U.S. brokers with local ejidal producers. They are grown in the winter off-season and trucked to Texas.

The brokers provide the seed, but they do not provide technical assistance or credit. Credit has been provided by a bank. One observer estimated that only 30 percent of production is actually shipped to the United States. Growers are free to sell rejected produce, but there is little local market for specialty watermelons, such as baby yellow watermelons. Prices have varied from N\$300 per MT to N\$1,000 per MT in recent years. In some years the growers do well, in other years they are burned by the brokers. At the time of our interviews in 1994, a Cuban representing a U.S. broker was in the local jail in Carrillo Puerto because his checks had bounced. A local federal government representative said that the same story was repeated over and over again, with always a new broker arriving with new promises. Apparently the state government had intervened with the growers and made guarantees to the bank to convince them to participate with the brokers.

Campeche

A Florida broker had set up operations in Campeche in 1993. The firm also operates in Panama, Costa Rica, and Ecuador. They sell a variety of fruits and vegetables, and have operations in other regions of Mexico. The firm was actively trying to expand contracting for melons in Campeche. They truck the melons to Nogales or send them by ship from Progreso to Florida in refrigerated containers.

The firm contributes the seed, sets a guarantee price and a reference price, and then splits 50-50 any returns above the reference price. For example, with melons, in 1993 the reference price was U.S.\$6.10/box and the guarantee price was about U.S.\$1.25. That is, the farmer is paid \$1.50, and the rest of the costs up to the reference price represent costs the broker supposedly incurs, including packing, transport, tariffs, selling. However, these costs are not broken out in the contract. Thus, the broker can set them at whatever level he sees fit to guarantee himself a profit before splitting with the grower. The firm was contracting mainly with ejidatarios, averaging about one ha. per producer.

The firm harvests, selects, washes, boxes and loads the truck or container. They have their own group of packers, apparently brought up from Central America. They use a moveable packing shed that they move from field to field. Some large private producers with whom they contract pack their own

melons.

They calculate the break-even yield for the growers is 1200 boxes/ha. of export quality fruit. The firm claimed an average of 1500-1700 boxes, but interviews with Blanca Flor ejidatarios demonstrated that they had not been able to grow sufficient export-size fruit to break even. The firm blamed this on the growers spending part of their loan on other expenses, and not investing sufficiently in the crop. The firm's tecnicos give written recommendations to the growers about what chemicals to use when, and the contract allows the firm to reject the crop for failing to follow these recommendations. The grower can sell any rejected fruit, but the ejidatarios reported that there was no local market for the small, "funny" varieties of watermelons they were growing.

Because the firm was relying on a bank for credit, the growers had to have collateral to participate, and many of them didn't qualify. As one said, "All they are doing is assuring a market, not investing any money. If I could get credit from the bank, why would I need the broker?"

At least this broker was present to give advice. Another local ejido had produced melons for a broker in Texas, but there was no local representative. The ejidatarios were not sure what chemicals to use. They received one list, then a different one. The credit advance arrived late, there was no technical assistance, and many of the melons were rejected at the border. They had also produced yellow crookneck squash under similar circumstances. They did not have good advice about when to harvest and waited too long. When the crop got to the border in Texas, most of it was too large to pass.

Conclusion

Small producers need a package of assistance -- credit, technical assistance, and marketing -- that brokers often do not provide. Brokers and peasants are not good partners because the brokers do not compensate sufficiently for pervasive market failures, especially insurance. And melons are probably not an appropriate crop for small producers, because both the market and the production is risky. Only with a cooperative organization to insulate them from market risk and a sophisticated program of integrated pest management to help insure the production would it be viable, as has been amply demonstrated in the many failed projects throughout Central America (Rosset 1992; Murray 1995).

V.6. Productores Organicos Del Cabo, S. de S.S., and Jacobs' Farm/Steve Farrer, San Jos del Cabo, Baja California Sur

Del Cabo is a cooperative of approximately 150 ejidatarios in Baja California Sur who produce organic vegetables and herbs for export in cooperation with organic farmers from California. It was conceived in 1985 by Larry Jacobs and Sandy Belin, both former Peace Corps volunteers in Guatemala and owners of an organic farm in California, along with the Comisar Ejidal in San Jos, Angel Salvador CeseZa Burgoin. The first production occurred in the winter of 1986-1987 with eight ejidatarios. They were subsequently joined by Steve Farrer, another organic farmer from California and an expert in tomato production. The group expanded rapidly up to 1992, and now includes ejidatarios in the ejidos of San Jos, Boca de la Sierra, Santa Cruz, Las Cuevas, and La Ribera. There is a satellite group in MSege as well.

Growers produce the herbs and vegetables on a very small scale, usually transplanting one or more rows at a time in plantings staggered over many months, and seldom exceeding one or two hectares per farmer. The U.S. partners borrowed money in the United States and advanced it to the cooperative on a monthly basis. The cooperative then advances the growers most purchased inputs and may even perform or pay for land preparation costs. The growers are responsible for the labor and water costs. The cooperative provides technical assistance in the form of hired agronomists and (in the past) farmers teaching farmers. The U.S. farmers have also invested a large amount of time in on-farm work and in researching and solving problems. The U.S. partners have been ultimately responsible for the pest control decisions. The product is packed by the cooperative in its own sheds, flown to the United States as loose cargo on commercial airliners, and marketed by Jacobs' Farm.

According to Larry Jacobs, "Del Cabo was established with the objective of assisting small farmers to improve their economic well-being by teaching them organic agricultural techniques, how to produce specialty crops, and how to administer an organization that would allow them to take advantage of niche export markets in the winter." That is, Del Cabo had an explicit social mission that included supporting agriculture in the Cabo area against the continual encroachment of tourism, raising the incomes of relatively poor ejidatarios, and introducing organic farming techniques to preserve the fragile ecosystem of Baja California. Organic production also allowed the group to differentiate the product and access niche markets in the United States.

Issues

1. Ejidatarios need a package of assistance. Del Cabo is an example of an ideal approach to working with small ejidatarios because the U.S. partners offered credit, technical assistance, and access to profitable markets. Many of the criticisms of non-traditional agricultural export projects with peasants have focussed on the riskiness of dealing with fresh fruit and vegetable brokers (e.g. Rosset 1992), and the success of a project such as Los Pinos in Guatemala is attributed at least in part to the presence of Swiss technical advisors (Glover and Kusterer 1990). Del Cabo exhibits similar features of long-term, sustained technical assistance, in addition to the credit and marketing a broker might provide. Del Cabo demonstrates that very small ejidatarios can become competent producers of fruits and vegetables with relatively sophisticated systems of organic pest control. What they then lack is access to markets. Merely providing one or two parts of such a package is usually inadequate, and may account for the failure of various FIRA-sponsored projects.

2. Cooperatives should be limited in size. A cooperative organization provides the most sensible means to deal with a large number of small producers. It allows certain efficiencies of scale that reduce transaction costs, and it can absorb the remaining transaction costs of dealing with its members, if the accounting is done properly. However, there is a certain scale and scope beyond which the organization does not function properly. It is hard to say what this size is, but the Del Cabo experience suggests that including producers from spatially distant ejidos is problematic, and that 150 producers may be too large. Even though running three cooperatives of 50 producers might raise some overhead costs, they could be compensated by each group's ability to spend money in the most useful manner. For example, one ejido in Del Cabo consists of long-time tomato producers with many tomato diseases in their soils. They need to spend money to clear clean soil or to create composts to rehabilitate the

current ground. But since they do not control the cooperative, they are not in the position to mobilize such resources through the joint organization. Other ejidos might decide that they need more or less technical assistance, as different groups have joined Del Cabo at different times. Del Cabo could still operate a joint packing house/shipping point to realize scale economies at that stage of production. Proposals to create cooperatives of thousands of smallholders should be viewed with suspicion unless they create democratic mechanisms for local groups to make their own decisions.

3. Someone must bear the start-up costs. The costs of market research, seed trials, initial training, and all the costs associated with starting a venture need to be fronted by an agent. For the most part the ejidatarios do not have it and the banks will not loan it to them. In the case of Del Cabo the U.S. partners provided these funds (probably U.S.\$250,000-500,000) as an investment. Costs were not controlled very well in the project, so it is difficult to say if there has been much return on the investment. It is likely that the investment would have paid a good return if the payouts to the ejidatarios had been held down, but since the project had ejidatario welfare as its motivation this was not done. Del Cabo is successful, but it begs the question of how to find a generalizable means to start such projects.

4. The learning curve in marketing is steep. Del Cabo developed a marketing organization, through Jacob's Farm, at the same time as it expanded production in Mexico. This is an expensive proposition and should be avoided unless no alternative can be found. Having a marketing organization that is concerned about producer welfare, that shares information continually with the farmers, and that actively seeks to expand markets is an invaluable asset, but existing brokers may be able to do it with proper oversight. The existence of Del Cabo, or of the marketing organizations formed to sell organic coffee (Equal Exchange, Aztec Harvests, etc.), should be taken advantage of by new entrants.

5. Diversify markets. Del Cabo has focussed on exporting via tourist airliners extremely fresh organic produce, the range of which they have consciously diversified. They have become limited by the availability of airline flights and are now considering setting up to truck produce to San Diego. This may affect quality, but it appears the only way to expand production. Another option, to sell produce locally, has been tried half-heartedly at various times by the cooperative, without much success. Nevertheless, it appears there are significant market opportunities in Cabo and La Paz, especially with the tourist trade, as well as the possibility of utilizing regular ferry service to move trucks from La Paz to mainland Mexico. The failure to take advantage of these opportunities appears to be based in the control of marketing in the United States by the U.S. partners. Because the ejidatarios have not engaged in this marketing effort, they have not acquired the capacity to organize marketing in Mexico. There is also the problem of convincing Mexican buyers that the produce is of a higher quality, thereby warranting the price premium received in the United States.

6. Minimize and share risks. Del Cabo advances most costs of production, provides constant technical assistance, and pays producers the same price for their tomatoes or basil no matter what day they are delivered, no matter the market price. The prices for each crop are fixed by the cooperative at the start of the season, and farmers are paid promptly. This minimization of credit risk and insurance against market risk through average pricing is one of the principal factors in Del Cabo's success and explains

the continued participation of most of the farmers. Despite torrential rains and loss of crops in 1991 and 1993, farmers who suffered such losses were still enthusiastic because the losses were shared through the cooperative.

Conclusion

Del Cabo is profitable in part because it has occupied a high-priced market niche, and because its principal crop, basil, is very labor intensive, giving smallholders an advantage. This has allowed it to make mistakes, to build a marketing organization, and generally to engage in learning by doing. It will have to increase productivity in order to survive, and it already faces competition in basil and tomatoes from larger farmers.

The cooperative form of "contract farming" has worked to resolve many of the market failures discussed in this paper, and to internalize transaction costs. If Jacobs' marketing organization were to enter into a formal contract with the cooperative, the relationship at this point would look much like export deals with brokers. The problem however is how one forms and develops a cooperative to this stage. If Del Cabo shows us the right road for smallholder participation, it still begs the question of who is the driver.

V.7. Rice contracting in Jalisco: Imperfect credit and product markets

The ejido *El Gargantillo* is located in the municipio of Tomatlán in the state of Jalisco about 50 kms south of Puerto Vallarta. The community is composed of 379 ejidatarios and 31 non-ejidatario families. The ejido land was originally distributed in parcels of 10 has. of irrigated land, or 20 has. of rainfed land, with about 65 percent of the parcels irrigated. There is an active land rental market, especially for the use of irrigated land, but land sales are rare. There is a high level of out-migration of the children of ejidatarios to Puerto Vallarta and the United States.

Most ejidatarios are either livestock producers or farmers although 16 percent of ejidatarios are not currently producing any agricultural crop on their land, do not own livestock, and rent out their land. About 38 percent of ejidatarios are primarily cattle producers, using most of their land for forage; 6 percent specialize in fruit crops, including pineapple, mango, papaya, coconut, lemon and watermelon; 14 percent produce maize in combination with a variety of other crops (including dry beans, chiles, sorghum). Maize tends to be produced on the rainfed land and is produced almost exclusively for home consumption and forage.

Rice is the most important agricultural commodity in Gargantillo and the Tomatlán irrigation district, produced by about one-fourth of all ejidatarios. The crop is grown in two seasons annually with some land left fallow for one of these two seasons. The fallow land is usually rented to livestock owners for forage. Rice is cultivated in many irrigated districts along Mexico's Pacific coast in the states of Jalisco, Nayarit, and Sinaloa, making it one of the most important crops in the region.

In Gargantillo, purchased inputs for rice averaged US\$835 per hectare -- a relatively large pre-harvest

investment. Most producers utilized all of their 10 ha. land endowment in production and larger producers rented in land so that the average land size in rice production in Gargantillo ranged between 13.9 and 18.5 has. (1991 to 1993). Because of the high costs of production, only a small fraction of producers are able to completely self-finance and consequently most rice producers rely on credit to fund a portion of their production expenses. Credit is usually obtained from the rural development bank, Banrural, or an agro-industrial rice processor. Informal credit and commercial bank credit are rarely used. In the fall-winter season of 1993, there were 40 producers of rice in the ejido. Of these, 25 contracted with the agro-industrial, 10 received credit from Banrural, and the remaining 5 self-financed.

V.7.1. The rice contract: Imperfect credit and product markets

Widespread loan defaults in the early nineties led to the loss of access to formal credit for many rice growers. In January of 1991, unexpected rains delayed the harvesting of the crop resulting in high levels of grain crystalization and, consequently, very low yields. Heavy rain at the time of harvest was not included as an insurable contingency in the growers' mandatory crop insurance contract so that the rice producers suffering crop losses were not compensated.³⁶ The crop losses and the failure of the insurance to reimburse farmers caused many producers to become delinquent in their loan payments to Banrural at a time when the government was changing its lending practices. The delinquent borrowers were unable to obtain further credit from Banrural until they repayed their overdue debt or arranged with Banrural for a rescheduling. Some of the delinquent borrowers were able to receive funding from the agro-industrial rice processor (AI), but the majority were forced to rent their land and cease production.

Unlike Banrural, the AI does not lend cash in a lump sum to producers, but rather provides credit in kind. The inputs it provides on credit include seeds, fertilizers, pesticides, and, in some cases, tractor and harvester rental fees. The AI delivers the inputs to the producers when they are needed and charges interest on the value of the inputs over the amount of time between when the inputs were delivered and when the loan is repaid at harvest. For example, interest on seed payments would be paid over about six months while no interest would be charged for harvester payments, since harvesting is done immediately before sale of the crop.³⁷ The AI purchases the harvest and deducts the amount owed for inputs from the payment received by the producer.

Tied credit transactions with the AI offer several advantages to producers over credit transactions with Banrural, including: 1) no collateral requirements; 2) lower transactions costs in obtaining the loan (the AI does not require loan applications, evaluations, or complicated contracts); 3) timely delivery of credit (or inputs) -- a common complaint with Banrural financing is the tardiness of loan processing;

³⁶The federal crop insurance program, ANAGSA, had been required in the past by Banrural for all rice loans. As ejidatarios were not required to provide collateral for their loans, the insurance was to act as a guarantee for the bank against default in case of crop failure.

³⁷The interest rate used to calculate the borrowing cost was not revealed to growers. Calculating the implicit interest rate used in the calculations was impossible for most growers.

and 4) a guaranteed market for their product. The fourth advantage appears to be quite important. Large shifts in the demand for domestically produced rice by rice processors have led in the past to situations where some producers were unable to find a market for their harvest. As the AI purchases first from those to whom it has lent money, the producer can guarantee himself a purchaser if he borrows from the AI. In this sense the producer is "tying" the AI to his crop as much as the AI is guaranteeing itself supply.

Not only does the AI operate more efficiently than Banrural in terms of lower borrower transactions costs, the AI has several advantages over the rural development bank in terms of lender transaction costs. Primarily this advantage stems from its ability to enforce loan repayment: 1) unlike Banrural, which must rely on the farmer to repay his debt after receiving payment for his crop, the AI can deduct past debt directly from the harvest revenue (The AI has access to the farmers' revenues because, as discussed below, the AI is the sole purchaser of rice in the ejido.); 2) unlike Banrural, the AI has no political motive for forgiving or rescheduling unpaid debts, and farmers face the very credible threat of not receiving further credit; and 3) the AI, being the sole purchaser of rice in Gargantillo, can threaten not to purchase future rice harvests from producers.

The AI contracts with farmers in Gargantillo through an intermediary, who is himself a rice producer in the ejido. The intermediary serves two main functions for the AI: he decides who can receive inputs on credit from the AI, and he is responsible for all communication with the AI with respect to input deliveries and harvest purchasing. The excess demand for credit (at the available interest rate) allows the AI, via the intermediary, to choose the best and most reliable producers. Because so many producers have fallen into arrears with Banrural, the AI has become a de facto monopoly provider of credit for many of the producers in Gargantillo.

In exchange for his services to the AI, the intermediary receives several benefits, including: 1) interest-free loans, 2) unlimited access to purchased inputs on credit, 3) an improved rental market for the tractors and harvesters owned by the intermediary (farmers that contract with the AI can receive these services on credit if they purchase them from the intermediary), and 4) implicit political power and influence in the ejido.

There is only one AI that operates in the ejido, permitting the AI to act as a discriminating spatial monopsonist for producers without access to credit and as a spatial monopolist for producers with access to financial resources.³⁸ The AI has four instruments it could use to extract rents from the rice producers in the ejido: 1) the price of unprocessed rice, 2) the prices of inputs it provides, 3) the interest rate on credit, and 4) the quality "discount," or the amount it deducts from the harvest for impurities found in grading.

³⁸There are a total of three rice processing agro-industrials in the region that could potentially purchase the rice produced in Gargantillo. However, in practice only one operates in the ejido. Economies of scale for an AI in the transactions of credit, input provision, and purchasing create a disincentive (make it relatively expensive) for an AI to contract with a small number of producers in an ejido, thereby discouraging the entrance of competing AI's in the ejido. At the same time, producers must bear very high costs (including search, transportation, risk/uncertainty, etc.) in order to find another buyer for their harvest. Despite being a natural monopsonist, the AI is ultimately limited in the rents it can extract by the existence of the other processors -- the threat that they will enter the market, or that individuals will sell to them.

In practice, the AI uses the interest rate and the grading discount rate as a method of extracting rents from the producers with whom it contracts. The AI probably uses these instruments because they permit the firm to extract discriminatory rents in a way that cannot be easily identified by producers, thereby minimizing animosity among the ejidatarios. No growers interviewed understood how to calculate the interest rates charged and the producers have no way to verify the accuracy of the impurity level used to make the discount. The discount for impurities is ostensibly for weeds, dirt, crystalized seeds, etc., and could be determined scientifically. In practice, scientific tests are not used and the purchasing agent for the AI can choose any discount level (within a reasonable range) without the producer having a way to verify its accuracy. Growers with high yields find their product graded down. There is also favoritism toward larger growers, but this may have an economic basis.

The AI will purchase rice on the spot market from the producers with whom it does not contract if there is sufficient demand. As mentioned above, producers with no contract with the firm run the risk of not being able to sell their product to the AI in certain years. Independent growers would have to seek a market for their product outside the ejido and would incur high search costs.

Conclusions

The rice contract in El Gargantillo illustrates the ways in which the AI is able to exploit missing credit and product markets in order to minimize its production and transaction costs. The provision of credit and inputs by the AI is conducted with very low transactions costs. The credit (in kind) is provided in a timely manner with a 100 percent repayment rate, no collateral, and very little paper work, overhead, or bureaucracy. Collection of the harvest and payment is also performed efficiently with trucks arriving on time and payment being given on the spot.

Despite the efficient provision of goods and services by the AI, the AI is able to control interest rates, harvest prices, and the discount rate to extract surplus rents from producers. It is able to do this because of its monopoly/monopsony position in the ejido. Of course since costs and yields vary among producers, and the AI cannot perfectly discriminate, some growers do better than others.

Good government policy would take advantage of the efficient credit and input provision while reducing the rents accruing to the AI. A policy that encourages competition among the AI's in input and credit provision and the product market would transfer some of the monopsonistic rents from the AI's to the producers. A functioning competitive market among the AI's would mean that the rice purchasers would be competing to offer not just a competitive price, but a competitive "package," including low input prices, interest rates, and grading discount rates.

Policies to encourage competition in the rice processing market might include: 1) encouraging small-scale processing facilities through credit and tax policies (which has been proposed by the producers of El Gargantillo); 2) developing a commodity market to encourage purchasing competition with processors from other regions; 3) helping the growers to organize and bargain with the AI; 4) creating third-party grading; and 5) anti-trust legislation to prevent price collusion and market concentration.

A second best policy would be to maintain government credit, input, and purchasing programs to compete with private AI's in order to maintain low prices. This was the policy of the Mexican government in the past but it has proven expensive to conduct. Such a policy does not take advantage of the AI's efficient credit, factor, and product distribution methods.

V.8. Sugar, tobacco, coffee, honey

Sugar, tobacco, and coffee are all examples of crops that involve large numbers of ejidatarios in production and where the GOM was heavily involved for decades. The liquidation of the GOM agroindustrial firms and the withdrawal of the state from most market intervention in these commodities is changing relations in these sectors. Here we discuss briefly some possible consequences in terms of the theory we have outlined above.

V.8.1 Tobacco

The Mexican government created the parastatal Tabamex in 1972 as an intermediary between the cigarette companies that were the main tobacco buyers and the ejidatarios that produced the tobacco. It was created by political pressure from the producers, and resulted from conflicts in Nayarit and Veracruz with the firms. Two firms, La Moderna and CIGATAM, accounted for 99 percent of the Mexican cigarette market and were the principal contractors for tobacco.

Tabamex took responsibility for dealing with the 25,000 producers, including the financing of production, the actual production process itself, and the purchase and processing of the tobacco. Credit administered by Tabamex was provided by the private companies. Producers were limited to financing for 4 ha., essentially creating politically administered quota assets for many smallholders, and fixing a small-scale structure of production. While some tobacco growers prospered, many received very low imputed wages for their work (Giarracca 1985), and the Nayarit region, for example, was characterized by a high rate of outmigration to the United States.

The GOM liquidated Tabamex, placing the relations with the producers back into the hands of the cigarette companies. As with some of the other cases discussed in this paper, government control had not led to significant investment nor improvement in efficiency, and in fact the situation had deteriorated. Though it is too early to predict the final outcome, the strategy of La Moderna is instructive.³⁹

La Moderna has encouraged the ejidatarios to combine their lands into compact parcels of 60-80 ha. For each group of ejidatarios, one family is named manager. La Moderna then forms an *asociación participativa*⁴⁰ with each group, set to run for 10 years. The firm provides seed, all machinery, no-

³⁹This summary is drawn from Craig Torres, "Mexican Tobacco Firm is Changing the Way Small Farmers Work," *Wall Street Journal*, 7/12/95.

⁴⁰See the discussion of this juridical form below under government policies.

interest credit, irrigation investments, and technical assistance. The ejidatarios provide the land and labor. Profits are split 50-50. After the 10 years, the investments revert to the ejidatarios. The firm claims it seeks to develop a more efficient set of contractors. The firm is currently working with 7,000 ejidatarios on 12,000 ha., and hopes to generalize this model. The firm believes that costs have fallen and yields risen under the arrangement, and they have been able to improve quality and more finely differentiate tobacco grades.

This arrangement is a clear response to the fragmentation of ejidal lands and the low levels of productivity that resulted from the lack of investment under Tabamex. Because tobacco, like sugar, exhibits certain scale economies due to the existence of machinery that can be used, the firm's solution is essentially to convert the ejidatarios into workers as it increases investment in the crop. Of course it is unclear whether the group farming arrangements will survive on their own; most experience suggests that they will not.

V.8.2 Sugar

The GOM sold the 48 sugar mills it had previously nationalized from 1988-1992. Many of the mills were purchased by soft drink manufacturers, such as Coca Cola or Pepsi Cola, and other food manufacturers that require sugar. There are strong pressures to compact the ejidal lands and farm them as single units under the control of the mill, to achieve economies of scale afforded by mechanization. This is being resisted by the growers (Chollett 1994). There are an estimated 128,000 cane growers in Mexico, most ejidatarios.

An earlier study by Gudeman (1978) in Panama of sugar production is instructive. He found that the mills were able to exercise monopsony control over the small producers, maintaining them in a cycle of immiseration, and he favored a cooperative to counteract this power. Instead the government cleared the land and turned the peasants into workers in the mill or on the plantation, using scale economies and machinery to increase productivity. The peasants were also paid an annual rent on their land. Gudeman found himself forced to admit that the peasants were in almost every sense better off: they worked less, they had more material goods, more food, and they had expectations for their children to go to school.

Sugar is a crop with scale economies. Holding on to a small-scale production system out of some nostalgia may be counterproductive from the point of view of the producers. However, sugar mills are natural local monopsonists, and some countervailing power must be created to protect the interests of the growers and workers.

V.8.3 Coffee

Coffee is a large sector in Mexico, with an estimated 250,000 growers, 70 percent with less than 2 ha. Mexico is the fourth largest coffee producing country, after Brasil, Colombia, and Indonesia, producing about 3-5 million sacks (of 60 kg.) each year. Coffee has been the principal agricultural export of Mexico in recent years, and approximately 70 percent of production is exported. Many producers sell

to intermediaries, though direct sales to foreign firms are increasing.

The government parastatal, Instituto Mexicano del Café (Inmecafé), was created in 1958 to regulate the market and issue export permits. It was also involved in technical assistance, credit, and research. It was liquidated in January 1993, but had been reducing its activities, as at its peak it had a budget of US\$250 million and 4,400 employees. It has been replaced by a Consejo that seeks to promote Mexican coffee and coordinate government policy, with about 30 employees. The government never exercised the degree of direct control in coffee that it did in sugar or tobacco, but its withdrawal creates problems and opportunities for small producers.

As is true in many sectors of Mexican agriculture, smallholders in coffee who have failed to repay their debts have been cut off from formal sector credit. This has limited their ability to invest in coffee production, leading to lower yields and poorer quality production. One of the biggest problems with Mexican coffee has been a lack of attention to quality, and consequently Mexican coffees have generally been used in mass-market ground coffees sold in Mexico and the United States, as opposed to being sold in whole beans to a high-end market.

Because many small coffee growers are organized into local cooperatives, various efforts have been mounted to pursue a different strategy of production and marketing. The Confederación Nacional de Organizaciones de Cafecultores (CNOC) was formed to represent 107 cooperatives in southern Mexico, or about 55,000 small growers, after the international coffee agreement collapsed in 1989 and Inmecafé began to withdraw. It formed two organizations to export coffee:

1. Promotora, SA de CV, the main exporter of CNOC, exporting about 10 percent of production.
2. Aztec Harvests, started in 1990 and a California corporation since 1992. The directors are from CNOC, along with David Griswold, the U.S. manager. CNOC received a grant of \$100,000 from the Inter-American Foundation to capitalize the company. Aztec Harvests sells at most 6,000 sacks a year, or one percent of CNOC's production. It is selling the very best quality coffee produced.

The strategy of Aztec Harvests is an interesting one, because it is part of a movement to sell products produced by smallholders in a more direct way to consumers in high-priced markets, such as Europe. Aztec Harvests has succeeded in obtaining contracts to provide coffee for Ben and Jerry's coffee ice cream and for United Airlines flights from the United States to Mexico. It is an example of brand differentiation, a relatively sophisticated marketing strategy.

A related approach has been the development of organic coffee production, which began in the 1980s in Mexico, mainly for the European market. The pioneer importer was Max Havelaar of the Netherlands. There are now a considerable number of roasters, such as Equal Exchange in Boston or Thanksgiving Coffee in Colorado, which import organic coffee directly from Mexican cooperatives. Growers are typically paid a premium of 20 to 30 percent for organic coffee. The Mexican government has recently provided some subsidies for organics. One study of organic production

showed that it required significantly more labor that tended to conflict with subsistence food production, but that producers were willing to shift techniques to receive the higher prices (Plaza 1994).

What is occurring in coffee is essentially a quality differentiation similar to the way wine is marketed. Coffees are presented as coming from specific micro-climates, as organic, as produced by Zapatista peasants, etc. The existence of local-level cooperatives provides the organizational basis to market with direct contracts, to minimize transaction costs and to organize technical assistance. The elimination of intermediaries lowers costs. One problem that an organization such as CNOC has still to confront is that high-quality coffee cannot be grown at low altitude. As long as all coffee was lumped together, everyone received the same price. But if now coffees from higher altitudes receive higher prices due to product differentiation, will those higher returns be shared with the producers at the lower altitudes? Or will the organization fragment along quality lines?

V.8.4 Honey

As similar change is occurring in honey production and marketing. Supported by the Instituto Nacional Indigenista, and financed by SEDESOL, indigenous honey producers in the Yucatan peninsula have set up their own cooperatives and small warehouses for receiving, cleaning, storing, and filling drums with honey. Previously the honey marketing was controlled by a group of intermediaries, who usually paid one price for all honey.

At one such cooperative in Champoton, Campeche, the president of the local cooperative explained how the ejidatarios had never understood that there were different qualities of honey. As a result, when they built their receiving center, they only put in one tank, where all the honey was combined. However, when they began to negotiate contracts directly with European buyers, they discovered that they needed a number of tanks to be able to separate the different qualities of honey, and receive the higher prices.

VI. Mexican Government Policy

The recent shift in Mexico's development strategy includes a fundamental rethinking of the role of the state in the agricultural sector. Concerned that agriculture was a major obstacle to the government's plan for economic recovery, the Salinas administration announced the start of a comprehensive reorganization of the agricultural sector in 1989. At the heart of these reforms is the desire to reduce government support and involvement in agriculture and to make the agricultural sector more efficient and competitive in an open economy setting.

The following section discusses briefly a number of the reforms and their relation to incentives surrounding contract farming. It concludes with a more lengthy analysis of *asociaci\ n en participaci\ n*, the government's proposal for a form of contract farming that combines private capital with ejidal assets.

VI.1 Reduction of GOM subsidies

Long-standing subsidies to agriculture are being removed. Most of these subsidies were input subsidies, and the inputs were produced by parastatal firms that regularly lost money.

VI.1.1. Water

Approximately 2.5 million hectares of agricultural land in Mexico are irrigated with pumped ground water, including many exported fruits and vegetables, as in Baja California, northern Sonora, and much of the BajPo. Pumping ground water for agriculture is an activity that has been highly subsidized in Mexico, as all electricity is sold through a government monopoly, the *Comisión Federal de Electricidad* (CFE). Electricity rates for agricultural pumping (Tarifa 9) have been very low, and were far below other rates in Mexico in the 1980s. The World Bank estimated this subsidy to agriculture at US\$353 million in 1987. From 1990 to late-1993, the Mexican government had been reducing the subsidy with a program of monthly price increases of 3 percent per month, but halted these increases temporarily for one (election) year in response to protests from grower organizations.

Marsh and Runsten (1992) compared the cost of pumping water in various competing regions of Mexico and the United States in 1992. The energy cost per foot of lift was still lower in Mexico than in the United States. Nevertheless, if Mexican agricultural energy prices were doubled to equal Mexican industrial energy prices, most of this advantage would be eliminated. Furthermore, some areas of Mexico, such as Sonora and the BajPo, face considerable lifts of over 300 feet with falling water tables.

Many crops may not be viable in areas with high lifts and unsubsidized electricity. Abandoned orange groves in Hermosillo and Ciudad Constitución are examples of such failed enterprises. Depending on fuel rates, there may be a large-scale switch to diesel engines, as has occurred in parts of California. Use of drip and micro-sprinkler irrigation may become more prevalent. Costs associated with such investments will favor larger farms.

Pressure may also increase to produce fruits and vegetables in surface water irrigation districts (3.3 million ha.) that are now mostly in grains, feeds, and oilseeds. The GOM has been attempting to transfer the irrigation districts to the farmers, and where this has occurred the farmers have achieved significant efficiencies in operating the districts, thereby avoiding water fee increases. However, the districts will still require large capital investments for rehabilitation. Whether the farmers will have to pay for part of such investments through higher water costs is as yet unresolved.

These cost pressures will encourage growers to participate in contract farming arrangements, both to gain access to credit and technology that can help compensate for increased water costs, and to gain access to assured markets where prices are set to account for costs. For example, the frozen vegetable processors in the BajPo are constantly recalculating the cost of pumping water and ratcheting up contract prices accordingly. Higher water costs will favor schemes that include more intensive and higher-value crops.

VI.1.2. Fertilizers and chemicals

The GOM has mostly privatized FERTIMEX and raised the prices of fertilizers. Where anhydrous ammonia cost US\$60-90 per ton over the 1982-1988 period, it cost US\$148 per ton in late 1991; ammonium sulfate was US\$46 per ton in late 1988 and US\$112 per ton in late-1991; Diammonium Phosphate (DAP), which accounted for 85 percent of Mexico's fertilizer imports in 1983, rose from US\$130-200 per ton in the 1982-1988 period to US\$295 per ton by early 1992. These price increases have largely closed the gap with U.S. fertilizer prices, except where it is actually less expensive to produce them in Mexico, as with some of the nitrogenous fertilizers. Imported fertilizers, such as liquid fertilizers and DAP, now actually cost more in Mexico than in the United States due to transportation and border costs.

Higher prices for fertilizers have already led to their abandonment on much rainfed land, and it will reduce use on irrigated land. Since it was widely believed that excessive fertilizers were used in Mexico before these price changes, this may not have drastic consequences for yield, and will have environmental benefits. It may also encourage the use of drip irrigation that allows application of fertilizers and chemicals more directly to the plants, thereby saving on several input costs. It may also encourage more interest in composting and organic farming techniques.

Agricultural chemicals were never produced by the Mexican government, but their prices were registered and controlled politically in different periods. There are now apparently no controls of any kind.

Higher fertilizer and chemical prices will encourage growers to participate in contract farming arrangements that provide such inputs as advances, as is often the case. Again, in many contracting arrangements, prices are set to account for costs of production, as opposed to commodity markets, where farmers are all price takers.

VI.1.3. Agricultural research

Most government-sponsored agricultural research is conducted by the National Institute for Forestry, Agriculture, and Livestock Research (INIFAP) with its 20 research centers and 85 experiment stations throughout the country. Like many Mexican government institutions supporting agriculture, INIFAP has traditionally focused its research efforts on grains, and has suffered severe budgetary reductions over the last decade (Cook et al., 1991).

The GOM has encouraged INIFAP centers to be more responsive to local growers and to look for supplemental funding from the private sector, but the personnel available to INIFAP who can work on intensive crops is severely limited. Many of the former INIFAP and CONAFRUT researchers have left to work on their own as consultants or growers. Even at its peak, CIAB in the BajPo had only one specialist in vegetables and ten in fruits out of 150 researchers.

There is widespread agreement among processors and growers involved in horticultural contract farming that the government is not doing enough to fund and perform basic research on fruits and vegetables in Mexico. Most of the processors perform trials and many of them are attempting to experiment with new crops. However, they admit that it is a slow and costly process and one they are not fully equipped to do well. Furthermore, the current "ad hoc" system leads to a great deal of duplication of effort and lost time. The lack of government-sponsored research is probably the most serious long-term constraint to the expansion and diversification of Mexico's horticultural sector, and no doubt impacts many other crops similarly.

VI.1.4. Agricultural extension

As with agricultural research, most of the GOM's extension agents focused primarily on grain crops, but they were notoriously ineffective. As a result, the GOM privatized the country's extension service in 1990. Neither the SARH nor INIFAP have extension activities now, with the exception of a high productivity maize program (PROMAP). All farmers who obtain loans from the GOM through either BANRURAL or FIRA are required to contract the services of a private extension agent, and to cover at least a portion of the cost.

With the withdrawal of the GOM from agricultural extension, the technical assistance typically provided through contract farming arrangements becomes much more important. Particularly for smallholders, who have less ability to hire private extension assistance, participation in a contract farming scheme may be their best opportunity to receive quality advice and training. In some of the cases we have reviewed, such as the Del Cabo cooperative or the frozen vegetable industry, the ejdatarios involved had never received any extension assistance before their entrance into the scheme.

VI.1.5. Credit policies

In 1989, the Salinas administration completely restructured BANRURAL and began reducing credit subsidies to agriculture. BANRURAL no longer provides loans to small farmers without adequate collateral, or to large commercial farmers. The smallest farmers and those with unpaid debts (*cartera vencida*) were cut off, some being accorded small loans or grants by PRONASOL. Collateral requirements were raised to 2:1 or 3:1, but ejidal property has not been allowed as collateral. This has effectively excluded a large percentage of smallholders from formal credit. The larger farmers are now required to obtain credit directly from the commercial banking system. Moreover, BANRURAL has ceased non-banking services.

More significant perhaps is that the government has also eliminated, in large part, subsidization of the real rate of interest. Only small farmers and other eligible farmers producing grains received any form of credit subsidy by 1991. Of note has been the high real cost of credit in Mexico; even before the devaluation of the peso at the end of 1994, the GOM was maintaining relatively high interest rates to attract foreign capital. The real Mexican rate was almost twice the real rate of interest prevailing in the United States and Canada. Even borrowing dollars in Mexico (from Bancomex) has been more expensive than borrowing dollars from a commercial U.S. bank: in 1994, the rate of interest (in dollars)

was over 20 percent in Mexico, versus about 10 percent in the United States.

High interest rates led to high default rates, which led to the formation of the Barzon lobby to pressure the government to restructure and forgive agricultural debts. As a result, investment in Mexican agriculture in recent years has been severely constrained. The 1994 devaluation has set off an even greater crisis, as spiraling interest rates (all loans had adjustable rates) caused almost universal default. In 1995, a massive effort at debt restructuring is underway, and little new capital is being loaned.

In these circumstances, the attractiveness of obtaining relatively low-interest credit through contract farming or partnership arrangements is obvious. Particularly for small producers, there may be no other means to obtain formal production credit, leaving them to self-finance or borrow informally at very high rates of interest.

VI.2. Reduction of GOM intervention

VI.2.1. Elimination of CNPH control

The control of the *Confederación Nacional de Productores de Frutas y Hortalizas* over export permits and certificates of origin has been eliminated by the GOM. Benito (1990) saw this control as a severe impediment to the rational expansion of the sector, and its elimination has encouraged entry in many formerly restricted products. However, most of the CNPH members were ejidatarios, and the elimination of government intervention in the sector has left many of them without financing.⁴¹ In this sense, elimination of CNPH control has reduced the participation of ejidatarios in contract farming by removing their property rights over government-granted quotas.

VI.2.2. Trucking deregulation

In July of 1989, the government deregulated the domestic trucking industry to increase competition and lower rates. The importance of this policy is apparent when one considers that due to the inadequacy of Mexico's rail network, over 80 percent of all freight is moved by truck.

Prior to the deregulation, trucking in Mexico was divided into 11 regional routes with regional cartel-like centers determining all cargo movement in their respective regions. Truckers were not allowed to cross regions and were restricted to specified routes and specific types of cargos. Entry by outsiders was discouraged by the large firms that had gained control over the ability of the centers to issue permits. This excessive control had led to obsolescence of the trucking fleet and high domestic shipping costs.

In essence, the deregulation removed all barriers to entry. Truckers can now obtain a permit directly from the Ministry of Transport and they may move, unload, and load any type of cargo in any part of

⁴¹See the discussions of melons and strawberries.

the country.⁴² In November 1990, the government removed most import barriers on imported equipment, including local content requirements, to lower the costs of trucks and help to modernize the trucking fleet in Mexico. This led to the import of much used equipment from the United States and greatly increased competition, driving down trucking rates.

VI.2.3 Privatization of Parastatal Firms

The GOM has sold a large number of state-owned enterprises in recent years. The Salinas administration made privatization a cornerstone of its economic policy. Among the firms sold were all 48 of the state-owned sugar mills, from 1988-1992. Tabamex, the GOM's intermediary in the tobacco industry was liquidated, as was Inmecafø, the GOM's intermediary in coffee, in January 1993. It is likely that the remaining assets of the GOM in agroindustry, such as CONASUPO, will be sold in the current sexenio.

The GOM not only sold its assets in these industries but also withdrew in many cases from controlling export quotas, prices, and other aspects of commercialization in which it had long been involved. Such free market policies have not yet led to large investments by the private firms that purchased the assets, but this may be due to macroeconomic factors. It is certainly too soon to judge the effects of NAFTA in this regard.

Since many of these sectors involved large numbers of ejidatarios delivering products to agroindustries (which is what caused the GOM to intervene in the first place), privatization will have a profound effect on Mexican agriculture. Some preliminary observations on tobacco, sugar, and coffee were discussed above.

VI.3. Land reform

A significant recent change in Mexican agricultural policy is the complete overhaul of the laws governing land ownership and corporate investment in agriculture. The Mexican Congress approved and finalized these changes on January 6, 1992 in an amendment to Article 17 of the Mexican Constitution.

Lack of investment was one of the key motivations for the reform. The Mexican Constitution defined strict limits on the size of individual private holdings based on its declared use. Private farmers had full property rights but were only able to own 100 hectares of irrigated land for row crops or 200 hectares for rainfed land, up to 300 hectares of irrigated land for orchards, and the amount of grazing land capable of feeding up to 500 head of cattle. It is widely believed that these land size ceilings have discouraged land productivity-enhancing investments. In addition, the constitutional obligation of the

⁴²The deregulation still prohibits U.S. truckers from operating in Mexico. Likewise, Mexican truckers cannot operate in the U.S. These laws will change in the future as the NAFTA provisions come into effect. This will increase competition.

government to continually redistribute land created a climate of insecurity among private land owners in Mexico, further discouraging investment.

The Constitution also prohibited all foreign and domestic corporate investment in production agriculture (i.e., agricultural land). This restriction effectively excluded a potentially large source of capital to improve agricultural productivity and has impeded technological change.

The highlights of the reforms include:

Removal of the government's obligation to expropriate large landholdings and redistribute land to landless peasants. Salinas declared the agrarian reform finished and said there was no more land to distribute.

Titling of ejidal land, legalization of the renting of ejidal land, and the option for the privatization of ejidos, which would allow ejidatarios to sell the land or use it as a form of collateral.

Elimination of the constitutional prohibition against corporate farming, with foreign corporations also permitted to own land.

Reaffirmation of the current farm size ceilings, with the proviso that those who made capital investments to improve their land would be granted exemptions from the established ceilings.

The "end of agrarian reform" is a political issue that of course will never be resolved. The titling of ejidal land has progressed very slowly, and virtually no ejidal land has been sold for farming purposes. The legalization of ejidal land rental and the joint-venture provisions of *asociación en participación* (discussed below) do appear to be creating more interest on the part of private firms in projects that include ejidal lands. At this early point of assessment (1995), it appears likely that these changes in land laws will lead to more contract farming with ejidatarios, but that within ejidos there will be more concentration of land, either through rental or, eventually, sale.

VI.4. NAFTA

The North American Free Trade Agreement (NAFTA) entered into effect at the beginning of 1994. NAFTA favors fruit, vegetable, and other intensive agricultural production in Mexico because it lowers trade barriers into the U.S. and Canadian markets, lowers the cost of inputs imported into Mexico, and holds the potential for the entry of important foreign service industries (e.g. financial and agricultural) into Mexico. It also holds the potential for severe price competition in several widely grown crops, particularly grains, thus encouraging Mexican growers to diversify or face bankruptcy. As NAFTA is to be phased into over a 15-year period, it is early to see significant effects. However, it is clear that Mexican agriculture lacks the capital needed to invest to take advantage of the opportunities presented by the trade agreement, and that much of this capital will have to come through joint venture and contract farming arrangements with foreign investors. Several of the cases discussed in this paper demonstrate the problems and possibilities of such arrangements.

VI.5. Asociaciones en participación en México

The GOM has been promoting different types of associations between groups of ejidatarios and private capital as part of its modernization strategy. The SARH had a program toward this end, but it is now mainly under the charge of FIRA which has been experimenting with such associations for over a decade (Dutrenit and Oliveira 1991).

There are two lists of *asociaciones* in Mexico that can be reviewed for some lessons. First, FIRA administered a set of projects throughout the 1980s, which have been analyzed by several authors. Second, a broader effort has been made by the government to promote *asociaciones* since 1990, and many of these have been included in a 1992 list of the Secretaría de Reforma Agraria, which is analyzed here.

FIRA

FIRA has had a *Programa Especial de Asociación de Empresarios Agropecuarios con Productores de Bajos Ingresos* since 1980. Dutrenit and Oliveira report that FIRA has financed more than 200 *asociaciones* over the decade, of which 37 were functioning recently. This suggests that most of the projects, for whatever reason, did not survive as joint ventures.

Muñoz and Fontes (1991) reported on 94 projects realized by FIRA by 1990. Of these, 44 percent were livestock projects (25 percent broilers, 8 percent eggs, 7 percent hogs, 4 percent milk), 15 percent were in flowers, 11 percent were horticulture, 4 percent in grapes, 18 percent in agricultural processing, and 8 percent in forestry, aquaculture, and other activities (Muñoz y Fontes). The clear intent of the projects was to foster relatively high-value activities that intensified the use of land and labor.

Muñoz and Fontes (1991) arrive at several interesting conclusions regarding this group of projects, which are most clearly expressed in the livestock ventures. First, they argue that these projects demonstrate the clear logic of the participation of the private firms, insofar as they are attempting to expand their operations without investing their own money in land and buildings. As the representative of TRASGO noted in a conference in Mexico City:

"Para nosotros como grupo, representa una gran beneficio el saber que contamos con una fuente segura y a largo plazo de abastecimiento de materia prima, sin invertir en activos ni en capital de trabajo en granjas avícolas..." (Lic. Arturo González Lima, México, D.F., 1 Abril 1992)

This type of contract farming has been common in broiler production in the southern United States for over 30 years. The farmer owns buildings which cannot be used for anything else and so becomes dependent on the firm for inputs, technology, and marketing. The firm avoids tying up capital in fixed assets. The form of contract is at times a problem, because the outgrowers have little bargaining power. The oversight by the government in Mexico is probably useful in this regard.

Second, the access to ejidal assets is made even more advantageous because the ejidatarios can borrow money at lower rates of interest from FIRA, thus increasing the profitability of the projects. While real rates of interest have risen in Mexico as inflation has declined, small farmers ("low-income producers") were still eligible for relatively cheap credit in 1991, as opposed to the high real cost of credit in Mexico (7.3 percent) to the private sector for activities such as FIRA was promoting in these *asociaciones*. While this rate represented a significant decline over the previous few years (due to the general decline in real interest rates in Mexico), it was still almost twice the real rate of interest prevailing in the United States and Canada in 1991. Though export-oriented ventures in Mexico had access to loans in dollars at more competitive rates (though it still cost twice as much to borrow dollars from Bancomext than from a U.S. bank), virtually all of the livestock ventures were oriented toward the Mexican market. The inescapable conclusion is that the Mexican government is subsidizing the *asociaciones* through credit, and that this is a powerful incentive to induce the participation of the private sector.

Third, MuZoz and Fontes note the leading role of the State in promoting the *asociaciones*. Some businessmen have said they are doing it out of "social duty." Since 1990, several other dependencies of the government have taken an even more active role in beating the bushes for new projects and trying to push them through to realization. Apparently, no foreign firms appeared on the FIRA list (MuZoz y Fontes), although there are several which have since joined. All of this suggests that the program has a social and political purpose that the government is actively promoting, and that some of the projects may not be economically viable at market prices.

MuZoz and Fontes point to the VaquerPas project as evidence of this. Conceived as a large-scale effort to grow corn and beans with a high level of technology, the project apparently would not have been profitable without a series of subsidies, especially debt-equity swaps (MuZoz y Fontes, p. 20). Similarly, a proposed project between Spanish capital (Costa Brava) and ejidos in the south of Sonora never came to fruition because the project proposal was riddled with errors that guaranteed that it could never be profitable, a fact that the government of Sonora was forced to point out. Another project to join 10,000 ejidatarios with the Canelos farming family in the Huites/Fuerte-Maya irrigation district has a large subsidy from *Solidaridad* built into it, probably the first of many if it is realized.

Nevertheless, the broiler projects have been relatively successful. The firms have discovered that the contract grow-out is often more efficient (better meat to feed ratio, lower mortality) than many of their own integrated operations (González Lima; MuZoz y Fontes). Dutronit and Oliveira report similar results in their study of contract egg production with BACHOCO. Of course these are technical, not economic measures, and it may well be that all family labor time is not being valued in the contract ventures. This is certainly the case in much of the fruit and vegetable production, as discussed above. But this is of course the "advantage" of the peasant producer, as Chayanov noted long ago. These *asociaciones* present the small producers with new opportunities that often allow incomes far beyond alternatives, even if the implicit wage is low. As noted at the outset, the problem of small producers in Mexico has more often been that they are left out than that they are exploited. If small producers have a viable means of exit, then they can decide for themselves.

Secretaría de Reforma Agraria List of Projects

A list of 140 *asociación* contracts signed since 1990 was reviewed. Some of these projects were financed by FIRA, but there is probably little overlap with the FIRA list discussed above.

There were 35 livestock projects, some of which were quite large and involved dozens of ejidos. This sector is clearly the main area of activity in the *asociaciones*. There were five cattle-feeding enterprises and several hog operations that were being built from the ground up, but for the most part the ejidatarios already had buildings that were sitting unused. And a large percentage of the ejidatarios owed the banks money for the buildings and their past operation. Of 30 chicken and hog projects, at least 22 of them concerned rehabilitating buildings and paying off overdue loans (*cartera vencida*).

Overdue loans also cropped up as a justification in several fruit and vegetable projects and a feed plant. But this had apparently become the policy of choice in Tamaulipas for all types of products, as approximately 25 of the projects in that state involved ejidatarios who produced grains or other commodities and who were teamed with an *empresario particular* to co-sign the loan, since the ejidatarios had unpaid debt. In most of these latter cases, the empresario paid off the debt, provided working capital (usually including wages for the work), and rehabilitated buildings or irrigation works in exchange for the crop production over a period of years.

Thus, many of the *asociaciones* are marriages of convenience to repay debts, relatively complicated means of renting out the land. The banks are essentially requiring the creation of such *asociaciones* in order for the ejidatarios to receive further credit. In this sense, the program could be seen as a means to cut government loan losses to agriculture.

There were 10 projects in forestry (mostly mills developing supply sources), 9 projects in rice, and a variety of different field crops in special situations, most of which could be termed contract farming (*compra-venta*). These last included such things as Bimbo contracting for wheat and VISA contracting for barley for beer.

In the fruit and vegetable sector, there were 10 projects in bananas and two in mangos, mostly real joint ventures with contracts of from six to twelve years. Similarly, raisin and wine grapes were being financed in Sonora and La Laguna for 10-year periods. Most of the rest were short-term production contracts or marketing agreements, including pineapple, melons, potatoes, pickles, broccoli, and chiles.

A large Sinaloa firm installed drip irrigation for tomatoes on 1100 hectares of ejidal land in Baja California. The ejidos were to inherit the drip system after 5 years, but it was unclear whether they would have any water to pump through it, or whether the contract was in fact signed to gain access to their water.

Another firm in Sinaloa was to build an irrigation canal to irrigate 2,000 hectares of land in that state in exchange for a share of the proceeds for some years. A fruit and vegetable broker agreed to fix up a packing shed, fix the irrigation system, and pay the debts of two ejidos in Tamaulipas in a joint venture to grow chiles, corn, and melons on 835 hectares.

Conclusions to the Asociación experience

Several things were clear in reviewing these projects. First, as noted above, much of the activity revolved around unpaid debts and means to resolve credit-worthiness problems for the banks. This might be driving government promotion of these schemes as much as anything, but it does have the advantage of putting fixed assets back into use.

Second, many of the arrangements are practices that were commonly carried out "under the table" in the past. For example, the Baja tomato arrangement is a relatively common practice, where a private investor makes an investment such as irrigation, pays rental on the land, and probably also hires some of the ejidatarios, and the ejidatarios end up with the investment good at the end of the contract. What has changed is that now the private firm can borrow money from the bank to finance such arrangements. It may even be able to borrow the money via the ejidatarios at preferential rates.

Third, although some of the firms are large enterprises that can guarantee access to markets, some are not, and it remains to be seen how much technology and know-how are transferred to the ejidatarios, and what happens once the debts are paid and the projects are concluded.

Fourth, much of the private participation is motivated by access to cheap capital via the ejidatarios or access to earlier investments made by the Mexican government in the ejidos. For relatively small debt payments, one can gain access not only to land and labor, but also to irrigation, machinery, animal structures, packing sheds, and so forth.

Fifth, there are relatively few instances of foreign capital entering into *asociaciones*. This may be due to a history of foreign capital using Mexican intermediaries to deal with illegal renting of ejidal land.

V. CONCLUSIONS: Market Failures, Peasants, and Contracts

Adopting contracting with ejidatarios as social policy in rural Mexico is essentially an attempt to compensate for incomplete institutions and market failures. However, the experience with contracting shows that it solves some of these problems better than others.

Credit

There have been very incomplete credit markets in Mexico and the situation has worsened in the past decade. Contracting solves the problem of operating capital, as either the contractor provides the money and/or inputs or the contract itself serves to induce the bank to loan to the producers. However, short-term production contracts--which are common in much fruit and vegetable production, for example--do not solve the problem of investment capital. Only longer term contracts or joint ventures that expressly provide for investment will buy investment goods for ejidatarios.

In reviewing the *asociación en participación* experience, it was apparent that the banks have had some success in inducing private entrepreneurs to finance the rehabilitation of irrigation works and poultry and hog structures in exchange for being able to market their production. There were, however, very few instances of infrastructure built from scratch, and it remains to be seen whether even the offer of subsidized credit will be sufficient to induce long-term investment on *ejidal* lands, that is, whether private investors will substitute for the role the government has played in this regard.

Extension and Technology Transfer

Since the government generally provided very little extension service to small producers, and what it did provide was of questionable value, the role of contractor (or *asociante*) as provider of technology and knowledge is a potentially important one. There are two problems.

First, the cases of frozen vegetables and strawberries in central Mexico noted above are also examples of highly contrasting degrees of technology transfer and extension. The large U.S. frozen vegetable firms taught people how to grow the crops, worked to develop systems of production appropriate to local conditions, introduced new varieties, and joined with growers to solve pest and disease problems. In contrast, the U.S. brokers in the Mexican strawberry industry transferred little technology to Mexico, which allowed the productivity gap between Mexico and the United States to widen.

It is widely observable that producers who need extension assistance are better off under contract to a firm that is itself a producer--or has the resources and commitment to act like one--than they are dealing with firms that are mainly marketing intermediaries. This is an important conclusion of Dutronit and Oliveira in their study of FIRA projects⁴³, it is apparent in Stanford's discussion of the melon industry in Apatzingan and in Rosset's analysis of melons in Central America, and it appears in Jaffee's study of contracting in Kenya. Brokers are not good partners for peasants.

Second, even with a responsible and committed firm, small producers are easily lost in a crowd if the firm is dealing with a variety of contractors. This raises the question of the appropriateness of the technology being transferred. If the firm is offering a production system which it uses itself, or which is used by large farmers, it may not be the most desirable technology for peasants, given the risk considerations, access to family labor, and capital constraints typical of small producers. Dutronit and Oliveira's recommendation that the *ejidatarios* hire their own technical assistance to also act as an intermediary with the contracting firm is a good one in this regard. It would be even better if there were an adequate supply of such assistance in Mexico, private extensionists who were educated to be sensitive to the needs and constraints of small producers. Provision for such private extension also relieves the contracting firm of part of the burden of transaction costs inherent in offering extension to large numbers of small producers, and may make such associations more attractive. The policy of

⁴³They conclude: "...en la medida en que el otro productor sea una empresa establecida e integrada en la *IP*nea de producción de la *asociación*, conozca mercados y políticas de comercialización y domine la tecnologíaPa utilizada en el proyecto, se asegura una mayor estabilidad a la *asociación* ante quebrantos, mejor calidad en la asistencia técnica y mayor asimilación de tecnologíaPa por los productores de bajos ingresos." (Dutronit and Oliveira, 1992, p. 569)

FIRA to require such assistance is helpful, but would be more viable if the government were paying sufficient attention to the training of human resources.

Marketing

Markets are very thin in many specialized agricultural products. In such commodities as fresh fruits and vegetables they are also very risky. Contracts with established firms that have secure access to markets can greatly lower the risk of peasant participation. As with technology transfer, all studies concur on the importance of avoiding speculative intermediaries. Rosset cites examples of small producers in Central America who were forced to take large losses that they could not afford because they had dealt with intermediaries who were unwilling to absorb low market prices or who simply disappeared. Jaffee emphasizes similar problems in export fruit and vegetable markets in Africa. These problems cropped up in our studies of blackberries and melons. There perhaps should be a process of bonding of intermediaries, a fund to pay growers when the intermediaries fail, and some means for settlement of disputes.

Marketing barriers are probably the most significant obstacles to peasant participation in lucrative products. The great irony of this discussion is that research demonstrates that peasants' interests are often better served by large, even multinational companies than by the typical intermediary. This directly contradicts most of the discussion in Latin America in the 1970s, which held that peasants would become slaves to international capital. But of even greater importance than size is an honest commitment to deal with groups of small producers as partners.

Research and Education

Although contract farming can do a good job of substituting for failed technology markets, it generally does not do much to solve agronomic problems that require significant research. One has only to look at the export fresh fruit and vegetable industry in Mexico to find countless problems of soil-borne disease, poorly adapted varieties, salinity, erosion, and pest resistance, all leading to low yields.

A recent study of a variety of fruits and vegetables in the context of the North American Free Trade Agreement (NAFTA) showed that Mexico's ability to compete with the United States was severely handicapped by consistently lower yields (Cook, et al. 1991). And in a crop such as avocados, where Mexico has superior yields and much lower costs, they have been kept out of the United States market by a pest problem and the lack of research to address it. Mexico will not be able to take advantage of the opening provided by NAFTA if research deficiencies are not addressed.

The belief that private capital will undertake such research is largely illusory. The attempts in Sinaloa to tax fertilizer to pay for research have been insufficient. The efforts of frozen vegetable processors to solve problems in the BajPo are underfunded and they all complain that they cannot do it themselves. Producers in Mexico appear willing to contribute to applied research on their crops, as they do in the United States, but they are unwilling to finance the educational infrastructure and the long-term basic research that is needed.

Instead, what usually occurs is the problems become so severe that an industry moves on to another location. Stanford reports that the decline in melon production in Apatzingán is partly attributable to diseases and low yields that made other regions more attractive once CNPH production controls were removed. A 1983 survey of growers in the Bajío that we conducted found that the crop most commonly abandoned in the region was dry beans (frijol) because of disease problems. Asparagus growers in Guanajuato have cut back production and exports as they try to solve what some believe is a viral problem, which has drastically lowered some yields. The long-term viability of an internationally competitive agriculture depends on an infrastructure of research that currently does not exist in Mexico, and for which contract farming will not substitute. The special needs of small producers are particularly ill-served by depending on imported technology.

Similarly, no association with private capital can solve the problems created by a lack of basic education. In some sense this is one of the greatest obstacles to the *asociación* model, because it widens the gulf between the contracting parties. It argues even more strongly for the use of sensitive private extension to assist the ejidatarios in adopting new technology and coping with the demands of their relationship to a larger firm. The peasant household has a logic that may include growing corn, selling family labor, and respecting social obligations. This reality must be recognized and respected in the design of associative projects.

Organization

Finally, an obvious means to cut transaction costs for smallholders is through organization, but contracting parties are unlikely to organize ejidatarios. By forming democratic organizations and presenting a united front, ejidatarios can absorb the transaction costs collectively. The SARH/CEPAL survey of ejidatarios in 1990 showed a quite small amount of ejidal organization for marketing purposes and this is an obvious obstacle to diversification.

An organization such as a cooperative can also serve to spread risk by averaging prices received from volatile markets. The Del Cabo cooperative in Baja California Sur functions in this manner, paying growers a fixed price for all deliveries of a given product. By adjusting the payout, growers can retain more or less capital at the cooperative level for joint projects.

Joint ventures or cost-efficient contracting with smallholders often presupposes the existence of such organizations of ejidatarios, and it is here that many problems arise. For the GOM (e.g. through FIRA) to ask that an organization be formed to participate in one of these contractual schemes is problematic, because it is not created organically. Much more attention needs to be paid to the keys to successful organizations and the scale or scope at which they cease being effective. This raises the important question of who will do the organizing, and the role of NGOs in this process.

Monopsony

One of the principal concerns of critics of contract farming has been the ability of a contracting firm to exercise arbitrary control over the terms and implementation of contracts. In this paper, we have

argued that this is largely the result of monopsony power which can be checked either by competition with other contractors (as in the BajPo frozen vegetable industry) or through organizations of producers to exercise countervailing power in bargaining with the firm (as has occurred widely in the United States). The withdrawal of the Mexican government from the sugar sector, for example, creates a number of situations where there are de facto regional monopsonies, and some of the problems discussed in our rice study demonstrate some of the problems.

If the experience of the United States is any use in this regard, there needs to be explicit provision made for producers to organize bargaining associations. Another possible institutional change would be to institute third-party grading, where the firm hired to do the grading operated with transparent rules and was mutually agreed upon by the growers and the contractor. The basic problem, of course, is that the legal systems do not function properly in many countries.

The power of the firm to "subordinate" the producers will never be entirely eliminated, but some institutional change or organization could curb the worst excesses. Certainly governments do not need to take over the firms to solve such problems, which was unfortunately the solution often taken in the past. Contract farming with smallholders can work, but it will not work in every case; there are both economic and technical causes of failure that must be addressed from the outset.

It is worth recalling also that in some cases monopsony results from a firm being a "pioneer" in a particular region and crop. In such circumstances, it is typical for the firm to lose money in the initial years. It therefore needs to earn relatively high profits for a period to recoup its investment in production development. Overregulation can keep such pioneering from occurring.

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