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COMPLEMENTARITY AND COMPETITION BETWEEN  
MEXICAN AND UNITED STATES AGRICULTURES

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Notwithstanding the substantial differences in size and wealth of the national economies, there are significant areas of comparability between Mexican and United States agricultures. In this paper I intend first to sketch out the essential elements of the national agricultural structures for both the United States and Mexico along with the currently predominant policy issues which emanate from these structures and announced societal goals. Following the establishment of these bases, the paper will cover the direct areas of competition and complementarity as demonstrated by trade statistics and other generally observable phenomena. The paper will close with considerations of the technological elements which cross national boundaries, and which are and have been effecting individual and societal well-being both in the United States and Mexico. The discussion will concentrate most heavily on the Mexican experience with more modest references to and comparisons with the United States.

Mexican Agriculture

Growth and development are the prime publicly announced policy objectives for the Mexican economy--with the simultaneous objective of broad participation

in the gains from development. Internal and external financial stability may be taken as restraints on strictly growth oriented policies and programs. Activity in the agricultural sector is carried out within the general framework of these policy objectives. Mexico's general economic progress over the past thirty years and more, has demonstrated a long term growth rate of better than six per cent. (7,14) Numerous factors may be considered fundamental to this progress--certainly in the early years, the agricultural sector should be credited with having played an important role in this progress. The face of Mexico's agriculture has been given a particular cast by the significant agrarian reform which has been carried out since the end of the armed phase of the Mexican Revolution and particularly during the late 1930's. In total, use rights to almost one-half of the agricultural lands have been transferred to former landless agricultural laborers through the formation of about 25,000 ejidos giving original benefits to some 2,800,000 ejidatarios.<sup>1/</sup> (1, Vol. I, p.36) While not all of the recipients participate in the market sector of Mexican agriculture, the ejido is a significant element in the agrarian economy. The specialized institutions which serve ejidal agriculture and the overwhelming concentration of its members in the most impoverished group of Mexican society requires that the special group of agrarian reform

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<sup>1/</sup> The authorization for Mexico's agrarian reform is based on the Constitution of 1917 and the detailed specifics are outlined in the Agrarian Codes (the latest reformulation, 1971). In the simplest terms, the principal direct instrument of the agrarian reform is the ejido, that is, the agrarian community which received and holds land under any one of three basic conditions. Whetton defines the ways as, "...lands may have been received as an outright grant from the government or as a restitution of lands that were previously possessed by the community and adjudged by the government to have been illegally appropriated by other individuals or groups; or the community may have received confirmation by the government of titles to land long in its possession..." The term ejidatario refers to an individual who has participated as a beneficiary in a grant of land in accordance with the agrarian laws. The totality of ejidatarios participating in a given grant, together with their families and the lands which they received, constitute an ejido. Thus the term "ejido" refers to a community, while "ejidatario" refers to a specific individual. (16, p.182)

beneficiaries be kept under consideration. (2) It was through rigorous application of agrarian reform laws that a number of structural rigidities were broken which had limited the possibilities of general economic growth. Forces were released which encouraged expansion of agricultural production; factor mobility, including manpower, capital and managerial capacity, was greatly increased. The agrarian structure resulting from the reforms (both the ejidal and invigorated "small" private proprietorship sectors) provided the environment within which water resource development, farm credit programs, price guarantees, technological improvement and other production supporting activities could develop. Agricultural product has grown at a compounding rate of over 4 per cent for more than 30 years, with growth rates estimated to have been significantly higher during the earlier years. (4, p.33)

In many respects Mexico has maintained a relatively consistent and continuing strategy of agricultural growth from the mid-nineteen twenties to the present, accepting that there have been a few significant departures, as for example in the 1930's. The development of major public irrigation projects was initiated under the Calles government of the 1920's, emphasis was placed once again on agricultural research, a public agricultural credit bank was established and the provision of purchased inputs for farming were facilitated. These have been the fundamental elements of public policies related to agriculture for almost fifty years and they continue to stand as principal elements. Some, such as Hansen, with considerable insight trace these policies toward modernization back into the nineteenth century. (5, p.8)

Concentrating our attention on the experiences of the last twenty years a number of these fundamental elements can be documented. For the period 1951-69 the agricultural sector had an estimated 4.1 compounding annual rate of growth; up until about five years ago the rate of growth was consistently above four and one-half per cent. In the last several years, or from about the mid-sixties,

the rate has dropped off to an estimated 2.2 per cent. (Table A-1) We will consider this problem later in the paper, but for the moment we want only to point out that for the two decades being considered, growth in agricultural output was associated with both increased areas under cultivation and increased yields per hectare farmed. (Table A-2) Most students of Mexican agriculture consider that irrigation development has been fundamental to the expansion of the nation's agricultural product. In 1953, Mexico had approximately 1.4 million hectares within formal irrigation projects; by 1970 the figure had ascended to 2.9 million hectares, an annual growth rate of about 5.4 per cent. (Table A-3) Because much of Mexico's farming is practiced in areas of marginal rainfall, the importance of water resource development has long been emphasized. Breakdowns of public investment directed toward agriculture have indicated that almost 90 per cent of this investment has been on water development projects. An additional feature of the water development in Mexico has been the tendency to locate the projects to the periphery of the high population central regions. In 1970 the data indicate that 70 per cent of lands included in formal irrigation districts are in the tier of states running across the north of the country. These states include less than one-quarter of the farming population. Looked at in another way, about 45 per cent of the new lands brought under irrigation through public programs between 1953 and 1970 were located in the Northwest region alone-- a region which includes less than 7 per cent of the nation's farmers and agricultural workers.

The Mexican strategy toward modernization calls for the development of improved agricultural production systems for application in the areas which have received the benefits of irrigation. The successful efforts in agricultural research have been almost exclusively directed towards irrigation agriculture, and the related support measures of input supply; agricultural

credit, crop insurance and farm credit also have been so directed. This kind of concentration of effort, with each program bolstering the other, makes considerable sense from the standpoint of generating a flow of agricultural product to meet domestic and foreign demand. (Tables A-4, A-5, A-6 & A-7)

It does of necessity, however, concentrate the producer benefits from the modernization process in a few hands and in a limited set of regions. The success of Mexican agricultural product growth has been an important support to national economic development. It is true that producer benefits were highly concentrated, in part because of the strategy followed; but, it is also true that many of the social benefits have been passed on to urban consumers by means of lower food costs. But irrespective of the social benefits associated with the strategy followed, the process is challenged on two fronts; one by a slow-down in agricultural growth, and the second from the excessive concentration of poverty within the rural sector. (Table A-8)

While it is possible to consider that the slow-down in production is a temporary phenomenon associated with bad weather, a substantial outflow of workers employed in farming, and/or a response to the lowering of farm price increases, there are also suggestions that the problems are more profound. It can be hypothesized that now, with the principal effects of the agrarian reform having run their course, that it is essential to shift the attention from strictly production oriented policies and problems to a whole new gamut of undertakings. Reducing rural poverty, expansion of internal demand for agricultural products and increasing the employment opportunities both within and outside of agriculture are currently more critical questions than those related to production. (3,11,12) And while the policies related to land distribution, increasing crop yields and irrigation development may all be important and worthwhile, they are not likely to help resolve the overriding

present problems.

In summary, Mexican agriculture can be perceived as having played a substantial role in national development over the past thirty and more years. The sector's fundamental responsibilities to the rest of the society to provide a steadily increasing supply of commodities, both for domestic and export needs has been substantially fulfilled. It has done this without increasing agricultural prices relative to the prices of other items. In terms of the standard evaluations of agricultural development it has also released workers to other sectors and it has absorbed a relatively declining share of net new investment. It follows that the sector has declined in its contribution to gross national product to only slightly more than 10 per cent of the total. We have also pointed out that the strategy employed in Mexico has left a significant fraction of those engaged in agriculture at the bottom of the economic barrel, and this includes the large majority of the ejidal sector.

#### United States Agriculture

In many respects the central issues surrounding agricultural policy in the United States are the reverse side of the policy issues that Mexico has been facing. That is, rather than directing public programs towards the expansion of agricultural product the emphasis has been to devise programs which would tend to hold back the provision of agricultural commodities to a level commensurate with market demand. The rapid changes in production technology have made it possible to supply domestic and foreign markets with less resources than those currently employed in farming. Fundamentally, it is the unequal growth between agricultural supply capacity and the potential demand for its products that has been the farm problem of the United States.

United States agricultural output has increased about 40 per cent over the past two decades; this is a rate only slightly greater than the increase in total population. (Table A-9) Holding down the increase to this level has been accomplished through fairly effective public programs tending to hold down the acreages planted to grain crops and cotton. Notwithstanding the modest rate of growth in agricultural product, the product per worker has increased more rapidly than that in non-farm activities. Land under cultivation also has been reduced. Capital, most particularly in the form of fertilizer, has substituted both for labor and land. Yields of most crops have increased substantially since the 1930's, with some of the strongest gains being registered during the decade of the sixties. A number of economic forces (including those directly related to public programs) have worked to give incentives for this kind of production response.

Here, as in the case of Mexico, the benefits of technological improvements tend to be passed on to the urban consumers of the final products; the expected in cases of products having fairly inelastic demand and where there is simple entry into production. Relatively low agricultural prices over a long number of years have substantially altered a number of the structural parameters of United States agriculture. As has been suggested above both the number of farms and the number employed in agriculture have been declining. There were about 6.3 million farms in the United States in 1930; the number has dropped to 2.9 million in 1970. (Table A-10) In 1930 there were 12.5 million employed in agriculture; this has been reduced to 4.4 million by 1971. The reduction in both number of farms and the employed in agriculture has not greatly altered the nature of family-type farming in the United States. The labor supply on farms is largely provided by the farm family; corporate structures represent less than 1 per cent of all operating units and only

about 8 per cent of agricultural production comes from corporate farms. And even for these farms, over three-fourths are individual or family corporations. The corporate structure in American agriculture is important only in Arizona, California, and parts of Texas and Florida.

While a concentration in producing firms comparable to industrial organization does not exist for agriculture, there have been important shifts in the proportion of different agricultural products coming from the larger sized and more commercial farms. Using the census definitions for large farms (over \$40,000 of gross farm product in 1964 and over \$30,000 in 1929, which is equivalent to slightly more than \$48,000 at 1964 prices). Kyle, Sundquist and Guither show the shifts in the percentage of production originating on large farms for a number of farming types. (10, p.6)

<u>Type of Farm</u>	<u>Per cent of Total Production</u>	
	<u>1929</u>	<u>1964</u>
Vegetable	20.0	81.4
Poultry	3.3	67.9
Cotton	1.4	55.2
Dairy	3.0	23.4
General	0.2	33.6
Tobacco	-	8.2
All farms	5.0	43.7

The data indicate the tendency for the larger farms to provide an increasing proportion of the agricultural product, notwithstanding the lesser tendency for dairy farms and general farms, and recognizing the particular government programs affecting tobacco production. Currently about 200,000 farms, or considerably less than 10 per cent of the total, produce over 50 per cent of the nation's agricultural product. The process of concentration can be expected to continue in the years ahead.

We can turn our attention for a moment to the effects this process of

consolidation and changing structure has had on the well-being of those who have been and still are engaged in farming. As a general proposition we can assert that a number of these recent adjustments in agriculture have been in a socially desirable direction. Costs have been reduced in agricultural production, with farmers substituting relatively available and, in our society, cheap capital inputs for the more scarce labor. And the product mix has shifted in accordance with public demand, from products associated with the traditional diets of some decades ago to the more currently popular styles of foods and nutrition. These are successes, and on balance, should be recognized as such; but, we cannot overlook the stresses which have been placed on the "people left behind"--both those who have left agriculture and those who remain at near poverty levels within it.

A number of important features concerning the United State's agriculture are demonstrated from the U.S.D.A. data showing average incomes for farm operator families, classified by value of farm sales. (Table A-11) One of the most important is that on the average, farming is a minor element of total family income for farms with farm sales of less than \$10,000. A large fraction of the units classified as farms are either part-time or rural residences. The well-being of the families on these units is much more dependent on their off-farm employment opportunities than on what occurs on the farm itself. Unfortunately, the classification covers a lot of variation, and a more rigorous census definition of what constitutes a farm would facilitate analysis. An attempt by Kyle, Sundquist and Guither (op. cit.) using Internal Revenue Service data gives a more useful break-down from the standpoint of specifying the problem of rural poverty. They show that 1.4 million low income farm families averaged a gross adjusted income of about \$2,350 from both farm and non-farm sources. The lower income half of this group had

only modest non-farm reported incomes. While those leaving agriculture in a number of areas, the Northeast, for example, have for the most part been able to do so either at retirement age or by taking on a substantial amount of non-farm employment, this has not been universally true. The adjustments out of agriculture have not been without an incidence of burden. When off-farm jobs have not been available and where the displaced farm workers have had limited skills the social costs are high.

### Commercial Interaction

The agricultural trade relationships between the United States and Mexico are largely a product of the structural characteristics of the two economies. The United States economy can be typified as: large, affluent and with a comprehensive and highly developed agricultural productive capacity for all temperate and semi-tropical crops; the Mexican economy as: relatively large, with intermediate levels of income, and with a fairly well developed and broadly based agricultural productive capacity encompassing temperate, semi-tropical and tropical crops. Trade possibilities in agricultural commodities are largely restrained on the one hand by the long-term imbalance in the United States's capacity to produce farm products relative to its domestic demand, and on the other by Mexico's relatively successful import substitution programs and effectiveness in keeping its agriculture in balance with national product needs. Overall, the United States imports about 12 per cent of all agricultural commodities used domestically; of these products about one-third are non-competitive with domestic producers and are mostly tropical products--with coffee and natural rubber predominating. Mexico also is relatively independent of imports; national production providing for over 95 per cent of its domestic agricultural product needs.

There are, of course, some specialized product needs for the United States, and Mexico has been an important supplier of a number of these. In Table 1 the total of United States agricultural imports are given along with the specific values for a number of commodities which are important in Mexican-United States trade. Overall, Mexico provides less than 10 per cent of the United States's agricultural imports. Coffee and sugar, two of the biggest items on the United States's import list are subject to control regulations, and Mexico must share this market with a large number of other tropical producers. It is in a number of special circumstanced products where Mexico has taken advantage of market opportunity. One of the big items is in feeder cattle. The demand for beef has expanded rapidly in the United States and domestic supply response for feeder cattle is to some degree limited by range capacities. The immediate location of Mexico, with cattle breeds familiar to United States feed-lot operators, and in a tick-free and hoof-and-mouth disease free zone, has propitiated the development of Northern Mexico as a supply region.

We are all familiar with Mexico as a supplier of fruits and winter vegetables. Close to 90 per cent of the tomato, cucumber, strawberry and melon imports originate in Mexico, and for these items Mexican production represents a significant fraction of the national supply during the winter season. Cantaloupe are shipped at a time when there is almost no United States production--hence, it dominates the late winter and early spring market. Mexican strawberry shipments are a large fraction of the winter fresh market and by 1970/71 had captured about 40 per cent of the frozen strawberry market. For winter tomatoes, Mexican shippers provide for about 70 per cent of United States consumption. Mexico also provides over one-half of the winter and early spring fresh cucumber supplies. For these few specialized products, either because of more favorable climatic conditions, or because of the conditions for producti

Table 1. Agricultural Imports, with Proportion Coming from Mexico for Selected Commodities. United States 1970.

Item	Value (Millions of U.S. \$)	Per cent coming from Mexico
All agricultural products	5,667.0	9.1
Feeder cattle	98.7	79.4
Boneless beef	542.4	7.2
Oranges (fresh)	7.2	71.4
Strawberries (fresh & frozen)	25.8 <sup>a/</sup>	88.3
Melons	12.7 <sup>b/</sup>	89.5
Cucumbers	12.3	85.7
Garlic & onions	10.2	68.3
Fresh tomatoes	95.8	99.1
Sugar	620.7	14.4
Coffee (green)	1,159.3	5.5

<sup>a/</sup> Reporting year: June 15 - June 14

<sup>b/</sup> Reporting year: December 1 - November 30

Source: U.S.D.A./ERS., U.S. Foreign Agricultural Trade Statistical Report, Calendar Year 1970. Tables 19 and 20.

(heavy labor requirements), the United States market is dependent on Mexico as a significant supplier.

The data in Table 2 give the total Mexican exports of thirty principal agricultural commodities for 1970 and for a number of these a specification of value exported with the per cent shipped to the United States. With the exception of cotton, the United States is the preponderant market for Mexico's agricultural exports. To a very real degree, Mexico is dependent on its North American Market. And this kind of dependency is not without its moments of difficulty. Four years ago Florida tomato producers concerned about the competition from Mexico voted to establish a market order regulating size and quality standards for fresh market tomatoes under provisions of the 1937 Agricultural Marketing Agreement Act. The size restrictions were considered by Mexican producers to discriminate against them because the restrictions were distinct for the vine ripened (principal Mexican export category) and the mature green categories. Once the Florida order was approved by the United States Secretary of Agriculture, Mexican shippers were required to meet the same quality standards for their production to be introduced into the United States. Mexican producers, government officials, and the national press objected to the unilateral actions of the United States producers, which the Mexicans claimed endangered their established West Coast tomato industry. As it turned out, a larger fraction of Mexico's 1968/69 tomato production met the standards than was originally expected and both Mexican and Florida producers enjoyed the benefits of higher producer prices than would have been obtained with unrestricted shipments. True to the postulates of economic theory, United States consumers were willing to make a greater total expenditure for the lesser quantity of tomatoes. Although by the summer of 1969, and for subsequent years, tomato producers, local officials and West

Table 2. Agricultural Exports, Specified for Leading Commodities with Proportion Shipped to the United States. Mexico 1970.

Item	Value (Millions of pesos)	Shipped to the United States (per cent)
Sum of 30 principal commodities	8,379.4	75.2
Cotton	1,628.4	-- a/
Garlic & onions	88.3	90.5
Sugar	1,135.4	100
Coffee	1,110.8	73.1
Beef	648.8	100
Feeder cattle	979.3	100
Strawberries	397.5	98.9
Melons	215.1	100
Cucumbers	104.7	100
Tomatoes	1,095.9	100

a/ United States agricultural programs preclude the importation of Mexican cotton except for trans-shipment.

Source: Based on data from the Dirección de Economía Agrícola, S.A.G., Mexico 1973, except for feeder cattle which are U.S.D.A. data.

Coast newspapers recognized that restricting the market was sound economic policy for tomato producers both in Florida and in Sinaloa; Mexicans with longer range and broader social interest recognized the heavy hand of unilateral economic actions which could just as easily be employed to damage national interests.

Just as Mexican agriculture is heavily dependent on the United States as a market for its agricultural exports, it is also dependent on it as a supplier for those agricultural inputs which it needs to import. The data in Table 3 identify a number of the leading input categories and specify the proportion being imported from the United States. Rather consistently by input category, three-quarters of the imported supplies supporting Mexico's agricultural production come from the United States. Over one-half of the value of agricultural inputs being imported are machinery and spare parts. Once a line of machinery items is introduced, it is not feasible to shift the sources of supply; for this fraction of its agricultural supply industry Mexico is for an intermediate term dependent on United States suppliers. There is somewhat more freedom to shift the sources of supply for the other categories of inputs.

It is less possible to quantify the non-trade factors related to commercial interactions--nonetheless it is indicated that they be at least briefly mentioned. A principal among these factors is the involvement of United States based agri-business firms in the servicing of Mexican agriculture. The roster of firms with operations in Mexico would be familiar to any Texas farmer: Campbell Soups, H.J. Heinz, DelMonte, Caterpillar Tractor, International Harvester, John Deere, Ford, Corn Products, Anderson-Clayton, National Biscuit, Purina and many others are all established in Mexico. Their developments in new techniques, either technical or managerial, are rapidly introduced

Table 3. Imports of Agricultural Inputs, Specified for Leading Items with Proportion Obtained from the United States. Mexico 1970.

Item	Value (Millions of pesos)	Obtained from the United States
Fertilizers and agricultural chemicals	203.6	79.8
Seeds	30.7	78.8
Breeding Stock	95.2	76.6
Agricultural tractors, machinery & equipment	474.2	74.8
All itemized imports	803.7	75.9

Source: Based on data from the Dirección de Economía Agrícola, S.A.G. Mexico, 1973.

into Mexican agriculture. The appropriateness, considering the extreme disproportion in factor social costs between the two societies and the indicated scale of operations, has not been very carefully studied. One might hypothesize some negative influences. Other commercial interactions include loans to finance agricultural activities. Upon occasion United States banks have provided loans to Mexican agricultural bank intermediaries, and credit is provided by the cotton firms; the amounts involved and the terms of the arrangements are not specified, however.

Non-commercial interactions include cooperative United States-Mexico programs in agricultural research, and plant and animal protection, weather services, and water resource development among others. Mr. Conroy reviews some of the implications of the water program in his Conference Paper; greater detail on the problems and the historical development can be found in Hundley's book, Dividing the Waters. (6) The Rio Colorado Irrigation District includes about 300,000 hectares normally under irrigation, or something less than 10 per cent of the country's irrigation capacity.

#### The Forces Toward Concentration

While faced with quite different problems, the agricultures of both the United States and Mexico are moving toward somewhat similar structures although currently at different levels and quite different orders of magnitude. The majority of agricultural production occurs on a small fraction of the farms in both countries, and in areas where urban employment opportunities exist there is an increasing incidence of part-time farming associated with alternative employment. While this phenomenon is not clearly identified in Mexican statistical reporting, for the United States the 1970 census clarified that 1.4 million of the 2.9 million farmers have a non-farm activity as their

primary employment.

Earlier in this paper we have identified the general structures of both countries' agricultures and have noted how economic forces and public programs have contributed to these structures. It seems appropriate, hence, to explore in slightly more detail the mechanisms which are at work, and to draw attention to the inter-relationships between the two countries under review. The quest for new knowledge and the development of improved farming techniques results in a changing mix of inputs in agricultural production processes. Agriculture in the United States developed primarily on individually owned and family operated farms; the society having ordered this preference under historical land policies and having maintained it with numerous public programs. In many respects the post-Revolutionary society of Mexico ordered this same preference, with some ambiguity with respect to a part of the ejidal sector. Now, although there are about 1.5 million commercial farms in the United States, students of the farm economy estimate that in the near future as few as 100,000 farms could produce almost all of the nation's food and fiber. Comparable statements could be made concerning Mexico. The relevant variables for both societies with respect to concentration of production are: the organization for the discovery and dissemination of new knowledge, the educational background of farmers in various social and economic groups, access to credit at comparable interest rates whether for large or small loans, availability of specialized inputs to various sized farm producers, wage policies, and political actions by affected groups.

The technical side is predominant. Public agencies in both societies are strongly involved in the generation of new technology, and while private research is also carried out, much of the basic research upon which this is based comes from the public effort. Since the knowledge is publicly produced

It does become available to any producer--large or small. But modernized agricultural production techniques are relatively complex and access to their application is considerably more discriminate. Early adoption of a modernized technique is dependent on sources of information which are directly related to the farmer's social and economic position. Operators with larger farms, who are better educated, who have direct access to experiment stations or agricultural extension agents, who are preferential clients of input suppliers, or who have specialized information services at their disposition, get the early possibilities for adoption. And it is the early adopters of production increasing or cost reducing technologies, who are able to capture the producer benefits implicit in the improved technique. Even as knowledge concerning the improved technology becomes more widespread, a number of the techniques are so complex that there may be special capabilities required that the less advantaged producers do not have. And providing for these requirements may require a degree of technical services which the society can not provide on a national scale. This is illustrated in part by the major effort carried out over the past several years in Mexico in the "Puebla Project", where a significant quantity of technical resources have been directed toward facilitating the application of a modestly technical process of producing maize in a region where traditional processes had predominated. (9) More complex production techniques place even greater pressure on the available technical services, particularly when some groups of farmers have low educational backgrounds.

In this context it should hardly be necessary to point out that who owns the land is an important feature concerning who participates in the benefits of agricultural modernization. The differential application of cost reducing techniques permits absorption of a major part of the producer benefits by the

owners of the residual claimant--in this instance the owners of land. While the traditional owner-operator structure of United States agriculture, and substantial agrarian reform in Mexico, have dulled the possible negative influences here, who controls the land has been an important constraint on more equitable sharing of the benefits of development in both countries. An allied consideration is that inter-regional differences in resource endowments or levels of resource development influence the potential for benefiting from modernization. In Mexico little effective research has been directed to improve production practices for natural rainfall zones and the benefits of the improving technology have been largely restricted to the irrigated zones on the country's periphery. Within the United States, too, some of the same forces have been at work. Improvements in cotton production have permitted its extension to the West and have left large numbers of former cotton producing farmers in the Southeast out. Where alternatives have existed for the resources left to one side, the social benefits may be greater than the dislocations involved. When alternatives are few or do not exist, the social costs may not have been given their appropriate weight.

Modernizing techniques in agriculture have rather universally involved the provision of purchased inputs--improved seeds, fertilizers, machinery, and the like. Access to these inputs is determined both by arrangements assuring their availability in appropriately divisible units corresponding to the range of farm sizes, and on the ability of farmers to finance the acquisition. For small farmers, tenants, and ejidatarios these conditions have not always held, and they have not been able to apply the modernized production technique. Thus, a full set of stratifying factors combine to limit the spread of modernized agricultural production techniques to a relatively small fraction of the nation's farmers. The cumulative nature of the individual effects, exacerbates the concentration.

Fundamentally, comparable strategies for agricultural development are being followed both in the United States and Mexico. United States agricultural progress has operated in a fairly parallel fashion to that of Western Europe, Canada and Australia. The process has been one of applying both biological and physical sciences to the practical problems of farming. The results have been rapidly increasing agricultural productivity, with the number engaged in farming being dramatically reduced. In the case of the United States this process pushed ahead most noticeably with the start of yield increasing technologies beginning about 1940, although the farm population itself had been dropping since about 1920. The process of agricultural modernization, using labor saving and yield increasing technologies began at a time when the society was already well developed as an industrial and relatively affluent economy, and where farm populations had started to drop in absolute as well as relative numbers. The people leaving agriculture for the most part could find employment in the expanding industrial and service sections; the society funded expensive public programs to facilitate the movement of two-thirds of the workers out of agriculture. It has been a process which reduced the farm population from about one-quarter of the national population in 1940 to less than 5 per cent in 1971. Even under these circumstances, as was pointed out earlier, a significant fraction of the displaced workers from United States agriculture have been left either in, or at the limits, of poverty as defined in this country.

This strategy of agricultural development is being followed in Mexico (and many other low to medium income countries) under a notoriously different set of economic conditions. The society does not have a strong industrial sector placing stresses on the labor market in search of available workers, it is not economically affluent, and the capital requirements associated with the labor displacing and yield increasing strategies are not without a high

opportunity cost. Markets are narrow, and expansion of supplies of agricultural commodities by a limited set of producers does not necessarily create its own demand. And yet the attractiveness of the United States's high yield agriculture demonstrated to the immediate north is a powerful force. The straight rows, the nicely manicured countryside and the effective supply of agricultural commodities look attractive to policy makers. Mexico's own success in following the formula, and the internationally famous examples in India and Pakistan all serve as positive testimony to the strategy being followed. The tightness of agricultural supplies on world markets in 1972/73 adds weight to the arguments in favor of policies tending toward concentrated production on modernized farming units.

The United States' influence on Mexican markets, both for its final products and as supplier of inputs are documented. We have also suggested that United States' location next to Mexico has had an influence on the strategy which it employs. Mexico is the first country to have worked out a successful set of arrangements for international collaboration on agricultural research. The results have been impressive, in large part because of domestic policies tending to concentrate agricultural development efforts on the same set of production problems which researchers were studying. An ancillary consideration is that the inputs required for the new technologies could be provided by established firms able to respond to the commercial opportunity.

What has not been so well resolved for Mexico is a view of the future consistent with the strategy chosen and the realities of the national society. Is the strategy chosen, so demonstratively effective in increasing production, a hopeful one with respect to the over-riding problems of providing employment opportunities and expanding the demand capacity of a much broader segment of the national population? Neither the view to the North, nor the influences which emanate from there need necessarily be helpful to these problems.

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## Statistical Appendix

Table A-1. Gross Product, Agricultural Sector. Mexico 1950-69

(Millions of pesos of 1960)

Years	Agricultural Sector	Crops	Livestock
1950	15,442	10,176	4,032
1960	23,970	14,790	7,966
1965	30,222	19,921	9,008
1969	32,967	20,063	11,477
Average annual growth rate.			
1951-60	4.5	3.8	7.0
1961-65	4.7	6.1	2.5
1966-69	2.2	0.2	6.2

Source: Adapted from Manuel Rodriguez Cisneros, et.al., Características De La Agricultura Mexicana. Mexico 1972. p. 130.

Table A-2. Crop Production, Area Harvested and Crop Yields  
Mexico 1949-70.

Concepts	Three-year annual average			
	1949-51	1959-61	1964-66	1968-70
Quantum of production <u>1/</u>	12,219	20,074	27,732	30,230
Area harvested <u>2/</u>	10,436	12,589	14,996	14,632
Quantum per hectare <u>3/</u>	1,171	1,595	1,849	2,066
	Average annual growth rate			
	<u>1951-60</u>	<u>1961-65</u>	<u>1966-69</u>	<u>1951-69</u>
Quantum of production	5.1	6.7	2.2	4.9
Area harvested	1.9	3.6	-0.6	1.8
Quantum per hectare	3.1	3.0	2.8	3.0

1/ Millions of pesos of 1966-68

2/ Thousands of hectares

3/ Pesos of 1966-68

Source: As given in Manuel Rodriguez Cisneros, et. al., Características De La Agricultura Mexicana. Mexico 1972. p. 130

Table A-3. Land Areas in Irrigation Districts. Mexico 1952-70.  
(Thousands of hectares)

Regions	1952	1970
Northwest	443.0	1148.2
North-Central	208.4	372.2
Northeast	250.7	495.8
Central-North	27.2	88.9
Bajío	245.6	472.5
Central	129.3	208.9
South	33.8	114.3
Peninsula	1.7	14.7
Mexico	<u>1339.7</u>	<u>2915.9</u>
Average annual growth rates		
	<u>1953-58</u>	<u>1953-70</u>
Northwest	10.2	5.4
North-Central	1.9	3.3
Northeast	7.5	3.9
Central-North	10.8	6.8
Bajío	4.4	3.7
Central	2.9	2.7
South	10.0	7.0
Peninsula	16.7	12.7
Mexico	<u>6.9</u>	<u>4.4</u>

Source: Adapted from, Manuel Rodriguez Cisneros, et. al., Características De La Agricultura Mexicana. Mexico 1972. p. 136.

Table A-4. Net Capital Formation in Crop Farming and the Rest of the Economy.  
Mexico 1950-67.

(Millions of pesos of 1960)

Activity	Three-year annual average			Average annual rate of growth		
	1950-52	1959-61	1965-67	1952-66	1952-60	1961-66
<u>Net capital formation</u>	<u>12,174</u>	<u>17,640</u>	<u>33,172</u>	<u>6.9</u>	<u>4.2</u>	<u>11.1</u>
Crop farming	1,889	1,907	2,175	0.9	0.1	2.3
Public	1,086	759	1,297	1.2	-3.9	9.3
Private	803	1,148	878	0.6	4.0	-4.4
<u>Rest of the economy</u>	<u>10,285</u>	<u>15,733</u>	<u>30,997</u>	<u>7.8</u>	<u>4.9</u>	<u>12.3</u>

Source: Adapted from, Manuel Rodriguez Cisneros, et. al., Características De La Agricultura Mexicana. Mexico 1972. p. 137.

Table A-5. Farm Price Indices and Expansion of Harvested Cropland.  
Mexico 1949-70.  
(Base 1966-68 = 100)

Concept	Three-year annual average			
	1949-51	1959-61	1964-66	1968-70
<u>General index</u>	<u>46.54</u>	<u>80.91</u>	<u>97.99</u>	<u>103.98</u>
Food crops	43.19	79.64	98.18	103.51
Industrial products	58.94	87.61	96.62	107.67
Feed crops	36.85	78.56	99.71	101.36
Average annual rate of price increases				
	<u>1951-60</u>	<u>1961-65</u>	<u>1966-69</u>	<u>1951-69</u>
<u>General index</u>	<u>5.7</u>	<u>3.9</u>	<u>1.5</u>	<u>4.3</u>
Food crops	6.3	4.3	1.3	4.7
Industrial products	4.0	2.0	2.7	3.2
Feed crops	7.9	4.9	0.4	5.5
Average annual rate of price increases				
	<u>1951-60</u>	<u>1961-65</u>	<u>1966-69</u>	<u>1951-69</u>
Total	1.9	3.6	-0.6	1.8
Food crops	1.7	3.5	-1.4	1.5
Industrial products	2.2	1.5	-3.3	0.9
Feed crops	8.2	14.0	18.0	11.7

Source: As given in, Manuel Rodriguez Cisneros, et. al., Caracteristicas De La Agricultura Mexicana. Mexico 1972. p. 143.

Table A-6

Presidential Resolutions Related to Ejidal Land Grants.  
Mexico 1915-69.

Years	Area in hectares	Number of beneficiaries
1915-20	381,900	77,200
1921-24	1,728,700	164,100
1925-28	3,186,300	302,500
1929-30	2,438,500	187,300
1931-34	3,286,000	216,400
1935-40	20,136,900	775,800
1941-46	5,970,400	122,900
1947-52	5,439,500	108,600
1953-58	5,771,700	226,300
1959-64	9,093,400	284,200
1965-69	18,134,600	322,900
Total	75,568,000	2,788,300

Source: Adapted from, Centro de Investigaciones Agrarias, Estructura Agraria y Desarrollo Agricola. Mexico 1970. Vol. I, p. 86.

Table A-7            Agricultural Exports and Imports. Mexico 1950-69.  
(In millions of dollars per year and in percentages)

Concepts	Three-year annual average			
	1950-52	1959-61	1964-66	1967-69
Agricultural exports	291.2	397.7	561.0	577.9
Agricultural imports	168.2	124.4	164.8	169.5
Gross foreign exchange earnings	123.0	273.3	396.2	408.4
Exports: <u>agricultural</u> total	51.1	52.7	51.0	47.2
Imports: <u>agricultural</u> total	27.3	11.2	10.6	8.8
<u>Agricultural exports</u> Total agricultural products	25.4	20.8	19.4	17.6
<u>Agricultural imports</u> Total agricultural products	14.7	6.5	5.7	5.2
Average annual rates of increase				
	<u>1952-68</u>	<u>1952-60</u>	<u>1961-65</u>	<u>1966-68</u>
Agricultural exports	4.1	3.5	7.1	1.0
Agricultural imports	0.0	-3.4	5.8	0.9
Gross foreign exchange earnings	7.3	9.3	7.7	1.0

Source: As given in, Manuel Rodriguez Cisneros, et. al., Caracteristicas De La Agricultura Mexicana. Mexico 1972. p.148.

Table A-8.

Families, by Income Class and Industrial Sector of the Head  
of Family. Mexico 1963.

Concept	Monthly family income classes					
	Total	Up to 300	From 301 to 950	From 951 to 3000	From 3001 to 9200	From 9201 and more
<u>Total number of families</u>	<u>7,329,642</u>	<u>1,346,175</u>	<u>3,275,432</u>	<u>2,049,392</u>	<u>572,420</u>	<u>86,223</u>
	<u>Structure in percentages</u>					
<u>Total</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>	<u>100.0</u>
Agriculture	42.7	67.2	48.9	24.4	19.2	16.6
Mining and Manufacturing	20.8	8.3	21.7	26.5	23.6	29.8
Commerce	13.8	7.5	11.5	20.3	17.6	19.6
Services	22.6	17.0	17.9	28.8	39.5	33.9

Source: Adapted from, Carlos E. Vásquez del Mercado, Diagnóstico de la Agricultura Mexicana. Mexico 1972. Anexo 4, Cuadro 2.

Table A-9.

## Farm Output, Inputs and Agricultural Productivity.

United States 1954-70.

(Index: 1967=100)

Year	Farm Output	Inputs				Agricultural Productivity <u>a/</u>
		All Inputs	Farm Labor	Real Estate	Fertilizer	
1955	82	98	176	97	45	83
1960	90	94	134	93	54	96
1965	97	97	109	99	80	98
1970 <sup>b/</sup>	102	103	92	102	113	99

a/ The ratio obtained by dividing the farm output index by the index of all inputs.

b/ Preliminary.

Source: Agricultural Statistics 1971. U.S.D.A. pp. 464-466.

Table A-10.                    Number of Farms Classified by Value of Sale:  
   United States 1960-71.  
   (Thousands of farms)

Year	Farms with sales						All farms
	\$40,000 and over	\$26,000 to 39,999	\$10,000 to 19,999	\$5,000 to 9,999	\$2,500 to 4,999	Less than \$2,500	
1960	113	227	497	660	617	1,848	3,962
1965	163	282	466	508	458	1,463	3,340
1971	253	365	392	385	409	1,072	2,876

Source: Data taken from, Farm Income Situation, ERS/USDA, July 1972, p.68.

Table A-11. Income per Farm Operator Family by Major Source Classified by Value of Sales. United States 1960-71.

(U.S. Dollars)

Year	Farms with sales						All farms
	\$40,000 and over	\$20,000 to 39,999	\$10,000 to 19,999	\$5,000 to 9,999	\$2,500 to 4,999	Less than \$2,500	
	<u>Realized net farm income</u>						
1960	18,955	8,652	5,368	3,305	1,961	850	2,962
1965	25,712	9,911	6,198	3,523	1,976	973	4,190
1971	27,289	9,721	6,026	3,397	1,993	1,039	5,581
	<u>Off-farm income</u>						
1960	2,177	1,678	1,258	1,573	1,849	2,731	2,140
1965	4,454	2,504	2,309	3,219	3,452	4,650	3,751
1971	6,447	3,825	3,676	5,221	5,743	8,479	6,230
	<u>Total income</u>						
1960	21,132	10,330	6,626	4,878	3,810	3,581	5,102
1965	30,166	12,415	8,507	6,742	5,428	5,623	7,941
1971	33,736	13,546	9,702	8,618	7,448	9,518	11,811

Source: Data taken from, Farm Income Situation. ERS/USDA. July 1972. p. 72