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WORKING PAPER NO. 8512

Aspects of Agricultural Development
in Israel

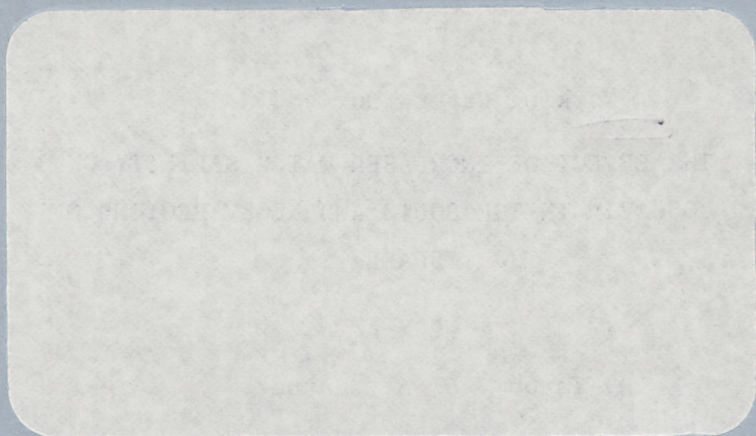
by

Yoav Kislev

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מאמרי המחקר בסידרה זו הם דווח ראשוני לדיון וקבלת הערות. הדעות המובעות בהם אינן משקפות את דעות המרכז למחקר בכלכלה חקלאית.

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Aspects of Agricultural Development
in Israel

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Yoav Kislev

April, 1983

ASPECTS OF AGRICULTURAL DEVELOPMENT IN ISRAEL (*)

YOAV KISLEV

(*) This paper is a draft of an article prepared for The Hebrew Encyclopedia. It does not cover all aspects of agricultural in Israel as there will be other articles on research, legislation, planning, Arab agriculture, extension, water, and foreign aid.

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Braha Dascal helped with the calculation of the exchange rate and Ayal Kimhi with productivity and terms of trade.

Overall

In the past, farmers could hardly feed themselves and their families and this is still true for some underdeveloped countries even today. The poor countries are therefore agrarian countries in which the majority of the labor force is engaged in agriculture. The productivity of modern agriculture, on the other hand, is high and in the industrialized countries the number of farmers is relatively small. In Israel, the share of employment in agriculture is 5 percent and each farm worker--hired and self employed--produces food and fiber for 15 families. The share of agriculture in GMP is 6 percent and in export, 10 percent.

There are three major groups of products in agriculture; each accounts for approximately a third of the output (Table 1): livestock, orchards, field crops and vegetables. Again, approximately a third of product goes to the domestic market for direct consumption, somewhat less than a third is exported and approximately 30 percent of farm product is raw material for manufacturing: milk products, meat, cotton, canned food; and lastly, one tenth of the agricultural product is utilized on the farm as feed, food to the family, and on-farm produced investment goods--livestock and orchards.

The unique feature of Israel's agriculture is the cooperative structure. Two fifths of the output is produced in kibbutzim (and

moshavim shitufiyim--with common agricultural enterprises and private households), 35 percent in moshavim, and the rest on private farms--Jewish and non-Jewish. Differences in capital intensity between the sectors create substantial differences in productivity: in the capital intensive kibbutzim, the product per laborer is 56 percent higher than the sector's average; and in the labor intensive non-Jewish (mostly Arab) villages it is less than half that average.

When the State of Israel was established in 1948, citrus was the major export product of agriculture and of the national economy. Today it accounts for less than a third of agricultural exports. The other major export is cotton, followed by fruits, flowers and vegetables.

Product and Income Account

The aggregate account of agriculture is exemplified with 1979 data in Table 2. Total value of the product was, for this year, 3,707 million IS; of these, 60 percent were field crops and vegetables, 37 percent in livestock and 3 percent in investment goods--planting of orchards, expansion of herds and flocks. The agricultural sector used in 1979 1,928 million IS worth of inputs purchased from other sectors, so that product--value added in agriculture--was 1,878 million IS. Factor income is slightly higher than product due to crop insurance compensation payments. Of the sector's income, farmers paid 422 million IS, 24 percent, as wages to hired workers, 271 millions as interest and rent and the rest--61 percent of income--residual return to farm operators'

own labor, to equity capital and profits.

The value of the revenue in Table 2 is the farm gate value to the producers. Consumers paid less, due to subsidies. In 1979 subsidies amounted to 365 million IS, most of it--350 million--in livestock products. Consumers paid in 1979 3,341 millions for the agricultural products; the buyers of livestock products paid 1,001 million IS.

The income data in Table 2 do not summarize appropriately income of farm families, as many operators are only part-time farmers. We shall return to this subject below, in the discussion of the family farm.

Production Factors and Inputs

The basic factors of production in agriculture are land and labor, but modernized agriculture uses also a host of other inputs: machinery, structures, irrigation systems, fertilizers, insecticides and pesticides, fuel, medicines and many others. Table 3 reports the the utilization of the major factors in agriculture for the period 1955 to 1983. The figures in the last line in the table are rates of growth--an annual average for the period for each column in the table.

Land area was doubled between 1951 and 1953, and during the 1950's cultivated area expanded gradually; but from 1960 and onward expansion was minimal. In irrigated areas, on the other hand, there was substantial expansion throughout the whole period. In recent years,

approximately half the cultivated land is under irrigation, and only water availability constraints further expansion of irrigated area.

Several stages can be observed in the development of the labor force (number employed) in agriculture (see also figure 1). The period immediately after the establishment of the State of Israel was a period of settlement of the land and enlargement of food supply to a growing population. Employment reached a peak of 127,600 in 1961. From 1962 to 1975 production potential and productivity in agriculture expanded into a market limited in its absorption capacity and, simultaneously, off farm income opportunities also improved. As a result, employment in agriculture gradually declined for a decade and a half. Accelerating exports in the second half of the 1970's opened new channels to growing production. Indeed, no clear trend is observed in employment since 1975 and its general level has been stable. During most of the period in Table 3, the share of hired workers in agricultural employment was approximately 40 percent; the rest were self employed.

The amount of assets of production, machines, structures, glass houses, equipment--gross capital--increased gradually throughout the period. The last 6 years, from 1977 to 1983, are exceptional, with no capital expansion. The persistent increase in production assets in agriculture is the major cause of expansion in productive capacity and the reduction in employment; the deceleration of accumulation in recent years may reflect abandonment of glass houses as farmers left flower production or cessation of the use of dairy structures on small farms as

milk production was concentrated in comparatively large dairies.

In a modern economy, most of the feed for livestock is purchased from farms specializing in its production. In Israel's agriculture this division of labor is realized at the international level and feed grains are mostly purchased from other countries. The large increase in the use of feed grain and oil cake in agriculture--with average rate of growth of 6.5 percent the highest in Table 3--reflects both a major expansion of livestock production, and the transfer of land and water from the production of feed grain and roughage to the production of import substituting wheat and the major export field crop--cotton.

Similarly to the pattern of utilization of land, the development and the exploitation of our second natural resource--water--was very fast during the fifties and decelerated since 1960. In more recent years, agriculture had to reduce the use of water with the expansion of consumption in the urban sector; and further growth in irrigation, or even the maintenance of the existing level, will depend on the ability to use nonconventional water sources, mostly sewage.

The use of fertilizers in agriculture is a measure of intensification and sophistication in production; fertilizer input grew at an average rate of 4.6 percent per annum. At the same time, knowledge and modern equipment permit increased efficiency of fertilizer usage--application limited to root zone, integration with irrigation, liquid fertilizers-- and increases effectiveness and permits comparative

reduction in the input; indeed, in the more recent years, fertilizer inputs grew at a slower pace than at the earlier periods in Table 3.

Major Lines of Production

The development in crop and orchard areas and in the numbers of livestock is reviewed in Table 4. The last line in the table--average rate of change for the period--covers in several cases alternating trends that were affected by changes in production potential in agriculture, in marketing possibilities in Israel and in developments in export markets.

Orchards areas expanded markedly during the period. However, the expansion in the early years was mostly in citruses directed to export, while at the end of the period--as citrus exports encountered difficulties--their area declined; other orchards, mostly deciduous fruits, expanded with their product directed to the local market (except for avocado and some mango). Field crops area expanded only at the beginning of the period, and since 1965 a slight declining trend can be detected--the result of urbanization and expansion of orchard areas. The production of vegetables grew throughout the period (see Table 5) but yield increases permitted steady areas, even declining in most recent years. Cut flowers production was insignificant and did not justify separate statistical reporting up to the late seventies--the time at which this line of production grew substantially, particularly for export.

The developments in livestock enterprises reflect mainly changes in production ability and absorption possibilities of the domestic market. Fish growing in artificial ponds increased at the early years. This growth intensified the use of water from local sources, expanded protein production, and diversified food. The development of the interregional water network and the transportation of water from local water-sheds to drier areas, the increased income, ample importation of beef and subsidized production of poultry meat--resulted in contraction of fish production in agriculture in the more recent years.

The national dairy enterprise was affected by milk yield increased and a gradual expansion of local consumption. Beef production expanded rapidly in the fifties with the importation of feed grains from the US; since that period the growth of this line has paralleled the expansion of the dairy herd which provides male calves for fattening. Similarly, egg production developed rapidly in the early years of the State of Israel as a convenient solution to the demand of the growing population for protein and as an appropriate line of production for new settlers. Since 1960, production is limited by the market; only occasional surpluses were exported, mostly at losses.

The development of production in the agricultural enterprises is reviewed in Table 5. Both major groups--livestock and field crops--expanded similarly from 1955 to 1975; more recently crop production, partly for export, expanded faster than livestock production

directed only for the domestic market.

The major change in rain fed farming has been a large expansion of the production of wheat; mostly a reaction to marked yield increases due to the introduction of Mexican high yielding varieties into the domestic breeding program in Israel. Increased yield potential justified additional application of fertilizers and auxiliary irrigation; and with higher yields, wheat replaced in rain fed lands barley, oats, sorghum and, to some extent, also hay and forage crops. There were two principal developments in irrigated field crops. Cotton, introduced only after the establishment of the state, expanded to become an important export crop. Sugar beet, grown for the import replacing industry, expanded in the fifties; but production ceased when it was realized that with world terms of trade, sugar production in Israel can survive only if highly subsidized.

Vegetables production expanded gradually, mostly for the local market and recently also for export, the share of which reached 15 percent of the product in the second half of the seventies. Citrus production expanded substantially as young orchards, planted mostly in the fifties, started fruit bearing; but in the seventies the trend decelerated and even declined. The production of non-citrus fruits grew gradually with the local market, and so also did the production of livestock products.

Export--Survey

Agricultural production grew in the last 20 years at an annual rate of 5 - 6 percent, population grew at 2.7 percent per year. Agricultural products are purchased for current consumption and the quantity is limited; indeed there is no apparent upward or downward trend in the per capita consumption of locally produced farm products (Table 6, column 4). The additional agricultural product was therefore directed to export markets. The share of product allotted to the local market declined from 1967 to 1983 from 44 to 26 percent and the share of direct export increased from 25 to 30 percent (Table 6, Columns 1,3). In addition, a third of the output of the processing industry is exported.

By the arithmetics, as described above, export is the difference between production and local consumption; but export is not merely production surplus. More appropriately, the volume of production is determined mostly by economic developments exogenous to agriculture in Israel and the mere existence of export enables the maintenance of a larger agricultural industry than needed for the fulfillment of domestic demand.

In Figure 1, employment in the farm sector increased in the fifties with settlement and expansion. With saturation in local markets, maturing of new investments, technological development and increased alternative urban income--farm employment declined, starting at the beginning of the sixties. This turn of the trend was recognized by the administration of the time; policies were modified accordingly, dairies

near cities were eliminated to permit increased production on farms (a development which might have occurred naturally with urban expansion), and special measures were taken to encourage production for export and to develop outside markets.

For the fifteen following years, the success of the export promoting measures was modest. The major factor in the expansion of agricultural exports in the sixties was the citrus industry. At the establishment of the state, citrus was the main export line of agriculture and of the national economy; the share of agriculture in total exports in the fifties was 40 percent and most of it citrus (Figure 1). Gradually, the manufacturing and service sectors expanded and agriculture's share declined to a tenth of total export. Although the share of the agricultural export declined, it grew in absolute terms. Citrus export doubled in the sixties (see area expansion in Table 4). However, our competitors are gaining strength--in the seventies the growth was halted and exports of citrus even declined.

Thus, the concentrated efforts that began in the early 1960's resulted in only gradual and little expansion of agricultural exports. What caused exports to accelerate since 1974? It seems that the major factor affecting the expansion of the "other" (non-citrus) agricultural export, is profitability which in turn is associated with the value of the European currencies relative to the dollar. Europe is the export market while most of the prices of the imported inputs are quoted in US dollars. Changes in the values of the European currencies are

represented in Figure 1 by the value of the Deutsche Mark in dollar terms (deflated by the two country's consumer price indices) and it almost doubled in the seventies. The vigorous acceleration of non-citrus exports was from 1974 to 1979 (Figure 1) and expansion continued for several years after the turning of the trend in the exchange rate of the mark. Both the lag in expansion and the continued growth after the change in profitability may be associated with investments in structures, equipment, services, and knowledge. These investments take time to mature and, once done--enable continued exports, at least for a while, even at worsening terms of trade.

The single most important barometers of the conditions of agriculture is employment. Since the middle of the seventies the number of people employed in agriculture remained stable (Figure 1). It seems that the expansion of exports, particularly of the labor intensive crops, checked the exit of labor from agriculture.

The development of the components of agricultural exports is surveyed in Table 7. Perhaps most important is the event that did not occur. Citruses, in 1972 more than two thirds of the exports in the table, did not grow in the seventies--in the period of vastly improving terms of trade. At the end of the decade, citrus export even declined.

The most important single product in the non-citrus agricultural export is cotton-- more than half the growth in the export accelerating period is due to cotton. It is followed by flowers, vegetables and

avocado. The latter is also the fastest growing product (in 1981 yields were particularly low; avocado yields, like some other fruits, alternate between years). Half the avocado area in 1984 was still not bearing fruits; which means that production will double in a few years even if no new orchards are planted.

Export--Discussion

The exported products vary a great deal, both in growing conditions in Israel and in their marketing environments. Cotton is concentrated on large farms; mostly in kibbutzim, but also in commonly cultivated plots in moshavim. Cultivation is water and machine intensive, averages per worker are 25 hectares of land and 10,000 m³ water. The crop is not suitable for the conditions of the small family farm. It is exported as a commodity to a single world market. Timing and other factors are important in getting maximum revenues, but Israel is too small to affect world prices and we are, therefore, not limited by the markets in the amounts we can produce and export.

Avocado can be produced both on the large and on small farms. As a quantitatively important product, this is a new and expanding crop, with fruit bearing areas distributed equally between kibbutzim and family farms in the moshavim and on private land. In the future, it can be expected that expansion will be mostly in the kibbutzim and in the moshavim shitufiyim in which 65 percent of the young orchards are planted. Compared to cotton, the marketing of avocado is in the opposite

side of the spectrum. The fruits are exported to local markets--mostly to France, with small quantities to other countries. These are markets that were developed by Israel's exporters and we supply them with approximately 90 percent of the avocado consumption. Increased supplies reduce prices. The ability to sell the expected future output will be determined by the expansion of demand in France and in the other European countries.

Flowers and vegetables are labor intensive crops, requiring both self employed labor and hired hands, and are suitable particularly for the family farm. They are seasonal crops exported to Europe in the winter when the local production is limited and expensive. In both lines we face competition from production in Spain, North Africa, Kenya and even Columbia (flowers). The European market is rich and choosie and successful export of flowers and vegetables from Israel depends on high standards of quality. In vegetables one of the central quality problems is length of shelf life--air transportation is expensive and surface transport takes several days. A large part of the reseach effort was directed to the development of long lasting tomatoe varieties and these are the ones now exported. The fruits and the vegetables we export are off season luxury crops; flowers exhibit even stronger characteristics of such products and their demand depends on the season, holidays, weather, and fashion. The buyers ask for an excelling flower--in quality and often in innovativeness--and our share in the market will be maintained only if we can modify types and varieties with changing tastes. In flower marketing we cooperate with the Dutch: we supply in

the winter months the needed types to complete the line of flowers the Dutch export, particularly to Germany; the Israeli exporters were therefore accepted to the exclusive Dutch flower exchange. However, competition with other countries develops even within this mode of operation.

Because of its size and age and because of its special marketing problems, the citrus industry occupies a special position among the exporting products. Some 30,000 workers, seasonal and full time employees, are associated with the industry, and this is a central crop in the family farms--40 percent of the area is on private land and a similar share is in the moshavim; the share of the larger, communal farms in this industry is comparatively small. Israel's citrus are an important factor in the export markets but our share is declining. Twenty years ago eighty percent of the grapefruits consumed in Europe were from Israel, today our share is less than 50 percent; in oranges Israel's market share declined from 40 to 20 percent. The decline is due to the entrance and expansion of competitors, mostly from Spain but also from other countries. The competitors have advanced technologically and enjoy short distances to the markets and, hence, reduced costs and higher quality. Recently a new product appeared in the grapefruits market--American, sweet, pink fruits. They fetch comparatively high prices. Experiments are now conducted in Israel to increase product differentiation and quality classification to strengthen our competitive stand.

Export agriculture operates in more difficult and unstable environments than the sectors producing for the domestic market. As seen, the difficulties are due to strong competition and to developments in the international exchange markets. These factors cause income changes and uncertainty. In an attempt to dampen exchange oscillations, the government introduced the instrument of exchange rate insurance (against a premium, exporters are assured against appreciation of the currency--each month compared to the previous quarter) but the dampening is only partial and it cannot, and is not intended to overcome secular changes. In Europe Israel's exports also encounter problems associated with the common market agricultural policy. So long as this market was composed mostly of northern countries, its main interest was in ample supply of fruits, vegetables, and flowers in the season in which we are not competing with local producers. With the entrance of Spain and Portugal to the market, countries competing with Israel's agriculture will become full fledged members in the European community. Their interest will be to halt competitive imports, Israel's included. Our exports will face tariffs and administrative obstacles. The agricultural policy of the market is decided together with general national and international policies of the European community; reaching convenient marketing conditions is a general policy challenge for Israel.

Government Support and Its Effect

In most developed countries, government involvement is larger in

agriculture than in the other sectors of the economy. The purpose of this involvement is, most often, to protect stable income, to insure orderly food supply, and to maintain agricultural and rural population. In Israel, in which agriculture was formed mostly by newcomers with no economic means who settled on national land with public assistance, government's intervention is naturally intensive.

The intervention is in planning, settlement, research, legislation, extension, in establishing the marketing boards and in participation in their operation, in the creation of Agrexco--the major export company--and in economic assistance. The government also operates in trade: it is the sole importer of beef, sugar and grains for bread, feed and oil. The economic assistance is provided through two major channels: product and factor subsidies, and credit. The support is detailed in Table 8. The main arguments for the support in export and water are the balance of payments and settlement in dry areas. The level of the subsidies to animal products is determined in two separate routes. In the one, a producer price is calculated--for milk, eggs, meat--following cost estimates of the Farm Income Institute. The Institute is an independent agency, operated jointly by the government and farm organizations and relying professionally on the Central Bureau of Statistics. Its findings are accepted as the basis for cost accounting in agriculture. In the second route a consumer price is set, reflecting considerations of assistance to low income families, anti-inflation policy and budgetary constraints. The subsidy is the difference between producer and consumer price.

The way the subsidies are set may imply that public support effects only the price the consumers pay and not the farm situation. However, basically, the level of the subsidies and support policy determine the size of the supported industries. An alternative policy may be to set consumer prices such that they cover production cost, or to permit free imports of milk substitutes, cheese, and meat. In both these cases, the demand for the local product would have been lower than today and the livestock industries would have been markedly smaller.

Credit in Agriculture

Agriculture in Israel is capital intensive. The source of most of the finance used for capital accumulation, and so also most of the finance for current factors of production, is in outside credit and not farmer's equity capital. Several reasons explain the reliance on exogenous finance: the families in Israel, and some of the firms in certain periods, save and transfer their savings to production units, including in agriculture; in a modern economy capital markets, particularly banking services, efficiently transfer funds from lenders to borrowers and as a result the transferred volume of credit is relatively large; the intervention of the government in the capital markets is widespread in Israel, and the public sector is an important channel transferring savings and foreign aid to the economic sectors; government's intervention in financing the farm sector is a direct continuation of agriculture being the major economic project of the

Zionist movement--the settling of penniless Jews on national land with public assistance.

Agricultural cooperation is mostly in credit: the cooperatives in the moshavim and the regional supply cooperatives are financial intermediaries transferring credit between members and from outside sources to members and to regional enterprises. On the one hand, cooperation enhances the transfer of credit to agriculture and, on the other hand, the large volume of credit and its central direction, often through the cooperative organs, strengthen cooperation in agriculture.

Many sources supply credit to farmers. The development budgets of the government and the Jewish agency are used to finance investments; aid to export--in inputs, in production and in transport--is in the form of specified credit; in part (decreasing recently) production for the local market also enjoys preferential credit; farmers get credit from suppliers of factors of production; and they and their cooperative intermediaries apply directly to commercial banks for additional credit.

The volume of credit to the agricultural sector doubled between 1970 and 1983 (Table 9). The share of the banking system in total farm credits grew over that period from 34 to 71 percent. The sector of the kibbutzim succeeds in mobilizing twice the volume the moshavim got; the share of the citrus industry declined markedly over the period. An interesting aspect is that approximately 45 percent the total banking credit is transferred through companies and farmers' organizations and

not directly to individual producers.

The ratio of credit to output is higher in agriculture than in the economy at large. In 1970 it was 3.6 times larger, more recently it was twice as large. This credit intensiveness is a testimony both to capital intensity in agriculture and to the reliance of the sector on outside sources of finance. Similarly, outside finance for investment in agriculture is generally complete, while in manufacturing it is only partial (though for certain periods the conditions of credit for manufacturing were more convenient than for agriculture). When the cost of short term credit is low and the supply of long term credit is constrained, farmers finance capital outlay with credit intended to be directed to current production expenses.

Unlike conventional inputs that the farmer can purchase at will at the given price, the volume of credit is quantitatively limited and, therefore, the mere availability of public credit is already a form of aid. In addition, the directed credit is subsidized and its cost is lower than the real market rate. The cost of credit, both of the freely provided and the directed, is strongly affected by inflation and by the changing direction of the monetary policy trying to cope with rising prices. So in Israel (Table 9 part B; note that parts A and B do not cover identical periods) cost of free banking credit was 2 percent per annum in 1978, 34 percent in 1981, and 3 percent in 1983. The variability was even larger for free credit in foreign exchange. The subsidy of directed credit is large especially in comparison to the cost

of free market credit. The particular low cost of after tax credit, that is to farmers paying income tax and who can write off interest payments, indicates how undesired it is, from the point of view of the farm operator, to finance investment and production with equity capital and is another reason--added to the causes mentioned earlier--for the reliance of the farming sector on outside finance.

The intensive credit subsidization aids in deepening capital in agriculture. However, large debts are dangerous for farmers building their enterprises on the basis of outside finance--as worsening terms of credit can create heavy monetary burdens. Particularly dangerous is the position of those who financed investments with short term credit; and indeed, increased cost of credit in 1984, part of the anti-inflationary effort, harmed markedly the ability of many to operate their farms at previous lines.

The intensive involvement of the public agencies in agriculture, particularly in its finance, naturally creates a degree of responsibility to share the difficulties of the sector. As a result, the common solution to financial entanglements is a conversion of short term credit to long term subsidized loans at comparatively low cost. Such a responsibility, even if implicit, creates the need to participate in the decision making process, in monitoring, and in control. A special administrative arm--centralized credit--was established to meet these needs. An agricultural entity as a kibbutz, or a moshav, operating within the system enjoys preferential credit conditions provided all its

financing goes through a single bank and its farm program, particularly investment program, is prepared with the Ministry of Agriculture and the bank and is approved by their representatives. In this way the public agencies limit and monitor the reliance on credit. The framework of centralized credit was, however, gradually abandoned when, more recently, its credit conditions were not much better than market rates and when the supply cooperatives credit independently and channeled it directly to the moshavim and the kibbutzim. Financial intermediation of the supply cooperatives makes monitoring particularly difficult in the moshavim in which the credit is again distributed by the local cooperatives to the individual farmers. These difficulties induced a new trend, both in the Ministry of Agriculture and the supply cooperative, to turn to individualistic treatment--directly with the individual farmer in the moshav, not through the cooperative credit and administrative pool.

Productivity and Terms of Trade

Investment opportunities, public support to factors of production, research, extension, highly developed infrastructure and alert farmers--increased significantly productivity in agriculture over the years. The conventional method of measuring productivity changes is based on viewing agriculture as utilizing two main factors of production--labor and capital--and creating the product, value added. The rise in the ratio of product to aggregate input of labor and capital is an estimate of technical change, of productivity increases. The

natural resource limiting the development of agriculture in Israel's water. The use of land did not change much and land's value in production, without water, is not large; land is therefore not included explicitly in productivity calculations.

Figure 2 depicts data on labor and capital inputs and on the product; productivity is measured as the difference between aggregate input and output and it grew at an annual rate of 6 percent. Most of the increase in product in Figure 2 is due to increased productivity: to technical changes realized in improved machinery, better seeds, methods, chemicals. We do not know what the separate contribution of these factors to productivity was and we also do not know what the contribution of the factors in public control--research, extension, services was. In the absence of this knowledge, productivity measurement has only limited meaning. Particularly limited is the comparison of productivity measures between periods and industries. It has been estimated, for example, that productivity in manufacturing increased during the '70's by only 0.6 percent per year; a rate which is only a tenth of the rate of technological change in agriculture. Before we know more about the factors contributing to productivity, we cannot take such wide industrial differences as reliable and we cannot reject the possibility that these difference are due largely to different measurement methods and definitions.

Changes in productivity in agriculture are associated with changes in the terms of trade--the ratio of product price to the price of the

major inputs--labor and capital. This measure was reduced in 1983 to a third of its 1955 level (Figure 3). This reduction parallels the 6 fold increase in productivity over the same period. The change of the ratio of the price of the product to the price of purchased inputs also resembles the changes in the sector's terms of trade in Figure 3.

Increased productivity facilitated worsening terms of trade. Two economic mechanisms operate here: the one is that as productivity increases, supply of agricultural products expands and their prices declines relative to the price of inputs. The other mechanism is that exogenous worsening of the terms of trade causes improved productivity which is realized in the exit of less efficient farmers and in adoption of improved methods and varieties.

One of the major components of the terms of trade affecting the development of agriculture is the increase in wages, originating in increased income outside of agriculture and causing structural changes in the farm industry. Labor income in agriculture also rised--both explicit wages of hired laborers and returns to labor of self employed farmers. Real wages can be calculated in two ways: from the point of view of the employee, interested in the purchasing power of his income, the appropriate measure is wages divided by consumer price index. From the point of view of the farm operator, who has to pay the wages (including an imputed wage to himself) the appropriate measure is deflated by the price of the agricultural product. The two measures are depicted in Figure 3: wages in terms of product rose more than wages in

terms of purchasing power--this is a reflection of the reduction of the price of agricultural products relative to the price of the aggregate consumer basket of goods.

The Family Farm in the Moshav

More than 43,000 farms were counted in the 1971 Census of Agriculture; of these 23,000 in moshavim, 6,000 Jewish private and 14,000 non-Jewish. Information on family farms is incomplete, but we know relatively more on the farms in the moshavim than on others, as the cooperative organization facilitates better collection of data.

There are in Israel (December 1982) 405 moshavim, 77 of these were established before the creation of the state and 328 after 1948. Newly established moshavim are under the auspices of the Jewish Agency--85 today--the others are served by the Ministry of Agriculture.

Many of the moshavim established after 1948 lack factors of production and their farms do not support full time employment in agriculture. And indeed part time farming is widely practiced in the family farm sector, the phenomenon is particularly prevalent in moshavim close to urban sectors and in those lacking economic resources. Table 10 reports employment of farm operators on and off their farms for 1976. The data in the table are averages and the presentation, side by side, of off farm workers and hired labor is partly due to the fact that the average farm stand both for farms with off farm work and for farms with

hired labor. But the combination of the two on the same farm can also be found--seasonally or on a continuous basis. The number of operators finding full time employment on their farms is limited; it was estimated that only a third of the farmers do not work off their farms.

The distribution of employment also means a distribution of income sources--from farming and from outside sources. There is no systematic reporting of these incomes. The most detailed information available is from the sample prepared by the Institute of Farm Income Research for 1976 (Table 11). By the sample, the share of income from the farm amounts to 45 percent of the total income of the farm family, and 55 percent come from outside sources; in these--less than 10 percent from the cooperative enterprises. Most of the income from outside sources--approximately 70 percent--is from off farm work.

Average income hides variability. Small, partly operated farms are losing enterprises the owners of which subsidize--in an appropriate calculation--their farm activities from other sources. Beginning farmers are also low income operators; well established farmers, on the other hand, have the factors of production and the capacity to reach high income in agriculture and elsewhere.

The comparison of income of farm families to that of urban dwellers is difficult as the data are not prepared on a common basis. A recent estimate (Finkelshtain) indicates that average income of a farm family, from all sources, is markedly higher than that of urban salaried family,

but the gap is, by the same estimate, closing: farm income rose in the 70's at the annual rate of 1.5 percent, urban salaries--by 5 percent per annum.

The structure of the farm in the moshav, the composition of the farm enterprises, is strongly connected with the structure of employment of the farm family. Changes between 1971 and 1981 are surveyed in Table 12. The number of orchard growers doubled between the census years--fruit growing is suitable for farmers with outside employment, particularly if routine cultivation and harvesting is given over to the cooperative in the moshav or to hired laborers. The number of farmers cultivating field crops declined to a half over the 70's; this is the decade in which local production of sugar stopped and therefore also the production of sugar beet in the Negev and Taanach areas. The number of flower growers increased five folds--this is a major export line of the family farms. Milk production was concentrated gradually in the hand of a small number of farmers; this is an enterprise requiring full employment on the farm. The number of cows per dairy grew 3 times between 1971 and 1981.

The trends surveyed in Table 12 reflect both structural changes that enabled expansion of farm work and concentration of the enterprises requiring complete attention in the hands of a small number of operators. It can be assumed that more recent worsening of terms of trade and the associated reduction of profitability of exports reduced, in later years, the number of flower growers and caused further

expansion of part time farming in the moshavim.

As mentioned, part time farming reflects lack of production capacity and availability of alternative income off the farm. It also reflects the fact that there are operators who find it hard to manage successfully their farms in the current economic circumstances in Israel. And indeed, in a survey of family units conducted by the Ministry of Agriculture, the farms were divided into 3 groups: in the first, 27 percent of the units that were regarded as economically viable; 43 percent were classified as in need of assistance in investment and in production quotas in order to shift to a path of economic independence; and the situation with 30 percent of the family farms is so difficult, or their alternatives so good, that the Ministry of Agriculture suggested not to assist them at all.

In addition to the moshavim surveyed by the Ministry, there is another group of 85 moshavim, mostly in the care of the Jewish Agency, joining the ranks of the needy. In these moshavim there are, in many cases, very few families and the aim of the agencies is to double and triple the number of families to reach municipal, social and economic viability. Expansion of production in these villages as well as in those served by the Ministry of Agriculture will be possible only if markets for their products can be found.

Cooperation in Agriculture

Israel's agriculture is characterized by widespread cooperation. In the kibbutzim both production and consumption is collective; in moshavim shitufiyim production is collective while consumption is in private households. Moshavim are villages of independent farmers cooperating in production, marketing, social, and municipal services. The villages operate joint enterprises--in many cases orchards or field crops away from home. Both moshavim and kibbutzim are serviced by supply cooperatives, mostly regional organizations. Associated with these cooperatives are other regional enterprises: feed elevators, transportation, enterprises, slaughter houses, water supply cooperatives, cotton gins, and many others. Cooperation exists also in the private sector--in finance, cultivation, water supply, packaging--both in the Jewish and in the Arab sector.

At the national level cooperation is in the marketing boards--the division of production quotas, in lines in which these apply, are in the hands of the boards; most non-citrus export is conducted by Agrexco which is owned jointly by the farmers and the government; all citrus marketing, domestic and foreign is conducted by the Citrus Marketing Board.

Cooperation enables realization of economies of scale in marketing and procurements and concentration of economic and political power. Economic and political cooperation support each other. Economic cooperation creates the framework for political action, it provides the

channels for public economic support of agriculture (motivated politically), it is the breeding ground for the representatives moving from local economic activity to the national political arena. The political sector supplies the economic assistance, the legislation and the organization. The marketing boards, for example, rely in their operation on specific laws and are assisted administratively by the government.

Of particular significance is the cooperation in credit, perhaps even the most important form of cooperation. The cooperatives in the moshavim and at the regional level, are financial intermediaries, channelling funds between members and between outside agencies and commercial banks and members. Mutual help, both at the moshav level and at the regional level is also financial. The financial intermediation relies on close contacts with members and on pooling of risk: banks will prefer to lend to a cooperative rather than to a single farmer or even to a single moshav.

Basically cooperation is voluntary--only those willing to share in communal life will join a kibbutz, and a farmer who chooses a lower level of cooperation will go to a moshav. But inside the cooperating group, cooperation is often forced: a citrus grower can market only through the Board and the only way to avoid this form of cooperation is to cease being a citrus grower. The reason for enforcement is that exit from cooperation can cause the group a much larger damage than the damage to the individual who exits. An example is water pumping from a

common ground water reservoir; by law, well owners are forced to coordinate pumping because the cost to the single owner of further pumping is smaller than to the group utilizing the reservoir as a whole. In other cases, enforcement is less clear and obligatory. In citrus there is, as mentioned, only a single marketing body; two companies export avocado and several compete in flower marketing in Europe.

The cooperative systems in agriculture are run democratically and the members have often to overcome private interests to maintain cooperation efficiently. In the moshav, where members specialize in separate lines of production, some joint action will improve the economic position of certain farmers, others will affect favorably different operators. Voting according to members' own interests handicaps the pursuit of the common benefit. This difficulty is not encountered in the kibbutz, where production and consumption decisions are made separately. Here is the solution of the major paradox of cooperation in agriculture in Israel: in the kibbutz, which is comparatively further removed from the traditional social mode of organization, cooperation functions smoother and more efficiently than in the moshav where the family has been kept in the center of economic activity. Cooperation in the moshav is particularly challenging.

A further difficulty is encountered by the marketing boards. As cooperative bodies they have to pay their members according to patronage principles--reflecting average and not marginal returns--and they cannot use the price mechanism effectively to direct production and supply.

The difficulties and limitations of cooperative action, on the one hand, and its many potential advantages, on the other, justify careful examination; particularly where cooperation is forced.

Summary and Evaluation

Like their colleagues in other developed countries, Israel's farmers produce ample supply of food, fibers and ornamentals. They do it in many cases on a part time basis, using only partially the resources at their disposal--particularly capital assets, labor, and managerial ability. Given markets, supply could be expanded with only little new investment. As these lines are written, the agricultural year of 1984 is summarized--it was a bad year, with low export prices and reduced income. There are signs that 1985 could turn out to be better. But to evaluate long term prospects, we have to examine possible long term developments in the sectors which affect agriculture--the markets and the national economy.

A major factor affecting the export markets is the reduction, in recent years, of the value of European currencies relative to the dollar. There are good reasons to believe that this trend will change, but plans cannot be based on the return to the rates of exchange of the late 1970's. It is more probable that, if stabilized, the exchange rates will be at the 1960's level (see Figure 1). Similarly, it may be that increased incomes and living standards in countries competing with

Israel's export will reduce the size of their agricultural industries and their supplies, but it is more likely that improved technology and investment will increase their potential production, for outside markets.

Domestic economic processes may have contradictory effects on agriculture. Reducing inflation may reduce income and cause a return of labor to agriculture; renewed economic growth will have the opposite effect. A policy to improve balance of payment will increase the real exchange rate, but such a policy will also reduce export subsidies.

If the developments described here as probable will be realized, Israel's agriculture will be able to expand again only if it will produce at growing efficiency. There are, therefore, many who see the future of Israel's agriculture in knowledge intensive production. If this direction proves successful, agriculture will expand; but if not, we will again face the trends of the past--of production to limited markets and reductions in number of workers.

If this last possibility will materialize, agriculture will undergo severe adjustment processes, with particular hardships in the sector of the family farms. The comparative advantage will tilt from the labor intensive lines such as vegetables and flowers to large scale products, mostly field crops. Many farmers will transfer land and water to local and regional cooperatives and seek employment outside their farms. Cooperation will be more difficult.

If "young" moshavim will be strengthened, established areas will have to contract. In a national economy growing at rates similarly to those enjoyed by the Israeli economy in the fifties and the sixties, exit from agriculture will be to improved income opportunities. If not, adjustment will be accompanied by reductions of income levels or wide scope public assistance. The test of the sector's organizations and institutions will be in their ability to exploit opportunities as they arise and to pass with minimum hardships worsening economic circumstances, if needed.

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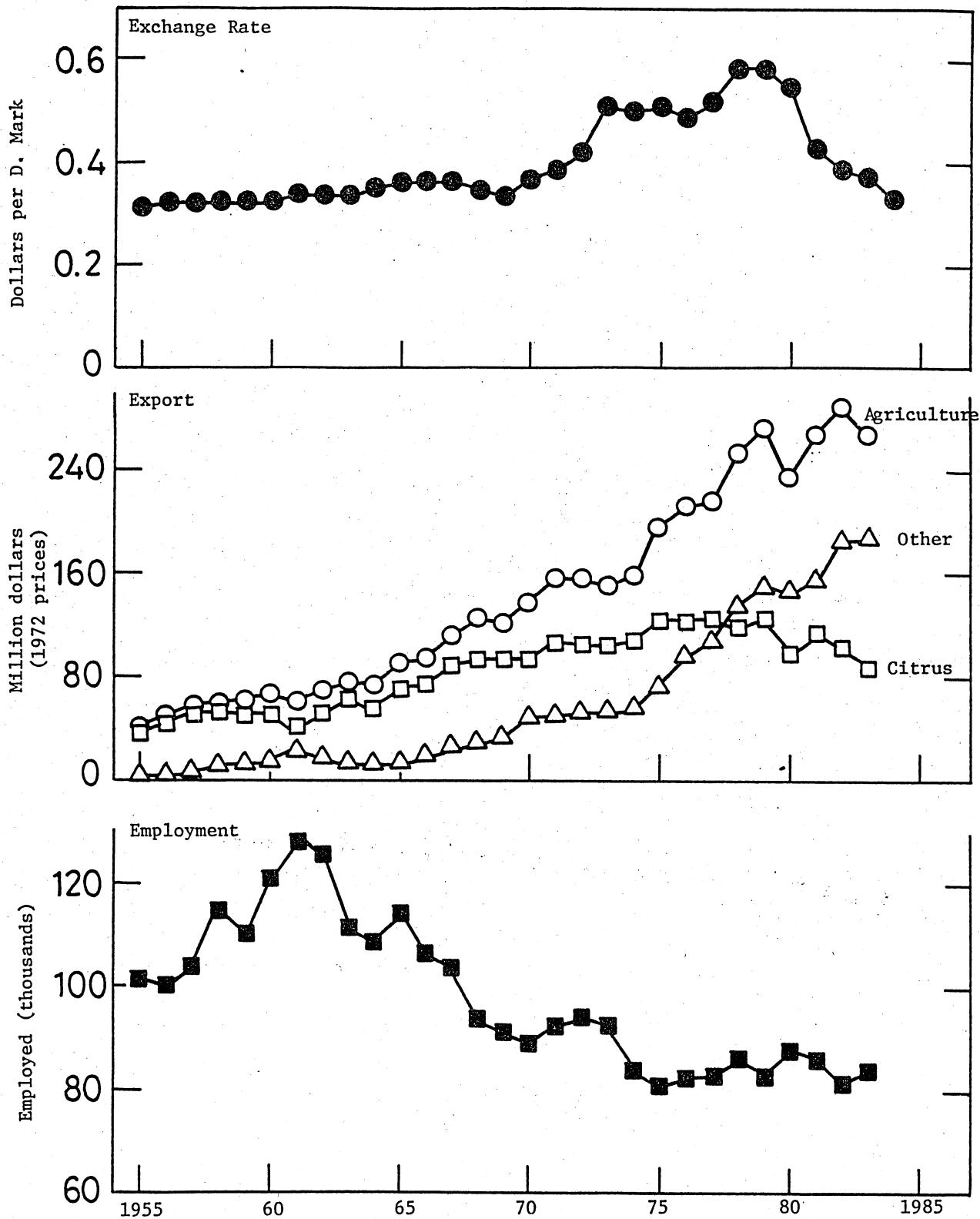


Figure 1: Exchange Rate, Export, and Employment

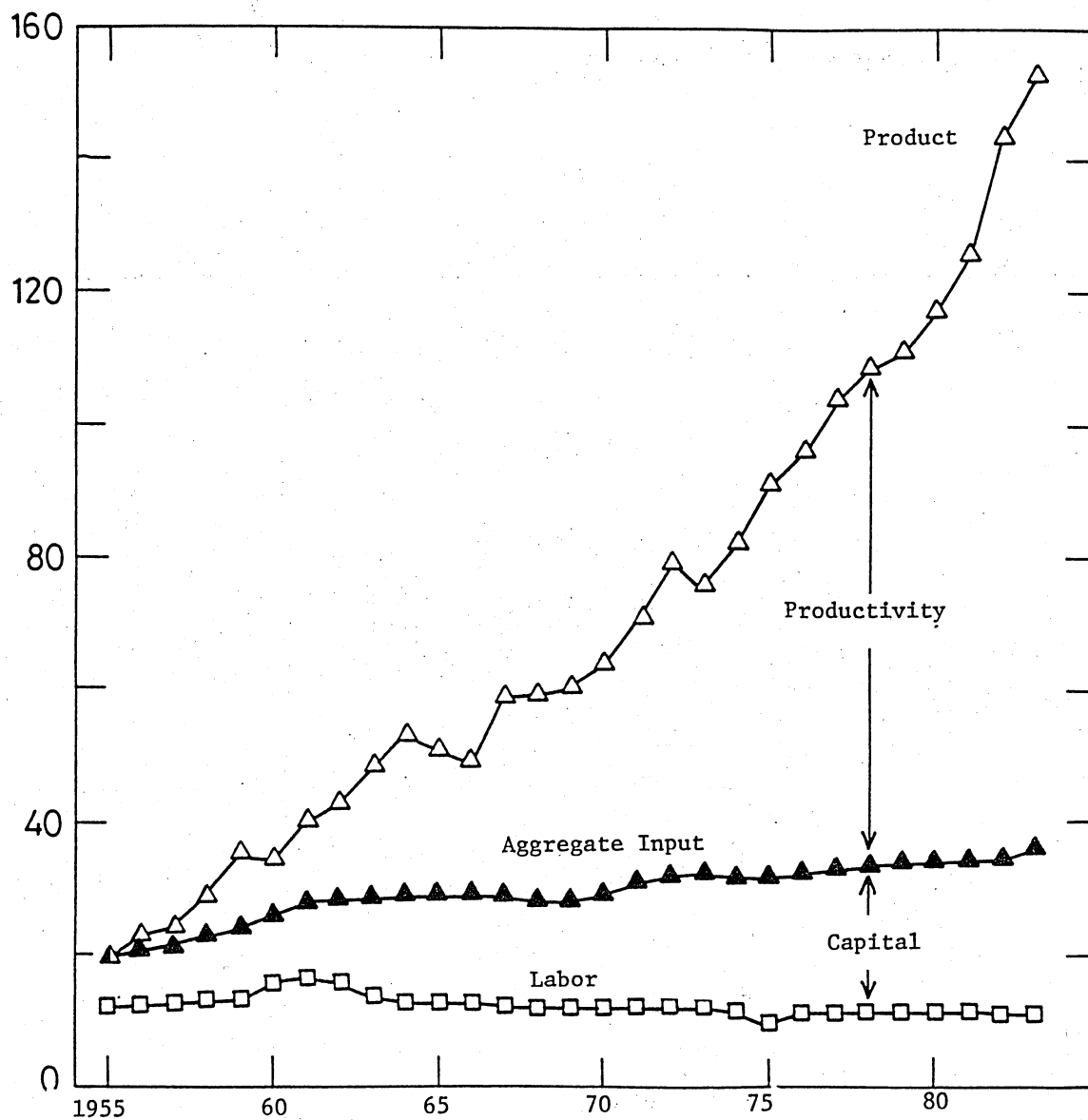


Figure 2: Factors of Production, Product, and Productivity in Agriculture

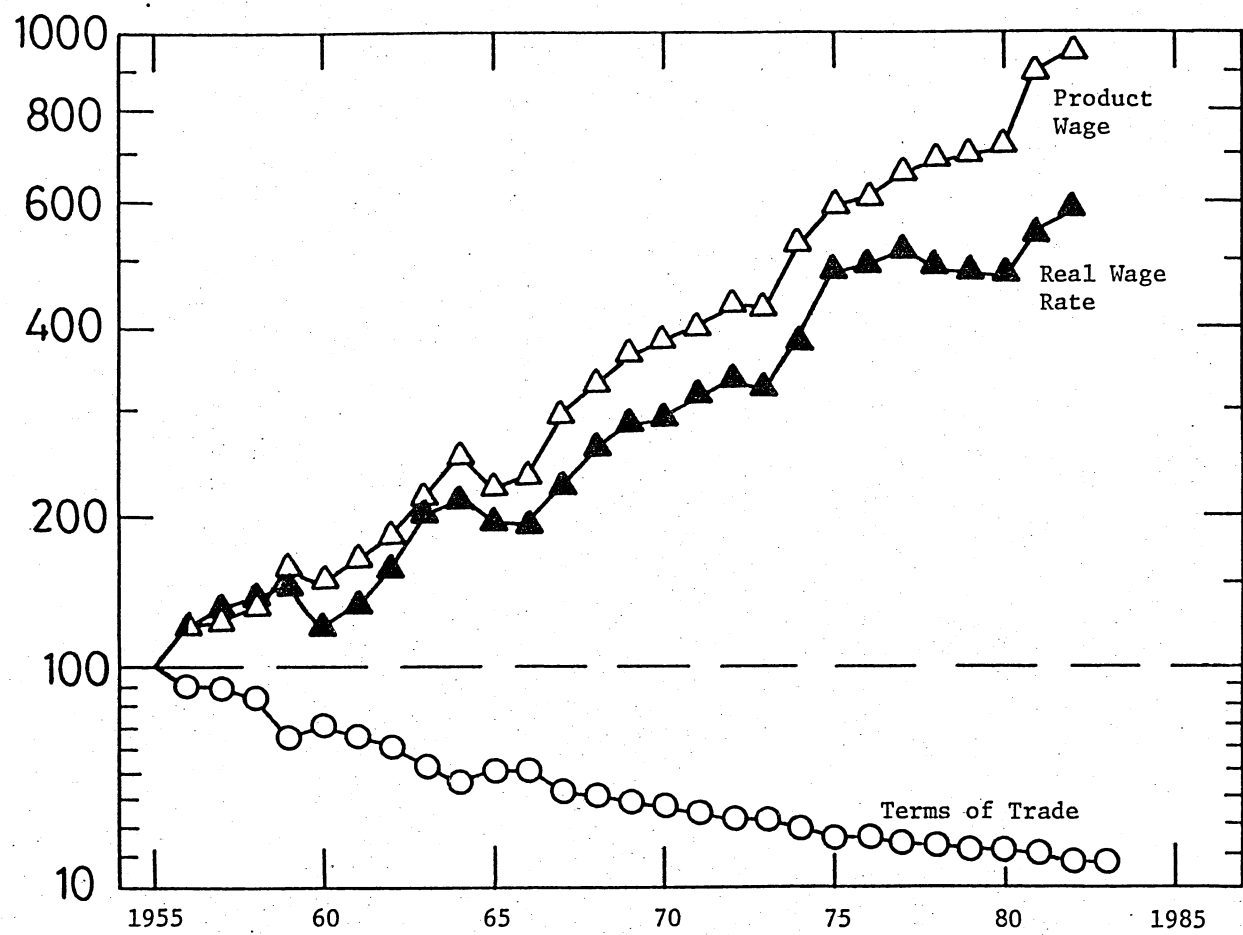


Figure 3: Wages and Terms of Trade

Table 1 : Agriculture in Israel--Characteristic
Sections for 1983 (percent)

<u>Groups of products</u>		<u>Destination of Product</u>	
Livestock	38	Local consumption	38
Orchards and ornamentals	26	Direct export	27
Field crops and vegetable	36	Manufacturing	30
		Home consumption and	
		intermediate products	11
Total	100	Total	100

<u>Product by sector</u> ^(*)	<u>Product</u>	<u>Product</u> <u>per day</u> ^(**)	<u>Fresh Export</u>	
Communal ^(***)	41	156	Citrus	34
Moshavim	35	82	Other fruits	12
Moshavot and private	17	94	Cotton	23
Non Jewish	7	46	Flowers	17
Total and average	100	100	Vegetables, peanuts, seeds	11
			Livestock	3
			Total	100

*) The data are for 1976.

**) Relatively to average in agriculture.

***) Communal: kibbutzim and moshavim situfiyim (with collective production and private households).

Sources:

For 1983 data--Ministry of Agriculture, Economic Report on Agriculture and the Rural Area, May, 1984.

For 1976 data--Ministry of Agriculture, Production, Value Added, and Input of Labor in Agriculture; Normative Estimates for 1976; April, 1978.

Note: Years are agricultural years October 1 to September 30.

Table 2 : Production and Income Account for 1979

	<u>Million Shekel's</u>	<u>Percent</u>
Agricultural Production	3,706	100
of this: Field crops	2,239	60
Livestock	1,351	37
Investment goods	116	3
Factors purchased from other sectors	1,928	52
Net domestic product (in agriculture	1,778	48
Compensations for natural damages	10	
Income originating in agriculture	1,788	48
<u>Distribution of income</u>		100
Wages to hired labor	422	24
Interest and rent	271	15
Residual: returns to own labor, equity capital, and profit	1,095	61

Source: Annual Statistical Abstract of Israel, 1980.

Table 3 : Inputs and Major Factors of Production

	Area Culti- vated(thou- sand dunams)	Irrigated (thousand dunams)	Labor (thousand employed)	Capital(gross, Index 1976 = 100)	Feed (Grain, oilcakes, thousand ton)	Water (million m ³)	Fertilizer (thousand tons)	Purchased Inputs (Index 1976 = 100)
1956	3,590	890	102.2	34.5	279	760	21.6	37
1960	4,075	1,305	121.1	50.6	597	1,060	33.7	65
1965	4,130	1,510	114.1	66.1	755	1,095	37.0	83
1970	4,105	1,720	89.8	80.6	933	1,340	53.1	110
1975	4,325	1,800	80.4	96.8	1,373	1,230	64.9	144
1980	4,386	2,003	87.7	103.6	1,501	1,223	73.7	163
1983	4,370	2,200	84.2	102.8	1,628	1,239	75.9	172
Growth (Annual percentage ave- rage	0.7	3.3	-0.6	4.0	6.5	1.7	4.6	5.6

NoteL Fertilizers--N + P₂O₅ + K₂O

Source: Annual Statistical Abstract of Israel, 1984; water--partly from Economic Report on Agriculture and Rural Areas, various years.

Table 4 : Crops and Livestock

	crops, area in thousand dunams					l i v e s t o c k			
	Citrus	Other fruits	Field Crops	Vegetables and Potatoes	Flowers and Ornamentals	Fish Ponds (thousand dunam)	Dairy Cattle (thousands)	Beef Cattle (thousands)	Layers (millions)
1955	195	320	2,370	263	-	37	73.0	11.1	3.2
1960	328	394	2,451	264	-	49	127.0	58.4	7.8
1965	410	425	2,633	301	-	61	120.3	56.8	7.0
1970	420	420	2,518	346	4.7 ^(*)	54	144.2	61.5	7.0
1975	425	436	2,695	368	-	51	189.1	97.3	8.0
1980	412	490	2,593	355	17.3	39	178.5	100.5	8.5
1983	370	560	2,500	340	15.0	37	185.0	105.0	9.2
Growth (Annual rate of change, percent)	2.3	2.0	0.2	0.9	-	0	3.3	8.4	3.8

*) The figure is for 1971.

Source: Statistical Abstract of Israel, 1984.

Table 5 : Production of Major Products

	Production (Index 1968 = 100)			Wheat	Barley	Cotton, Fiber	Sugar Beet	Vege- tables	Citrus	Other Fruits	Poultry Meat	Beef	Milk (million liters)	Eggs (millions)	Fish (thousand tons)
	Total	Crops	Live- stock												
				t h o u s a n d				t o n s							
1955	32	34	32	36	42	2	21	209	392	7	16	6	159	504	4
1960	59	54	66	41	27	11	245	296	610	38	46	25	277	1,114	14
1965	85	84	87	150	67	22	295	307	878	101	74	31	323	1,296	19
1970	109	110	109	125	14	35	237	472	1,262	139	102	36	440	1,320	22
1975	149	150	148	243	21	49	259	609	1,506	177	173	37	582	1,570	22
1980	179	196	159	253	29	78	-	607	1,543	163	200	40	670	1,615	25
1983	215	244	179	335	38	93	-	779	1,530	239	250	34	762	1,803	22
Growth (average															
Annual change, percent)	7.0	7.2	6.3	8.5	-0.3	14.7	-	4.8	5.0	13.4	10.3	6.4	5.8	4.7	2.5

Source: Statistical Abstract of Israel, 1984.

Table 6 : Destination of Agricultural Output
(Percent)

	Local Consumption	Manufac- turing	Direct Export	Domestic Consumption Per Capita
	(1)	(2)	(3)	(4)
1957	44	31	25	90
1971	42	28	30	95
1975	42	31	27	105
1979	32	31	37	86
1983	36	33	31	108

Domestic Consumption per capita: Index, 1972 = 100.

Table 7 : Agricultural Export--Major Lines
(million dollars in 1972 prices)

	Total	Citrus	Non-Citrus Export				
			Total	Crops	Flowers	Vegetables	Avocado
1972	158	108	52	19	9	8	4
1975	193	125	71	31	11	8	6
1978	258	120	139	62	33	17	13
1981	267	114	153	58	36	28	6
1983	274	91	184	72	41	23	30

Note: Crops:Cotton, ground nuts and wheat.
Most of the growth in this group is due to cotton.

Table 8 : Subsidies and Value of Product in 1983
(billion Shekels)

	Subsidy	value of product	Rate of subsidy (percent)
In prices of products to the local market:			
Dairy milk	6.4	10.2	63
Eggs	2.6	5.8	45
Poultry meat	4.6	15.5	30
Direct subsidies:			
Other products for the local market	.1		
Indirect subsidies for local marketing			
(credit)	0.7		
Export			
Direct	1.3		
Indirect	3.9		
Other subsidies			
Feed	.3		
Water	4.2		
Total	24.1	114.4	21

Source: Ministry of Agriculture, Economic Report of Agricultural and Rural Areas.

Table 9 : Credit to AgriculturePART ONE

(Credit outstanding, end of year, in million Shekel of September, 1981).

	<u>1970</u>	<u>1974</u>	<u>1978</u>	<u>1983</u>
A. Estimate of total credit to agriculture	11,052	13,375	16,113	22,020
Credit from commercial banks	3,792	5,220	8,945	15,622
Distribution of bank credit (percent)				
Kibbutzim	-	18	21	27
Moshavim	-	8	12	14
Citrus, growers and marketing	-	20	12	4
Marketing agencies	-	21	24	16
Supply cooperatives and other farm services	-	24	23	28
Others	-	-	8	811
B. Credit to the public relative to gross national product in Israel (percent)	34	38	43	53
Credit in agriculture relative to gross Sector's product (percent)	125	98	106	118
C. Investment in agriculture	1,576	2,441	2,985	3,444
Finance of investment in agriculture (percent)	100 ^(*)	89	93	-
Finance of investment in manufacturing (percent)	10 ^(*)	43	52	-

Table 9 (cont.)

<u>PART TWO</u>				
Real cost of credit (percent)				
	<u>1978</u>	<u>1980</u>	<u>1981</u>	<u>1983</u>
Before taxes				
Short term banking credit in local currency	2	19	34	-3
In foreign currency	-6	16	43	36
Directed credit				
in local currency	-24	-39	-28	-44
in foreign currency	-14	-3	18	13
After taxes				
Short term banking credit in local currency	-19	-27	-16	-2
In foreign currency	-23	-31	-18	17
Directed credit				
in local currency	-29	-50	-43	-20
in foreign currency	-25	-36	-22	6

*) The figure is for 1969.

Sources: Bank of Israel, Annual Report (various years),
Banking Credit by Industry (various years),
 Bank of Agriculture, Annual Report (various years).

Table 10 : Labor on the Family Farm in 1976
(days of work per year)

	On the Family Farm			Family labor off the farm	Total family labor
	Own Labor	Hired	Total		
In the established moshav	216	120	336	136	352
Young moshav, partly established	170	78	248	174	344
Young moshav, not established	141	47	187	168	309
Private farming	163	181	344	63	226

Notes:

Established moshav--established before 1948

Young--after 1948

Partly established--under the auspices of the Ministry of Agriculture

Not established--The Jewish Agency.

Source: S. Shklanevitz, The Family Farm in 1976, Farm Income Research Institute, Tel Aviv, 1982.

Table 11 : Distribution of Income by Source--
Jewish Farm Families in 1976
 (Thousand IL.)

	Total Income	Farm Income	Off farm Income
<u>Moshavim</u>			
Established moshav	108.4	65.2	43.2
Partly established	82.1	29.8	52.3
<u>Young not established</u>	62.0	17.5	44.5
Average per farm in moshav	80.1	33.1	47.6
<u>Private</u>	102.7	73.6	29.1
Average family farm	82.4	37.2	45.2
Of this: Non-active farms	52.5	-2.7	55.2
Active farms	87.5	43.8	43.7
A farm with product less than 25,000 IL.	67.4	-3.8	71.2
A farm with product of more than 25,000 IL.	89.8	49.4	40.4

Notes and Sources: See Table 10.

Table 12: Product Composition in the Moshav

	Number of producers		Units per producer ^(*)	
	1971	1981	1971	1981
Orchards	7,240	14,631	31.5	23.4
Vegetables and potatoes	5,882	6,305	20.6	22.2
Field crops	13,809	7,163	61.7	29.3
Flowers	890	4,750	3.8	2.4
Cattle	5,917	2,158	18.9	58.5
Poultry (layers)	19,155	7,882	0.8	1.5

*) Dunams except cattle (number of heads) and poultry (thousand layers).

Source: Carmel Nadav, Analysis of Changes in the Moshav Farms in the 1970's, M.Sc. Thesis, Hebrew University, Rehovot, 1985.

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